POWER SYSTEM RELAYING AND CONTROL COMMITTEE
OF THE IEEE POWER AND ENERGY SOCIETY
MINUTES OF THE MEETING
September 11-14, 2017
Phoenix, AZ

A. Call to order/ Introductions Pratap Mysore

Chairman Pratap Mysore called the meeting to order at 8:00 am on Thursday, September 14, 2017.

All attendees introduced themselves. A quorum check was conducted and it was verified that the quorum was not met (60 members attended out of 130). Main Committee Attendance sheet was routed.

B. Approval of Minutes & Financial Report Murty Yalla

Motion to approve Minutes of the May 2017 meeting in Albuquerque, NM was not made as there was no quorum. The minutes will be sent to all the main committee members through email for approval.

The financial status of PSRC is in good standing.

C. Chairman's Report Pratap Mysore

Power Systems Relaying and Control Committee (PSRCC) met jointly with Power Systems Communications and Cybersecurity Committee (PSCCC) in Phoenix, AZ. This was a successful meeting and it was nice to see 19 new attendees at this meeting. I am sure that the newcomers were able to attend many working group meetings and appreciate the work done at these meetings. I take this opportunity to thank Cathy Dalton and Mal Swanson making extra efforts to see that newcomers are integrated well into the PSRC community. I welcome you all again and look forward for your active participation in the future.

With the reorganization complete, PSRCC Policies and Procedure manual for standards development is under revision. Final draft version of the manual for will be submitted for approval. Phil Winston's help in the preparation of the draft and valuable suggestions are appreciated by all the officers.

Looking forward to seeing you all in Jacksonville, FL in January 2018.

Reports of Interest

A. Report from the Vice- Chair – Russ Patterson

a. Technical Paper Coordinator's Report.

No report

b. 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
- Sep 2018 meeting will be held in Minneapolis, MN from Sep 10-14, 2018.

B. CIGRE B5 Activities Report – Rich Hunt – No report

C. IAS Power System Protection Committee – No report

D. 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. Our official administrator IEEE Standards Association is withdrawing from this role; our TC 95 TAG has been seeking a replacement to keep the US as a TC 95 voting participant. We are in discussion with three potential new administrator organizations, and have live prospects in play.

Standards projects of interest:

- 60255-1 Edition 2, CD, Common requirements (revision). This standard is the IEC parallel to IEEE C37.90, which is also now in revision. We just submitted US comments, including a number of requests to consider harmonization of these standards. At the request of the TC 95 Chair, we are attempting to arrange live US participation in the IEC drafting team meeting.
- IEC 60255-181: *Functional requirements for frequency protection* – we await the CDV, due in these months.
- IEC 60255-187-1: *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – CDV is

newly out for vote – comments and vote are due on November 17. Contact Eric Udren for a review copy.

- IEC 60255-187-2: *Functional requirements for busbar differential protection* – The first meeting will be held in UK during October 25-27 by TC-95 MT4.
- IEC 60255-187-3: *Functional requirements for biased (percentage) differential relays for transmission lines* – first draft of the standard will be presented and discussed during the TC-95 MT4 meeting in London. It will be available for PSRCC meeting in January 2018. PSRC has a WG established already for review.
- 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. The MT is working on a CD, which includes higher-frequency RFI testing among other changes.
- Update to IEC 60255-27 Ed. 2: Measuring relays and protection equipment – Part 27: *Product safety requirements*. New work will 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 Ad hoc working group (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 may meet during the TC-95 meeting in London during the week of October 25. Confirm status of the meeting with Murty Yalla before planning on participation.

- The next TC 95 MT1-4 meetings will be held in London during October 23-27, at 389 Cheswick road, London, UK W4-4AL (BSI office in Hammersmith).
  At the Phoenix meeting of PSRCC WG I4, TC 95 Chair Dr. Murty Yalla thanked Eric Udren for the excellent work performed over decades in keeping PSRC and IEC participants informed about standards development activities and assisting with synchronization of harmonized developments.

E. Standard Coordinators Report – Adi Mulawarman

PSR Standards Coordinator's Report Fall September, 2017

The status of standards activities that have taken place since the May 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)

The following standards will also be moved from PSRCC to PSCC.
C37.115, C37.118.2. Including the 2 standards mentioned above, there are a total of 4 standards that will be moved to PSCC.

The following standards are in discussion (not finalized) of being moved to Nuclear Power Engineering Committee.

C37.105, C37.98

PAR Nu	Project	Commi	Approval Da	PAR Expiration	Invitation (	Ballot Clos	Status
PC37.101	Revision	PE/PSRCC	Pending				NesCom Agenda 12-Sep-2017
PC37.120	New	PE/PSRCC	Pending				NesCom Agenda 12-Sep-2017
PC37.246	New	PE/PSRCC	10-May-13	12/31/2017			RevCom Agenda 06-Sep-2017

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	Commi	Approval Da	PAR Expiration	Invitation (	Ballot Clos	Status
P60255-11	Revision	PE/PSRCC	14-Jun-13	12/31/2017	10/28/2016	7/15/2017	Sponsor Ballot: Comment Resolution
PC37.112	Revision	PE/PSRCC	23-Mar-17	12/31/2021	5/11/2017	8/11/2017	Sponsor Ballot: Comment Resolution
PC37.237	New	PE/PSRCC	5-Dec-2012	12/31/2017	2/20/2016	5/16/2016	Sponsor Ballot: Comment Resolution
PC37.241	New	PE/PSRCC	25-Mar-10	12/31/2017	10/27/2016	1/15/2017	Sponsor Ballot: Comment Resolution
PC37.248	New	PE/PSRCC	3-Sep-2015	12/31/2017	2/8/2017	8/24/2017	Sponsor Ballot: Comment Resolution
PC57.13.1	Revision	PE/PSRCC	11-Dec-13	12/31/2017	2/12/2017	9/8/2017	Sponsor Ballot: Ballot

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

PAR Nu	Project	Commi	Approval Da	PAR Expiration	Invitation (	Ballot Clos	Status
P60255-11	Revision	PE/PSRCC	14-Jun-13	12/31/2017	10/28/2016	7/15/2017	Sponsor Ballot: Comment Resolution
PC37.237	New	PE/PSRCC	5-Dec-2012	12/31/2017	2/20/2016	5/16/2016	Sponsor Ballot: Comment Resolution
PC37.241	New	PE/PSRCC	25-Mar-10	12/31/2017	10/27/2016	1/15/2017	Sponsor Ballot: Comment Resolution
PC37.248	New	PE/PSRCC	3-Sep-2015	12/31/2017	2/8/2017	8/24/2017	Sponsor Ballot: Comment Resolution
PC57.13.1	Revision	PE/PSRCC	11-Dec-13	12/31/2017	2/12/2017	9/8/2017	Sponsor Ballot: Ballot

C37.247 has filed an extension and SA confirm agenda.

PAR Nu	Project	Commi	Approval Da	PAR Expiration	Invitation (	Ballot Clos	Status
PC37.247	New	PE/PSRCC	23-Aug-13	12/31/2017			WG Draft Development

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

PAR Nu	Project	Commi	Approval Da	PAR Expiration	Invitation (	Ballot Clos	Status
PC37.91	Revision	PE/PSRCC	27-Mar-14	12/31/2018			WG Draft Development
PC37.230	Revision	PE/PSRCC	27-Mar-14	12/31/2018			WG Draft Development
PC37.245	New	PE/PSRCC	8-Jun-2012	12/31/2018			WG Draft Development
PC37.249	New	PE/PSRCC	24-Jun-14	12/31/2018			WG Draft Development
PC37.250	New	PE/PSRCC	27-Mar-14	12/31/2018			WG Draft Development
PC37.108	Revision	PE/PSRCC	5-Dec-2015	12/31/2019			WG Draft Development
PC37.110	Revision	PE/PSRCC	11-Jun-15	12/31/2019			WG Draft Development
PC37.116	Revision	PE/PSRCC	11-Dec-13	12/31/2019			WG Draft Development
PC37.233	Revision	PE/PSRCC	5-Dec-2015	12/31/2019			WG Draft Development
PC37.235	Revision	PE/PSRCC	11-Jun-15	12/31/2019			WG Draft Development
PC37.242	Revision	PE/PSRCC	26-Oct-15	12/31/2019			WG Draft Development

PARS expiring 2020-2021

PAR Nu	Project	Commi	Approval Da	PAR Expiration	Invitation (	Ballot Clos	Status
PC37.251	New	PE/PSRCC	5-Feb-2016	12/31/2020			WG Draft Development
P1646	Revision	PE/PSRCC	23-Mar-17	12/31/2021			WG Draft Development
PC37.102	Revision	PE/PSRCC	23-Mar-17	12/31/2021			WG Draft Development
PC37.118.:	Revision	PE/PSRCC	18-May-17	12/31/2021			WG Draft Development
PC37.234	Revision	PE/PSRCC	23-Mar-17	12/31/2021			WG Draft Development

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

F. Power System Communications and Cybersecurity (PSCC) Committee Report

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

The PSCC sponsored a supersession at the PES General Meeting on the topic of cybersecurity. The four hour panel session included six presentations covering topics such as practical approaches to security operations and the convergence of cyber and physical security for OT risk reduction.

We would like to highlight the following new work in the PSCC that will be starting in January at the JTCM includes:

1. S7TF. Electrical Power System Cyber Device Function Numbers, Acronyms, and Designations. This work will be similar in concept to C37.2 and its functions and acronyms for electrical schematics to cyber security design. This new work will focus on identifying/documenting what cyber-related features are enabled and what protective cyber controls are set. Work will be coordinated with work already ongoing in the PSRC to update C37.2.
2. S8TF. Testing Power System Cybersecurity Controls. This work will be similar in concept to C37.233-2009 “Guide for Power System Protection Testing”, but with a focus on the testing/commissioning/check-out procedures of protective cyber controls and measures.

Finally, we would like to announce the 2017 selection by the PES Technical Committee of the Technical Council for the IEEE PES Working Group Award Outstanding Standard or Guide for IEEE 1815.1, Standard for Exchanging Information Between Networks Implementing IEC 61850 and IEEE Std 1815 (DNP3)(Published Dec 2015). Congratulations to the working group members and its officers, chair Ron Farquharson, secretary Ed Cenzon, and editor Grant Gilchrist.

G. NERC Report - Bob Cummings
NERC Report to IEEE PSRC - Bob Cummings
14 September 2017

1. Hurricane Irma

- Transmission Impacts (not simultaneous, many back quickly)
  - 5 – 500 kV
  - 58 – 230 kV
  - 153 – 161 / 138 / 115 kV
  - 75+ – 69 kV
  - 27 generators taken off before storm or unavailable
  - 6 generators tripped during storm
  - Peak customer outages of 7.3 million customers on Monday, 11 September at 1800 EDT
- 2.9 Million customer outages as of 6 am EDT 14 September 2017
  - 2.6 million – Florida
  - 224 thousand – Georgia
  - 16 thousand – South Carolina

2. Fault-Induced PV Inverter Disturbances

- Inverter Task Force Report released 8 June 2017
  - 1200 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance report
- Alert – Industry Recommendation issued 20 June 2017
  - Loss of Solar Resources during Transmission Disturbances due to Inverter Settings
- Both documents are available at: http://www.nerc.com/pa/rrm/bpsa/Pages/Alerts.aspx
- Frequency tripping
  - Manufacturers are adding tripping delay for frequency trips
- Voltage ride-through
  - Simulations to identify momentary cessation risk
  - Initial analysis showed significant resources potentially at risk for low voltage problems
  - Specify maximum delay and ramp rate for Restore Output
  - Additional simulations and analysis ongoing
- Expanded Inverter-Based Resource Performance Task Force (IRPTF)
  - Task Force expanded and scope extended
  - Reporting to both NERC Operating and Planning Committees
- **NERC and IEEE have signed a Memorandum of Understanding**
- NERC and IEEE are beginning to reap the benefits of the MOU:
  - Joint PES/NERC Low Short Circuit Current Impacts Task Force
  - Collaborative efforts on 1547 DER workshops

4. Single Point of Failure (FERC Order 754)

- Response to Informal Comments posted on project page.
- Second draft has been completed.
- Scheduled for 45-day formal posting September 8 – October 23, 2017 following
- Standards Committee Authorization.
- Developed corresponding implementation plan (5 year implementation) for
- Correction Action Plans addressing Category P5 changes and Requirement R4.
- Industry Webinar September 20, 2017 | 2:00 – 3:30 p.m. EDT

5. 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, pending approval

6. System Protection Coordination (Phase 2)

- PER-006-1 – Specific Training for Personnel
- Addresses Requirements R1, R2, R5, R6 of old PRC-001-1.1(ii)
- Filed with FERC 9/2/2016, pending approval
- FERC-approval of PRC-027 and PER-006 retires PRC-001-1.1(ii)

7. 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

8. 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
- Initial posting and ballot ended September 7, 2017
- SDT meets September 26-28 at NERC in Atlanta to respond to comments

9. Standards Applicability for Dispersed Energy 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)
- DER subgroup is working on a draft DER data collection guideline.
- The intent of the guideline is to inform affected entities of the issue (DER) and how it can affect them. From there, the document will provide some guidance as to who collects the data and the idea that the entities need a process to collect the DER data. Determining what data is needed is an on-going discussion point for the guideline.
- NERC is working with the DER subgroup to put together a video on DER. The video is anticipated to be 10 min long and will highlight information from the DER Feb 2017 Issued report.
- NERC is collaborating with IEEE on an International Task Force dedicated to TSODSO interactions. The task force is being sponsored by Power System

Operation,Planning and Economics Committee. One focus of the group will be DER data exchange. In general the key issues addressed by the task force include the veracity and frequency/velocity of data exchange enabling dynamic and steady state model coordination, and the in-house cleansing, formatting and integration of data into business processes.

- NERC is collaborating with Argonne National Laboratory on their Combined T&D Co-Simulation Tool Enabling Bulk Power System Reliability Studies. The objective of the project is for a full-fledged combined T&D co-simulation tool that can be adopted by NERC and ISOs in their planning and operation studies for high DER penetration scenarios.

H. B: ADVISORY COMMITTEE REPORTS

Chair: Pratap Mysore
Vice Chair: Russ Patterson

B1: WG Awards and Technical Paper Recognition Working Group

Chair: Hugo Monterrubio
Vice Chair: Mal Swanson

September 2017 Meeting Minutes:

The B1 Working Group was unable to meet Monday September 11, 2017 in Phoenix due to travel disruptions caused from airport closures due to Hurricane Irma. The WG will discuss and vote for individual and WG awards via email in order to meet the deadlines that happen before our next meeting in January.

The following awards were announced/issued during the May PSRC Main Committee Meeting on 9/14/17

a. Certificate of Appreciation to Chair and VC of Completed Working Groups (Period: May 2016 – May 2017)

WG	Type of Output	Title	Chair	VC
D32	Paper	Summary paper/presentation for C37.243 Guide for the Application of Digital Line Current Differential Protective Relays Using Digital Communications	**Bruce Mackie**	**Craig Palmer**
J6	Report	Protection Issues Related to Pump Storage	**Joe Uchiyama**	**Dale Finney**
J7	Report	Avoiding Unwanted Reclosing on Rotating Apparatus	**Mike Reichard**	**Steve Conrad**
K15	Report	Centralized Substation Protection and Control	**Ratan Das**	**Mital Kanabar**
K5	Guide	C37.119 IEEE Guide for Breaker Failure Protection of Power Circuit Breakers	**Roger Whittaker**	**Adi Mulawarman**
K20	Standard	Review and comment on C57.21 IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA	**Jim Niemira**	**Bryan Boysen**

H1	Guide	Guide for the Application of Digital Teleprotection	**Marc Benou**	**Ilia Voloh**

b. PSRC Service Awards

Bronze Service Awards for 15 Years of Service to the PSRC

i. **Rafael Garcia**
ii. **Oscar Bolado**

Silver Service Awards for 25 Years of Service to the PSRC

iii. **Raluca Lascu**
iv. **Bruce A. Pickett**
v. **Roger Ray**
vi. **Sam Sciacca**
vii. **Tony Seegers**
viii. **Murty Yalla**

c. PSRC Members Elected to the IEEE Fellows Class of 2017 (Announcement Only)

i. **William Dickerson** - for leadership in precision clock and synchrophasor technologies
ii. **Veselin Skendzic** - for contributions to technologies and standardization in power system protection

d. 2017 PSRC Distinguished Service Award

i. **Ratan Das** – for Contributions to Technologies and Standardization in Power System Protection

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 Phoenix meeting was 224, which meets our higher than normal attendance track record.

19 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. Mal Swanson, with fits and starts, promoted the Newcomers meeting during the Monday evening dinner.

Retention Program:

- Three gentlemen Mentors attended the Newcomers meeting and offered to help new attendees on any issue.
- Cathy Dalton hosted 8 lady Mentors during a Tuesday luncheon, and they are also available to help any new and not-so-new attendee with any subject.
- Heather Malson and Eric Udren are planning extra activities during future meetings.

No management support letters were drafted. If any attendee or potential attendee needs stronger management support for PSRC participation, we encourage them to let us know.

Eight Service Awards were presented.

Regards,

Malcolm J. Swanson
Membership Chairman

B4: O & P Manual and WG Training
Chair: Phil Winston: O&P Manual:

Draft of the PSRCC P&P to be forwarded to the Officers for revew and approval after the September meeting. The goal is to get it submitted to the Standards Board AudCom for approval prior to October 10, 2017.

Chair: R Hunt: WG Training:

No information available.

B5: Publicity

Chair: C. Dalton
Vice Chair: M. Swanson
Assignment: The B5 working group's scope was newly defined in January 2017 and presented at the May 2017 meeting for approval.

New Assignment or 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 PSRCC.

The new working group chair is Catherine Dalton. The new vice chair is Malcolm Swanson.

Cathy provided IEEE PSRC Updates for PAC World magazine to Alex Apostolov. These were published in March 2017 and June 2017, respectively. These updates cover awards and recognition, webinars, working group updates and articles of technical interest. These updates will now be provided on a regular basis.

Cathy will be providing articles of technical interest for inclusion in PAC World, and encouraging other PSRC members to do so. Sakis Meliopoulos and Paul Myrda will be providing an article on CPS for the September 2017 issue.

Webinars facilitated through Cathy and IEEE include Mark Siira's Smart Grid webinar, Ratan Das' Centralized Protection system webinar, and Bruce Mackie's Digital Line current differential protection 37,243.

At September Phoenix meeting, she asked subcommittee chairs to email her with webinars ideas. She also contacted Mike Dood and Craig Preuss so as to be able to include IEEE PES PSCC updates with the PSRC update.

With the logistical assistance of Elizabeth Schimpf from Beckwith Electric, Cathy also hosted eight lady Mentors during a Tuesday luncheon. These ladies will be available

to help any new and not-so-new attendee with any subject. She also explained the Publicity WG and will be asking for volunteers to assist with various activities.

Regards,

Catherine Dalton
Publicity Chairman

B8: Long Range Planning

Chair: Mike McDonald
No report is submitted.

B9: PSRC Web Site

Chair: Russ Patterson
PSRC subcommittee officers voted to go back to the approach of having individual webmasters for subcommittees. These webmasters will be responsible for updating individual working group web pages and their subcommittee's webpage.

Rick Gamble has agreed to take over as the overall webmaster for the PSRC. Individual subcommittee webmasters will work with Rick with an emphasis on maintaining consistency across all subcommittees. Rick (with officer input/approval) will have the final say on website design.

I. ITEMS OF INTEREST FROM THE MAIN COMMITTEE

A. The following motions were made by SC chair to the Main Committee:

1. The following motion was moved by Karl Zimmerman (D SC Chair): "Mr. Chair, the Line Protection Subcommittee D, requests approval for the transmittal of PC37.230, "Guide for Protective Relaying Application to Distribution Lines" to the IEEE SA for balloting. The motion was seconded by Fred Friend. The motion will be circulated through e-mail for voting as there was no quorum during the meeting.

2. The following motion was moved by Don Lukach (K SC Chair): "Mr. Chair, the, Substation Protection Subcommittee, K, requests approval for the transmittal of PC37.245, "Guide for the Application of Protective Relaying for Phase Shifting Transformers" to the IEEE SA for balloting. The motion was seconded by Randy Crellin. The motion will be circulated through e-mail for voting as there was no quorum during the meeting.

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 September 13, 2017 in Phoenix, AZ. The participants introduced themselves, a quorum was achieved (28 of 49 members and 31 guests), and the May 2017 minutes were approved (Mike Meisinger made motion, Heather Malson 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, September 15th.
- 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 final report of the C2 WG (Role of Protective Relaying in the Smart Grid) was approved and posted on the PSRC web site. A presentation was given by Roy Moxley, Vice Chair during the main committee 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 C-18 has submitted PC37.246 IEEE Guide for Protection Systems of Transmission to Generation Interconnections to RevCom

WG C-19 has submitted C37.247, IEEE Standard for Phasor Data Concentrators (PDC) for Power Systems to IEEE for Editorial Review.

WG C-20 the WG has approved the report “Impact of VSC HVdc Transmission on AC Protective Relaying” and submitted it for Subcommittee approval. Subcommittee members please review and respond by October 15.

CTF33 met jointly via a web call to assist with Hardware-in-the-Loop (HIL) Simulation Based Testing of Electric Power Apparatus and Controls. This work is sponsored by the PELS, IAS, and IES.

CTF34 met to discuss Low Short Circuit Current Impacts as requested by NERC to work with PES and PSRC to fill the identified gap for Grid Code impacts on machine design and short circuit modeling.

Old Business
There was no old business.

New Business
The CTF-35 Task force was formed to follow up the work of WG C-18 as the soon-to-be approved C37.246 It will be chaired by Alla Deronja with an assignment to write an

IEEE transactions paper of PC37.246, IEEE Guide for Protection Systems of Transmission-to-Generation Interconnections.

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. The working group report was approved and posted on the PSRC web site and the working group was disbanded.

No future meeting requirements.

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.

The working group did not meet. The guide was approved by IEEE-SA on September 28th; it is, presently, in the editorial review stage and expected to be published by IEEE-SA on November 30th. The Working Group will be disbanded by the Subcommittee in January after the guide is published.

No future meeting requirements.

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.

The working group did not meet. The standard is in Rev Comm review.

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 did not meet. The paper has been provided to the C Subcommittee members for review, with comments requested to be submitted by October 15.

Next meeting Requirements: single session, 40 attendees, with computer projector.

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: 0.5
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 Wednesday, September 13, 2017 in Phoenix, AZ in single session chaired by Yi Hu and Gene Henneberg with 9 members and 7 guests attending. Each attendee introduced themselves and described their affiliation.

Yi Hu presented the IEEE patent slides. No attendee indicated any knowledge of any patents critical to implementation of the proposed PC-37.250 Guide.

A quorum was not achieved. The May 2017 minutes will be re-circulated electronically for approval.

There is a concern that the WG is slightly behind the desired schedule to complete the Guide. The WG will determine whether a PAR extension may be needed after next January or May meetings.

Draft 0.43 was recently distributed to the working group members. This draft reflects most recent changes and additions made by the editing team volunteers. This included continuing clean-up of grammar and spelling, shortening some sections, and following the overall IEEE document format. Additional sets of comments have been received from a number of WG members after the present version was distributed.

Whether an IEEE Guide may need any Normative References was discussed. In general individual references are not critical to application of the Guide, so may reasonably be included in the References section.

Yi led a discussion of the SIPS definition developed during the May 2017 meeting as included in version 0.43. Some changes were made and agreed by the WG members present at the meeting.
The revised SIPS definition now reads:

> System Integrity Protection Schemes (SIPS) 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. The SIPS encompasses Special Protection Systems (SPS), Remedial Action Schemes (RAS), as well as additional schemes such as, but not limited to, underfrequency (UF), undervoltage (UV), out-of-step (OOS), etc.

Requirements for next meeting: Room for 30, single session and a projector with HDMI connector.

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.

The working group did not meet.

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

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 Phoenix, AZ on Tuesday, September 12, 2017 at 1:30 pm with 16 members and 10 guests. Copies of the agenda, the May 10, 2017 meeting minutes, and revisions to Draft 3.3 of the Report were reviewed.

After introductions, the May 2017 meeting minutes were reviewed and approved. Mukesh Nagpal, John Seuss, Lynn Schroeder, and Arman Vakili joined the working group as new members.

The WG began by reviewing Section 3.4.2 by Duane Buchanan on overcurrent protection of the Main Substation Transformer and coordination with the Collector Feeder overcurrent relays. Arman Vakili described the use of voltage restrained overcurrent protection on the low-side of the Main Substation Transformer for wind farms connected to transmission systems that are relatively weak sources. Arman volunteered to write an additional section in 3.4 describing the use of and setting criteria for voltage restrained overcurrent relays at wind electric plants.

The WG next reviewed some additional material for Section 3.1 on Collector Feeder Overcurrent Relay Protection submitted by Jacob Lien. There was also some additional discussion on setting considerations for negative sequence, zero sequence, and load encroachment elements to ensure proper directionality for phase and ground directional TOC elements. Ritwik Chowdhury volunteered to write a section on this subject.

Last meeting's discussion on setting 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 resumed. Martin will write a section based on his experience to date, and Arman agreed to review and add additional comments.

The group requests a single session, meeting room for 25-30 at the January 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 C-32 working groups, to the extent possible**.

Meeting Adjourned @ 2:30 pm.

Minutes Submitted 9-12-2017,
Martin Best

C-25: Protection of Wind Electric Plants

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 Phoenix, AZ on Tuesday, September 12, 2017 at 1:30 pm with 16 members and 10 guests. Copies of the agenda, the May 10, 2017 meeting minutes, and revisions to Draft 3.3 of the Report were reviewed.

After introductions, the May 2017 meeting minutes were reviewed and approved. Mukesh Nagpal, John Seuss, Lynn Schroeder, and Arman Vakili joined the working group as new members.

The WG began by reviewing Section 3.4.2 by Duane Buchanan on overcurrent protection of the Main Substation Transformer and coordination with the Collector Feeder overcurrent relays. Arman Vakili described the use of voltage restrained overcurrent protection on the low-side of the Main Substation Transformer for wind farms connected to transmission systems that are relatively weak sources. Arman volunteered to write an additional section in 3.4 describing the use of and setting criteria for voltage restrained overcurrent relays at wind electric plants.

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Last meeting's discussion on setting 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 resumed. Martin will write a section based on his experience to date, and Arman agreed to review and add additional comments.

The group requests a single session, meeting room for 25-30 at the January 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 C-32 working groups, to the extent possible.

Meeting Adjourned @ 2:30 pm.

Minutes Submitted 9-12-2017,
Martin Best

C-26: C37.233, Power System Protection Testing Guide

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, Sept 12, 2017 with 13 members and 8 guests.

When attendance was taken at the beginning of the meeting quorum was not satisfied; therefore, minutes from the January and May meetings were not voted on for approval. We plan to have an email correspondence to satisfy this issue.

Don Ware and Matt Black spoke on the current status of our document. We are slightly behind schedule of where we would like to be and will be making use of WebEx or some other teleconference technology to work through the remaining comments before the January meeting. We have plans to work with a working group member with access to WebEx and compare our available options between WebEx and Adobe Connect and move forward with the most appropriate option.

An updated excel spreadsheet was distributed showing status of volunteers assignments.

The section 1.0-1.6 was reviewed in the working group as a test for how we will conduct WebEx meetings. Essentially, we will accept or reject the comments as a WG so that the document will be prepared to submit to the subcommittee by June, 2018. If there are substantive changes that need to be tabled until a further time, we will address those on our second pass.

There are a few group members that are still having trouble with iMeetCentral. They have been instructed to contact the WG chair or Vice-chair for assistance. We announced at the meeting that only Matt Black and Don Ware will have editing rights on the document within the IMeet Central Program, but members are able to download current version.

The working group asked for a volunteer to review Annex D (Transformer oil and winding temperature computational methods) which was the only unassigned review assignment left in the guide. Jakov Vico graciously accepted the assignment.

Other assignments accepted were: Brian Boysen to review or clean up section 1.5.3 and Steve Turner volunteered to check on section 1.7 as to possibly move it somewhere else within the document.

The current version of the Guide C37.233 is v2.2. Our next meeting will need a single session with a pc/projector and room for 40. We please request conflict avoidance with K16, C31 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:

a) 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.
b) 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.
c) 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
d) 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.

Called to Order with 6 members and 9 guests. No quorum was present.

Introductions

Patent slides were shown and discussed. No attendees were aware of any essential patents.

Monthly conference calls are continuing with the work projected to be completed once IEC/IEEE 60255-118-1 is published. This will be well before the PAR expires at the end of 2018.

A discussion of the need for a working group vote to accept changes. Chair will enquire with subcommittee. If needed, chair will merge revised with original document to create a tracked-change document then call for a vote to accept all changes and proceed to ballot.

Continued discussing changes to the draft, starting where we left off in Section 6. This occupied the remaining time of the meeting.

At the end of the meeting a note to the chair was made to reach out to Alison Silverstein and others on the list of reviewers of Section 6 to determine if any further content was available.

Motion to Adjourn, seconded and carried.

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 8:00 with 16 members and 12 guests for a total of 28 people. Update to numbers – 4 new members and 7 new guests. Will have to verify numbers, but it seems that moving to 0800 decreased attendance, possibly due to conflicts.

Discussion:

Mike Garcia had incorporated the writing from the J5 document into the C29 locations. Some of the J5 writing was potentially beyond the scope of our document and we were considering how to implement, or not, parts of their writing. Overall feeling was to keep testing discussions broad in mentions and move ahead from there. Similar steps can be taken for other material.

**NOTE for J5 material – Heather was being cautious regarding disposal of out of scope material as a courtesy. Discussed this with Gene Henneberg (unable to attend meeting due to conflict) who facilitated material move between groups. He felt that the relinquished material was to be used at the sole discretion of the group.

Question asked about the original presentations from the task force still being available. Kevin Jones, Gene Henneberg, and Jun Verosa were the original presenters. We may consider adding to appendices or perhaps to PSRC site as reference material.

Question about dealing with specifics of different relay technologies affecting writing in the document. Those specifics can be addressed as needed by the authors while writing. If the need arises, the introductory assumptions can be adjusted to reflect material.

Heather briefly showed the Slack interface and advised that invitations would be sent with the expectation to try and more work for document would be conducted in there for a few months to see how that goes.

Requests for January Meeting:

Projector and Room for 40 people

Avoid conflicts if possible with D29, C26, and D37 and for related topics and Chair/Vice Chair obligations. Avoid 0800 on Tuesday, if possible.

Actions

Steve Turner and Jose Ruiz volunteered to work on Dynamic Testing writing – add to list

Heather reply to email post meeting for attendance.

Heather did notes, Mike did attendance.

Slack Work Space for WG C29 TASKS

Heather Due date: September 30

- ➔ Set up the Slack group in the next 1-2 weeks
- ➔ Send invitations to all group members and guests

All members and guests Due Date: October 08

- ➔ Determine accessibility via web and or phone application
- ➔ Create login **USING YOUR NAME** so everyone knows who you are (profile pics are optional/your choice)
- ➔ Introduce yourself in the "Welcome" channel. Channels are like message boards or groups for specific topics.
- ➔ Look around Slack and familiarize yourself with the layout, post any questions you have in the "How Do I…" channel, and let Heather know if there are any problems.
- ➔ Email Heather if you have any difficulty accessing the site

Heather and Mike Due Date: October 08

- ➔ Upload all relevant WG documents to appropriate locations
- ➔ Create and update current assignments and assignment vacancies for group
- ➔ Upload all MASTER copies of documents for visibility – these will be in pdf form and updated as draft documents are revised.

Everyone Due Date: 22

- ➔ Review current assignments for accuracy. If you find an error, please post the correct information.
- ➔ For all unclaimed assignments, pick while you can. The remainders might not be your primary interest.
- ➔ Those who wish to write a section and would like technical support for that section, request a partner for the section and/or let Heather and Mike know.

For those whom revision and editing are more comfortable than writing based on the outline, please let Heather and Mike know. We will review after all material is assigned.

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

Please avoid conflict with J5 & D29 working group meetings.

C-30: Microgrid Protection Systems

Chair: Michael Higginson
Vice Chair: Fred Friend
Output: PSRC Report
Draft: 1
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 Tuesday afternoon at 3:00 PM with 35 attendees, including 23 members (5 new members) and 12 guests.

The Chair opened the meeting with introductions. The meeting minutes for the May 2017 meeting were reviewed and approved. The outstanding assignments were reviewed with updates regarding P2030 development.

The WG reviewed comments received from section reviews, enumerated as follows:

1. Section 4.2, review by Amin Zamani.
    a. Amin to add additional detail about real time setting calculations.
    b. Michael and Amin will add some industry experience.
2. Section 3.2, brief review by working group during meeting.
    a. Mircea Rusicior will review/ need to consider impact of P1547 revision.
3. Section 3.3, Xiangyu Ding will write
    a. Ben Kazimier will review.
4. Section 4.1, Jean-Nicolas Paquin will review the system grounding.
5. Section 6 (bibliography), Mukesh Nagpal will develop

The path to completion was reviewed:

1. Complete writing assignments prior to January 2018 meeting.
2. Complete initial review of all sections prior to May 2018 meeting.
3. A field example will be provided by Mukesh as an annex.
4. Overall document review following May 2018 meeting.
5. Complete report by end of 2018.

There was discussion on interaction of this topic with other working groups. There may be something from CIGRE C6. Michael will contact those with outstanding assignments. Working group members are encouraged to submit their assignments and reviews as soon as possible. The next draft will be compiled prior to the next meeting to facilitate discussion.

Next meeting: Computer projector and room for 40 attendees. Please avoid conflict with I2, C32, and JTF1.

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

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

WG C31 met on Wednesday, September 10, 2017 at 11:00 AM in a single session with 11 members and 26 guests attending. 6 of the guests became members.

The PAR was developed during the May meeting and has been submitted but not yet approved due to administrative issues.

After introductions, the Chair provided an overview of the draft based on the old report, and a suggested new outline. It was decided to use the new outline and transfer the old report content into this outline. Assignments were made as follows:

- Transfer of old report into new outline – Alla Deronja, due 10/15

Review of sections:

- Section 4, General Considerations:
  Don Ware [review sub-team team lead] (dware@powergridmail.com)
  Phil Tatro (philt@eig-llc.com)
  Jim O'Brien (jim.o'brien@duke-energy.com)
  Gary Stoedter (gkstoedter@midamerican.com)
- Section 5, Protection Scheme Redundancy:
  George Moskos [review sub-team lead] (george.moskos@eversource.com)
  Jay Anderson (jay.anderson@comed.com)
  David Morrissey (dmorrissey@aetco.us)
  Ritwik Chowdhury (ritwik_chowdhury@selinc.com)
- Section 6, Redundancy Applications Considerations:
  Craig Palmer [review sub-team lead] (cpalmer@hubell.com)
  Lynn Schroeder (lschroeder@mkec.com)
  Aaron Martin (akmartin@bpa.gov)
  Xiangyu Ding (xiangyu.ding@sandc.com) – distribution protection

New items identified were:

- Firmware Considerations: Roy Moxley
- Network Redundancy: Solveig Ward
- Crossover/mixed use SIPS/primary protection/automation: Aaron Martin
- Refurbishment Considerations
  Review of relevance of other documents:
- NERC SPCTF 2009: Bob Cummings
- C16 PSRC Report Relay Scheme Design Using Microprocessor Relays, 2014: Robert Frye
- NERC Directory 1 (2016): Bob Cummings
- Ancillary functions K5: Alla Deronja
- NPPC directory 4 - redundancy requirements: Jeff Pond
- WECC RAS: Aaron Martin
- NERC RAS: Solveig Ward

Draft report will be emailed to the members by 10/15. The review assignments are due to the Chair by 12/15.

For next meeting 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 second meeting of working group C32 was held on Tuesday, September 12 at 9:30 AM with 15 members and 41 guests present. The following items were discussed:

1. Meeting agenda was reviewed.
2. Minutes from the first working meeting in May C32 at Albuquerque meeting in were reviewed and approved.
3. The following two presentations were made at the working group meeting.
    a. “Impact of Renewables on System Protection” presented by Evangelos Farantatos.
    Presentation was on mix of Type 3 and 4 wind turbines posing risk to reliability of traditional out-of-step and direction protection schemes. Using generic EMTP RV models developed by EPRI simulations, results illustrating the risk were presented. It was agreed that the simulation results were somewhat general in nature from these generic models. Since th

    b. “Impact of Power Electronic Sources on Transmission Line Ground Fault Protection” presented by Mukesh Nagpal.
    Theme of the presentation and the working discussion was on impact of power electronic sources (partial or full converter or inverter sources) on reliability of the line ground protection relaying. Using actual short circuit incidents within BC Hydro system, it was illustrated that the negative sequence relaying is not reliable when fault current is largely from power electronic sources. However the zero sequence relaying can be used reliably as long as the line connects the sources via transformer which is source of a zero sequence current.

4. Norm Fischer advised that the work group report need to be coordinated with the JTF1 working group.

5. Members of the working group were urged to review and submit their assignments to the chair.

6. Meeting adjourned.

Then next meeting will be in a single session with room for about 50 attendees and projector.

Avoid conflicts with C18, C24, C25, and C30.

a. 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.)
b. C17: “Fault Current Contributions from Wind Plants” (Report is complete and available on PSRC Publications webpage.)
c. C20: “Impact of Voltage Source Converter (VSC) HVDC Transmission on AC System Protection” (Active working group - Report is not complete)
d. C25: “Guide for Protection of Wind Power Plants” (Active working group - Report is not complete)

4. Reviewed C32 report draft outline. Comments and points of discussion were:
   a. Minimum generator MVA rating will not be added to report scope.
   b. Report's focus on impact to transmission system protection should prevent overlap with IEEE 1547.
   c. The following topics were added to the outline (reference attached report outline for placement of new topics):
      i. Effect of Pre-fault Conditions (on Fault Current)
      ii. Response of Tradition Protection Elements to Currents Produced by Inverters
      iii. Interaction of inverter controls at separate generation sites and impact on protection.
      iv. Interaction of inverters with control of SVC's, shunt capacitors, etc.
      v. Frequency Ride Through
      vi. Smart Inverter Technology
      vii. Emerging Protection Technologies (to detect fault current from inverters)
5. Volunteers were identified to provide contributions for the following sections: (Assignments are due by August 15.)
   a. Section 1 Introduction – Jimmy Deaton
   b. Section 2-a Fault Current - Manish Patel, Amin Zamani, Prasad Dongale
   c. Section 2-b Interaction of inverter controls and impact on protection - Yu Xia
   d. Section 3-a Utility Owned Transmission Line Relaying (Tie Line/Adjacent Lines) -Hillmon Ladner, Addis Kifle
   e. Section 3-a-iii Transfer Trip to isolate generator for short circuits on utility system -Mike Jensen, Andrew Nguyen
   f. Section 3-a-v Contingency Considerations - Jeff Barsch
   g. Section 4-a Short Circuit Model - Kevin Ridley
6. Thanks to Mike Jensen for taking meeting notes.
7. A meeting room with capacity of 50 with a projector is requested for the September meeting.

Avoid conflicts with C18, C24, C25, and C30.

Title
Working Group C32
Report Outline (Outline Draft Rev. B)
Assignment: Write a report that addresses protection challenges and practices for the interconnection of inverter based generation to utility transmission systems.
1. Introduction (Jimmy Deaton)
   a. Need for report
   b. Scope (What is covered and what is not covered?) 46kV and above.
   c. Interconnection configurations (Include interconnect configurations and figures from C37.246 Section 5 for reference.)
   d. Description of Typical Wind Plant (Very High level summary)
   e. Description of Typical Solar PV Plant (Very High level summary)

2.Protection Challenges (Describe problem)
   a. Fault Current (Manish Patel, Amin Zamani, Prasad Dongale)
      i. Magnitude and Angle (Fault Detection)
      ii. Sequence Components (Fault Detection and Directional Element Performance)
      iii. Effect of pre-fault condition (on fault current).
      iv. Response of traditional protection elements to fault currents produced by inverters.
   b.Interaction of inverter controls at separate generation sites and impact on protection. (Yu Xia)
   c. Interaction of inverters with control of SVC's, shunt capacitors, etc.

d. High Penetration of inverter based generation – low system fault current, low system inertia
e. RF Interference (Are carrier schemes at risk?)
f. Inverter Setup and Configuration (How does configuration impact inverter performance during utility events? How does this impact utility protection schemes?)
i. Low Voltage Ride Through
ii. Frequency Ride Through
iii. Dynamic Reactive Voltage Support
iv. Smart Inverter Technology

3. Solutions to Protection Challenges (Describe solutions)
a. Utility Owned Transmission Line Relaying (Tie Line/Adjacent Lines) (Hillmon Ladner, Addis Kifle)
i. Preferred Protection Schemes
ii. Directional Element Settings
iii. Transfer Trip to isolate generator for short circuits on utility system (Mike Jensen, Andrew Nguyen)
iv. Generator step-up transformer winding impact on utility protection
v. Contingency Considerations (Jeff Barsch)
vi. Emerging protection technologies (to detect fault current from inverters
b. Information received from generator operator and requirements placed on generator operator by utility (Review C37.246 Section 4 to determine if additional content is needed.)
i. Requirements imposed on generator owner for backup protection for utility faults
ii. Requirements imposed on generator owner for inverter configuration
4. Other Challenges for Utility (with solutions)
a. Short Circuit Model (Kevin Ridley)
b. Transient Overvoltage
c. Harmonic distortion
d. Inverter Based Generation Islanding Considerations

5. Utility Practice & Lessons Learned
a. Protection schemes (Utility Owned)
i. Line Protection for tie and adjacent lines
ii. Transformers
iii. Shunt Capacitor Bank (Protection and automatic control)
iv. Other elements
b. Testing Practices deployed by utilities (Testing Practices to validate inverter configuration, operation, and protection functions during utility system events)
c. Utility Procedure and Documentation Requirements to Place Site in Service
6. Conclusion

CTF-33 Support for WG-P2004 "Recommended Practice for Hardware-in-the-Loop (HIL) Simulation Based Testing of Electric Power Apparatus and Controls"

Temporary PSRC Chair: Gene Henneberg
PSRC Scope:
Support the development of this IEEE recommended practice in cooperation with PELS, IAS, and IES efforts.

CTF-33 met in Phoenix, AZ on September 12, 2017 with 12 attendees. This was a joint meeting through webinar with the P2004 team and chaired by Mischa Steurer. Webinar attendees were about 56.

P2004 WG Scope:
Chair: Michael "Mischa" Steurer
Vice Chair: Georg Lauss
This recommended practice provides **established practices** for the use of the method of **Hardware-in-the-Loop** (HIL) **Simulation** based **Testing** of Electric **Power Apparatus** and **Controls**. It is intended to be **generically applicable** in synergy (in conjunction) with any specific testing standard (if applicable).

Mr. Steurer presented several slides that described the organization, need and scope for the P2004 WG project.

Hardware in the loop testing has been in use for 15+ years by interested stakeholders such as HIL equipment manufacturers, users, consultants, testing facilities, regulatory agencies, research facilities, and members of academia. This WG will draw extensively upon previous work conducted by the IEEE. P2004 will serve as a platform to further promote HIL testing and educate the broader audience about this method.

WG P2004 will be **agnostic to the specific real-time simulation and power amplifier technologies** but focus on the **structures, models, and procedures** specific to **conducting** HIL based testing

The official first face to face meeting for P2004 WG will be at October 3 at the IEEE ECCE meeting in Cincinnati, OH. Mr. Steurer also listed resent and other upcoming WG meetings.

Power systems protection relays have long been tested via HIL. Therefore, it is vital for the success of WG-P2004 to keep a close interaction with the IEEE PSRC. CTF-33 has been established as the conduit for this interaction.

PSRC members with experience in HIL based testing are encouraged to join both the CTF-33 and WG-P2004. Individuals may sign up for the WG by contacting Blake Lundstrom, blake.lundstrom@nrel.gov Even without active participation the WG-P2004 email list will inform members of all meetings (mostly held via web/telecom).

WG-P2004 invites contributions from PSRC members at either the CTF-33 or WG-P2004 meetings. Contact either Mischa Steurer, steurer@caps.fsu.edu or Georg Lauss, georg.lauss@ait.ac.at if interested in making a presentation at a P2004 WG meeting. Examples of such contributions relevant to PSRC work include:

- Summarize all testing standards under PSRC purview and illustrate how some of those are executed using HIL
- Users of HIL (e.g. utilities or relay manufactures) describe their experiences with HIL.
- Projects involving either relay testing or system controller testing is of interest to P2004

Several PSRC attendees briefly outlined their experience and identified additional individuals (not necessarily PSRC members) with relevant background and interest in HIL.
The next joint PSRC CTF-33/WG-2004 meeting will be scheduled in Jacksonville, FL in January 2017. We will need a room for 20, a computer with audio, and a projector.

CTF34 – Inverter-Based Short Circuit Current Impacts
Chair: Kevin W. Jones

Vice Chair: Gary Kobet

Assignment: Coordinate/communicate the efforts of the PES/NERC Low Short Circuit Current Impacts Task Force and PSRC working groups addressing the issues of inverter-based resources.

Overview:

ATTENDANCE

20 Total with 3 members and 17 Guests.

General Items

WG CTF34 met in single session on September 13 in Phoenix, AZ with 3 members and 17 guests.

Kevin Jones discussed the issues that led to the formation of CFT34, which is an industry concern about high penetrations of inverter-based resources impacting short circuit currents and system inertia on the power system. Kevin briefed those in attendance of the PES/NERC collaborative effort that was recently launched to create an industry guidance document within a year to address these issues. This PES/NERC Task Force is working under the guidance of the PES Technical Council and NERC. Kevin Jones of the Power System Relaying and Control Committee (PSRC) and Pouyan Pourbiek of the Power System Dynamic Performance Committee (PSDP) are the co-chairs of this Task Force. Gary Kobet of the PSRC is the vice-chair. The Task Force currently consists of around 15 members from various segments of the electric power industry. The scope of this Task Force is to "Identify/define the issues/impact of having large penetrations of inverter based resources on the power system". This PES/NERC Task Force is planning on having the industry guidance document published by spring, 2018.

Discussions ensued about the need for CTF34 to remain as a PSRC Task Force. There are presently several different working groups addressing issues with inverter-based resources, most notably C24, C32 and JTF1. In light of these working groups that will perform much of the detailed work that will result from the PES/NERC guidance document, it was decided that CTF34 would remain a Task Force until the PES/NERC industry guidance document was published, at a minimum. It was also decided to change the title of the Task Force from "NERC Standards Gaps Investigation" to a more logical "Inverter-Based Short Circuit Current Impacts" title. The previously undefined scope of this Task Force was then defined. Going forward, CTF34 will have scheduled PSRC meeting times where updates will be given on the progress of the PES/NERC industry guidance document and the efforts of PSRC working groups C24, C32, JTF1 and others involved with inverter based resources.

REQUIREMENTS FOR NEXT MEETING:

For the next meeting, CTF34 will need a room for 30 and an overhead projector.

D: LINE PROTECTION SUBCOMMITTEE

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

The Subcommittee meeting was called to order on Wednesday, September 13, 2017 with 28 members and 42 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 May 2017 meeting in Albuquerque 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 :1.21
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 via WebEx on Wednesday, September 13, 2017, 11 am MST.

There were 15 members and 2 guests. The attendance list is attached.

The patent slides were presented. No concerns were raised.

May meeting minutes were presented. Mike Meisinger motioned to approve the minutes. Pat Carroll seconded the motion. The minutes were approved.

June meeting minutes were presented. Mike Meisinger motioned to approve the minutes. Chris Walker seconded the motion. The minutes were approved.

July meeting minutes were presented. Pat Carroll motioned to approve the minutes. Mike Meisinger seconded the motion. The minutes were approved.

August meeting minutes were presented. Mike Meisinger motioned to approve the minutes. Pat Carroll seconded the motion. The minutes were approved.

Working group discussed revisions to the following sections:

• Review team comments
  - Several versions of Figure 5-6 were presented. WG decided to remove the figure and add a reference to IEEE Std 80 IEEE Guide for Safety in AC Substation Grounding
  - 5.4.4 Other protection devices ▪ New section was reviewed and accepted by the working group
  - 7.1.1 Phase faults ▪ Discussion on transients was moved to this section from section 4.4.

- 7.1.3▪ Range for transformer inrush was discussed and it was suggested that we reference an S&C publication.

  ▪ Reference to C37.91 was removed since it no longer includes information on range of expected transformer inrush

- 8.3.4 Load restoration overshoot ▪ Changes were reviewed and minor editorial changes were made

Motion was made by Mike to form a balloting body. Pat seconded. The working group approved.

The Plan Going Forward

• Request approval from the subcommittee to form a balloting body.

• Clean up the document, see list below, and send final document out to the working group approval by end of year.

• Form balloting body in December

To-Do List for WG approval/Ballot:

• Replace figures with Visio format

• Complete editorial review and word usage cleanup

• Complete bibliography

• Add/fix references within document

Assignments:

Here is a summary of assignments made during the two WebEx meetings (**Note:** some may have been completed):

• Jim

- Will send us the S&C paper on transformer inrush

• Claire Patti:
- Find and add reference for magnitude of transformer inrush current to section 7.1.3.
- Fix first sentence of section 7.4 Reclosing (79 function) and try to generalize to include reclosers
- Harmonize use of microprocessor, digital, and numerical within sections
- Review document for consistent use of relay, element, device, units, etc.
- Look at use of section vs. clause. Find out what IEEE recommends.

Old Business:

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.

WG D29 met in single session on September 12 in Phoenix, AZ with 12 members and 12 guests.

Normann Fischer had a whiteboard discussion on relay processing time and how it relates to setting Out-of-step relays. This discussion focused on how to correctly set the out-of-step blocking timer so that a relay that uses double blinders can correctly identify the difference between an out-of-step condition and a power system fault.
Arman Vakili

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Arman Vakili gave a presentation showing how the AVR affects the trajectory of the impedance in the impedance plane during a power swing. The trajectory of the impedance during a power swing is different when the AVR is in service (automatic mode) compared to the trajectory of the impedance when the AVR is in manual mode. The final impedance is the same in both cases, but the trajectory to get there is different.

Kevin Jones then discussed the writing assignments and reviews of the already written sections. Kevin would like all written assignments to be sent to him just after Thanksgiving so that he has time to review them and add them to the master document before the January 2018 meeting.

Kevin plans to complete his test system modeling tasks in PSSE before the end of 2017 so that other members can perform their simulation tasks.

For the next meeting, D29 will need a room for 30 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 2.0

Working Group Assignment: Write a tutorial on factors affecting the application and setting of ground mho and quadrilateral distance elements on transmission lines.

Working group D30 met in a single session in Phoenix on September 12, 2017, with 7 members and 14 guests.

After introductions, the WG Chair informed the WG that the latest draft of the tutorial (Draft 2.0) has been posted on the PSRC website and available for viewing.

The WG Chair distributed the tutorial's outline, stated that all writing assignments have been received, and thanked the contributors. He then requested the contributors to present their writings to the WG.
Demetrios Tziouvaras went through his contribution dedicated to challenges when utilizing ground distance protection for underground cables due to the cables' zero-sequence impedance errors.

Aaron Martin discussed a challenge of single-pole tripping on a line, which is parallel to another line when single pole load is transferred to the parallel line. In their application, to avoid the operation of the protection of the parallel line, they extended protection element's time delay setting longer than the open pole time of the faulted line.

Jorg Blumschein presented challenges of ground distance protection associated with line single-pole tripping.

Aaron Martin addressed ground distance setting considerations in pilot schemes.

Mike Kockott provided material on series compensated lines, which is brief because there is another WG addressing the protection issues with series compensated lines in more detail.

The material submitted by Joe Perez on neutral shift effects on ground distance protection will be further reviewed for applicability in this tutorial.

The WG Chair also noted that Ted Warren made comments to Section I Introduction and Section II Ground Distance Element Design of MHO elements and will address them with the original author of these sections.

Gary Kobet reviewed the whole document and provided many comments, which are planned to be reviewed at the January 2018 meeting.

Action Item

Aaron Martin will add some material on what element operated (quadrilateral ground distance) in his example of single-pole trip on the parallel transmission line.

The next meeting is planned in January of 2018 in a single session for 30 attendees with a computer projector.

D34: <u>Coordinate with IEC 60255-187-3 Functional Specification for Line Current Differential</u>
Chair: Normann Fischer
Vice Chair: Joe Mooney

D34 did not meet in Phoenix and has no minutes to report. It is unclear if there will be a meeting in January and will depend on how soon the document is provided to the members.

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: 1

Working Group D35 met on Wednesday, September 13th, 2017 at 8:00am in a single session with 17 members and 14 guests.

After introductions, outstanding writing assignments were discussed.

There was concern that the current format of the writing assignments would lead to a lot of redundancy in each section. Alternate formats were discussed, i.e. should the individual subjects be driven by communication path technology, pilot scheme, or system topology. After much discussion, it was agreed upon that system topology would be used to drive the main discussion points, with introduction of communication path technology and pilot schemes at the beginning of the document. Advantages and disadvantages to communication path technology and pilot scheme will then be discussed as they relate to each individual system topology. This more or less matches the original planned format.

A few system topologies were added for writing assignments:

- Ordinary Line
- Underground (or other) pure cable line
- Line with multiple distribution banks tapped on the line

Writing assignments were made for the new sections, as well as all previously unassigned sections.

Other points of discussion:

- how to incorporate single pole tripping schemes.
- how much discussion should be made on cost of each scheme, comm. paths

At least one working section will be sent out to the group so that all writing assignments will have a similar format (one-line, etc.)

For the next meeting, WG D35 will need a room for 40 and a computer 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:
Ordinary line - Mike Benitez
Ordinary line with tapped distribution transformers - Jeff Barsch
Double circuit overhead transmission line with mutual effects - Rick Gamble
Single circuit transmission line with WI (weak infeed) - Qiao Yin Yang
Series compensated overhead transmission line - Nuwan Perera / Vijay Sundaram
Hybrid line (overhead line and underground cable) - Alla Deronja
Overhead line and transformer in line - Roger Hedding / Vinod Sekhar
Tapped transmission line, grounded bank on line - Brandon Armstrong
High SIR, electrically short - Bruce Mackie
Very long line - Adi
Three terminal lines:
Line with outfeed - Josh Lamb
Weak infeed - Don Fontana
Pure underground cable line - Demetrios

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 did not meet in Phoenix.

The paper and presentation are complete.

The paper has been accepted for presentation at the 2017 Western Protective Relay Conference and the 2017 Minnesota Power Systems Conference. Nestor Casilla plans to present the paper at these conferences.

The abstract has been submitted for consideration at the 2018 Texas A&M and Georgia Tech protective relay conferences. Gustavo Brunello has offered to present at these conferences if the paper is accepted.

The chair recommends that the D36 working group be disbanded since their work is complete.

During the sub-committee meeting, a motion was made and seconded to disband working group D36. This motion was approved by the sub-committee.

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 second time on Tuesday, 12 September with 14 attendees, 7 members and 7 guests, of which 3 were attending for the first time.

The title/assignment for D37 was updated to read “Impact of fixed series compensation on transmission line protection”. This was approved by the D subcommittee, and so will be reflected as such going forward.

Charlie Henville gave his scheduled presentation “New Zealand Experience”. A copy of his presentation is attached. The content of his presentation covered many of the aspects that were identified to be covered in the D37 report (draft report outline), and so served as substantiation for these aspects to be included in the report. Many thanks to Charlie.

Aaron Martin and Deepak Maragal were unable to attend the meeting, so their scheduled presentations, “BPA Experience” and “NYPA Experience” respectively, will stand over until a future meeting, tentatively May 2018.

For January 2018 meeting, a presentation on the actual components comprising a series capacitor installation, covering also the reason for each component, will be arranged. Luis Polanco will arrange this, as he indicated at the meeting that he has a potential candidate in mind. If anyone else has a candidate in mind for this presentation, please liaise with Luis.
The draft outline as prepared by Mike Kockott for this meeting was agreed upon, with just some minor changes. At the meeting Mike added numbering to the draft.

Action items

Mike Kockott to format the draft content outline into a structured report framework. Writing assignments when received will then be incorporated directly into the report framework.
Writing assignments

3 Understanding series capacitors and their impact
1. What are series capacitors and why are they required
   a. Series capacitor installation, size, location, etc.
2. Phenomena that impact on line protection (21, 87L, 67, 67N)
   a. Voltage inversion, current inversion, low frequency oscillations, bank unbalance (single pole tripping, phase segregated bypass), current distortion
   b. Fault level
3. Phenomena that impact on plant/equipment other than the line protection
   a. TRV, SSR, capacitor bank harmonic currents

3.1 (3.1.a): Charlie Henville
3.2 (3.2.a): Mike Kockott, Luis Polanco
3.2 (3.2.b): Luis Polanco
3.3 (3.3.a): Nuwan Perera

4 Planning for addition of series capacitors by line protection engineers
1. Upfront information required
   a. Size, location (mid-line, end-line), phase segregated bypass
   b. For end line, VT location (line-side, bus-side)
   c. Available teleprotection equipment (line-end to line-end, line-end to capacitor)
   d. Loadability
   e. etc.
2. Upfront studies required
   a. Zone of influence (e.g. zone of voltage inversion, series capacitor line + adjacent lines)
   b. etc.

4.1 & 4.2 (4.1.a – 4.1.d, 4.2.a): Charlie Henville, Mike Kockott, Luis Polanco

5 Steps for successful installation, from perspective of line protection

1. Considerations when selecting/setting the line protection
   a. Application of knowledge gained from upfront information/studies
   i. How far back into network to replace existing line protection, change settings
   b. Impact, on line protection, of installed series capacitor protection and bypassing mechanisms (e.g. MOV action, etc.)
   c. etc.
2. Motivation for/benefit of upfront real-time simulator testing
   a. Planning the test cases (what to test, why) – how far back into the network to perform the studies (screening studies)
   b. Actions, after testing

5.1 (5.1.a – 5.1.b): Adi Mulawarman
5.2 (5.2.a – 5.2.b): Nuwan Perera

Mike Kockott to send a reminder mid-November to WG members/guests with assignments.

Completed assignments to be sent to Mike Kockott and Luis Polanco by the end of November. Please work with partners so the deliverable to Mike and Luis will be a single document.

Mike Kockott and/or Luis Polanco will insert the received contributions into the report framework. The report framework with the inserted contributions will be sent to all WG members and guests around mid-December.

The attendance at the meeting was low. If any that could not attend would like to volunteer to contribute to the writing assignments (those already assigned, or as yet unassigned – see draft report topics), please inform Mike and Luis.

During the sub-committee meeting, the revised assignment was approved.

DTF38: Impact of series compensation on transmission lines
Chair: Chris Walker
Vice Chair: Greg Ryan

Task Force Assignment: Investigate the need for a working group on the Impact of High SIR on Distance Relaying

The meeting started with introductions.

Chris introduced the assignment. Karl Z presented the background (at an ad com meeting Pratap suggested this task force based on significant feedback and observations from the industry).

Discussion was around what information is already published and what the technical paper would look like. There was much discussion about the need for a technical paper and great interest in the room. A vote was held to indicate the interest in moving forward. The vote was practically a unanimous yes. A recommendation will be brought to the subcommittee to move forward with the below assignment. The assignment was revised from the proposed assignment to remove Impedance Relaying and replace with Line Protection to allow for the scope to expand if needed.

Assignment: Prepare a technical report to the line protection subcommittee to evaluate the impact of high SIR on line protection.

There were total 39 attendees in the meeting, 22 new members and 17 guests.

For the next meeting in January 2018, we need a room with capacity of 40, and a computer projector.

At the subcommittee meeting, a motion was made and seconded to convert DTF 39 into a working group D39 with the assignment “Prepare a technical report to the line protection subcommittee to evaluate the impact of high SIR on line protection.” The sub-committee approved the motion.

DTF39: Revise C37.104 IEEE Guide for Automatic Reclosing of Circuit Breakers for AC Distribution and Transmission Lines
Chair: Manish Patel
Vice Chair: Bruce Mackie

Task Force Assignment: To determine if a working group is needed to review C37.104 IEEE Guide for Automatic Reclosing of Circuit Breakers for AC Distribution and Transmission Lines

Task Force DTF39 met on Tuesday, September 12, 2017 at 8:00am MST in a single session with 19 members and 4 guests.

After introductions, the patent slides were reviewed. No one knew of any patent issues at this time. The current guide was reviewed. The chair had developed some talking points of possible revisions to the document. These talking points were reviewed. Mike Jansen and Ilia Voloh agreed to review the document on reclosing on wind generation and other types of DG.

The task force then accepted the following assignments to review the sections to determine if improvements can be made.

- Section 4: Jim O’Brien, Alla Deronja, Greg Ryan, Meyer Kao, Vijay Shammugasundaram
- Section 5: Bruce Mackie, Dave Aldrich, Amin Zamani
- Section 6: Alla Deronja, Rick Gamble, Josh Lamb
- Section 7: Ilia Voloh, Jay Anderson

Joeg Blumschein will write a sction on single phase trip and reclose on phase to phase faults. Additional comments or questions that were discussed during the meeting included the following:

- Microgrid will probably not be included in the scope of the document
- It was suggested to divide section 7 into sub-sections that include transmission or distribution or both.

Brandon Armstrong volunteered to be the vice-chair of the working group.

At the next meeting of the task force, the assignment and scope will need to be discussed and approved so the PAR can be developed and approved.

For the next meeting, DTF39 will need a room for 30 and a computer projector.

Coordination Reports

T&D Committee / Distribution Subcommittee

The next T&D Committee / Distribution Subcommittee meeting will occur during the IEEE PES Joint Technical Committee Meeting January 7 – 11, 2018 at the Hyatt Regency, Jacksonville, FL.

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 has been balloted and the comments are being incorporated.
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 next 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 in 2018.

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

The chair began a discussion asking if some of the published papers should be converted to guides. This may help reduce the length of long guides such as the transmission line protection guide. The discussion listed some advantages and disadvantages to this effort. After the discussion, Task Force DTF 40 was created to discuss the future plans for revising the Transmission Line Guide. One member suggested tutorials may be the best method to help future engineers. The initial assignment of the task force will be to provide recommendations to the Line Protection Subcommittee by reviewing the scope of material and investigate how to improve future revisions of IEEE Line Protection Guide C37.113. Considerations will include reducing the size of existing guide by breaking sections into standalone guides and reviewing technical reports on topics that are subsets of existing line guide. Jeff Barsch will be the chair of the task force.

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 September 13, 2017. The Chair announced changes in the Subcommittee Membership: two memberships were suspended: Chis Chelmeski will not be attending PSRC meetings anymore. John Tengdin became an Honorary Member. The Chair welcomed two new Members: Allen Goldstein and Jun Verzosa. The meeting continued with 26 members of 42 total, comprising a quorum. 20 guests were also present. Minutes of the May 2017 meeting were approved without objection.

The Chair presented new several announcements

a. New items from May Adcom Meeting
   i. Publicity for WGs via PacWorld magazine and webinars.
   ii. CTF33 hardware in-loop testing.
   iii. CTF34 NERC examination of fault contribution from inverter-based devices.

b. New items from standards coordination meeting
   i. WG minutes should state that patent slides were presented, and indicate whether or not there were responses.
   ii. New patent slides are available, including a slide for meetings of standards WGs that don't have a PAR yet.

c. Reminders carried from prior meetings
   i. WG written minutes available to SC H VC within a week of meeting, 2 weeks to attendees & members.
   ii. Please use PSRC template for minutes!

iii. Check your PAR completion date – avoid extensions!

iv. Double sessions are discouraged – scheduling crunch.

v. Standard format for SC H vote mailings (Subject line):

PSRC VOTE REQUIRED SC H [WG HXX] (2014-1) by May 31, 2014

WG business:
WG H17 was suspended as the group did not meet for 3 PSRC meetings.
WG H27 needs new leadership: Chis Chelmeski will not be attending PSRC meetings.
WG H39 completed its assignment and was disbanded.
WG H42 was disbanded, as no revision of C37.93 is needed. Related work will start in PSCC.
HTF43 was disbanded, as standard revision will be reviewed at a later date.

Old business:
None.

New business:
A new HTF46 was formed with assignment to determine if a working group should be formed to generate a Recommended Practice for Human-Machine Interfaces (HMI) used in Substation Automation Systems, and Craig Preuss 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 8 members and no guests, with quorum. The patent policy slides were shown, and no issues were identified.

The minutes from previous meetings were approved.

Most comments have been resolved and the changes made to the document. We are continuing to work on Annex A, specifically the TDM extensions to the IRIG-B time code, and we are waiting for an XML implementation annex from Pierre Martin. Both are expected to be incorporated into the final draft allowing a recirculation in time to meet the October 16 RevCom submission deadline.

We have been advised by the Standards Coordinator to concurrently apply for an extension, in case we don't meet the deadline due to technical comments requiring discussion. This extension will be ignored if we do meet the submission deadline, as we expect.

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 9 members and 5 guests present for the Sept 12, 2017 meeting.

The minutes from the May 2017 meeting were reviewed and approved with no comments. The patent slides were also presented with no objections voiced.

The Chair began with a review of the report's status, it had been voted approved by the SC with only one negative vote but several editorial comments were received. The report was edited to address the comments received since May; then the updated report was distributed to the WG for another review of the edits made to date. In general, several figures were revised to be more generic and easier to view and print, and wordsmithing across the report for consistency. Additional references (#5 & #6) were added to the bibliography and clause 3.1.

Today the report was reviewed with those attending for the comments remaining and edits made. With all comments now addressed, the report needs to be put into the correct report format per Miriam. Once completed, it will be resent to the SC for final approval and posting.

Once the Report is re-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 25 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 Wednesday, September 13, 2017, 9:30 – 10:45 AM

Total attendance was 6 members, 1 corresponding member, and 6 guests. Attendees introduced themselves, the patent announcements were made, and a roster was

circulated. No comments were received back from the attendees regarding the patent announcements. The chair reviewed the current status which is:

The committee draft (CD) was revised into the current Draft 7 based on IEC and IEEE circulations in late 2016 and was submitted to IEC for circulation as a CDV in early June. The closing date for that circulation is November 17. That draft was also submitted to the IEEE for a recirculation which completed on July 15. There were 4 editorial comments, 4 of the 6 negative ballots were changed to approve, and no new negative ballots were received. Those editorial comments have been addressed with the help of the IEEE editorial staff. The WG needs to wait for the completion of the CDV circulation before further action with the IEEE. The WG applied to IEEE for a PAR extension to cover the completion of the project which will extend into 2018.

Balloting was discussed: the 2 remaining negatives are from WG members and the WG understood the concerns had been addressed; not changing the vote may have been an oversight. In any case, the WG will follow SA procedures for resolution and preparation of appropriate documentation as may be required by IEEE for final approval of the standard.

There was discussion of translation of the standard, preparation of the French version including challenges with the graphics, the best word processing system, and other related aspects of document preparation and presentation.

The WG looked at the changes requested in the comments from the IEEE recirculation and decided to take the revision date out of the recommended changes, so WG is accepting 3 and revising one of the comments.

Production of a summary paper was discussed. Summaries in 1995 & 2005 were accepted by Transactions on Power Delivery (TPWRD) without a problem, but the 2011 paper for C37.118.2 was not and was finally accepted by Transactions on the Smart Grid. The summary paper for C37.118.1 was accepted by TPWRD after major rewrites by a few members and a long review process. The issue is that Transactions wish to have new developments rather than descriptions or summaries of standards. After discussion, the WG decided have enough new development and need to present the standard that we should write a paper. We also should plan to take it to some of the regional conferences. To this end, the chair will draft an abstract/outline and circulate it to the WG with the plan to have an outline that we can start working with at the January meeting.

The WG requests a meeting space for 20 people, single session, and computer projector for the next meeting in January. The WG would also like to reserve 2-3 sessions on Sunday or Monday to resolve comments from the CDV it that becomes necessary. Details on day & time of added sessions need to be coordinated by the meeting organizer with the Chair.

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: PC37.249 Guide for Categorizing Security Needs for Protection Related Data Files (Joint Working Group Substations Committee C19 & PSRC H22)

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 seven (7) members and nine (9) guests in attendance (1 member short of a quorum). After introductions the IEEE SA Patent slides were presented in detail and no claims of any potential patent infringement were recorded.

The Guide is now at draft 8.0. Twelve (12) out of twenty (20) assignments have been submitted, reviewed, and accepted. The timeline agreed upon is to complete the remaining assignments by the end of 2017. It is expected that the work be completed by PAR expiration date (end of 2018).

The group discussed the new None classification and it was noted that FIPS 199 only uses High, Medium or Low (None is included in the Low classification). There was consensus that for harmonization purposes the new classification should not be used. The group however agreed to leave the item open for further discussion to see if the classification applies to any of the file categories. IEEE SA will be contacted to request a copy of 62351-11 for the group to review and validate the harmonization.

The group also reviewed the incomplete items remaining and re-assigned as needed. The use of the term “settings” files was clarified. The text was revised to clarify the difference between settings procedures/guides and settings files.

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.

H23 did not meet in Phoenix. A web meeting was held on September 6 to discuss two comments received from the first recirculation ballot. Barring additional comments within the

working group, draft 9 will be submitted for a second recirculation ballot on or about September 14, and submission to RevCom is anticipated immediately following the close of this ballot.

Meeting requirements for next meeting: single session for 20 people, computer projector

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.

Chris Chelmecki resigned as chair of H27 on May 22 due to his change of employment and associated departure from PSRC activities. No one accepted his invitation to take over as chair of the WG prior to the September PSRC meeting.

9 people attended the scheduled September session for H27. A thoughtful discussion on the purpose and scope of the COMSET standard took place. Several possible use cases for COMSET were discussed. Some of the activities that are required to achieve these goals were identified as being within the scope of H31 and not being part of COMSET.

H. Falk indicated that he may be willing to become the new chair of H27, depending on external factors.

Action items:
ALL: Anyone who has a use case for COMSET shall write a paragraph describing it and submit to C. Preuss.
C. Preuss will collect the various use cases, assemble them, and send to the H27 mailing list.
E. Allen will provide minutes of the discussion and provide a report for the H Subcommittee. E. Allen will also add the e-mail addresses of new attendees to the H27 mailing list.

As there was no chair and no membership roster available, no meeting of H27 officially took place.

Meeting requirements for next meeting: single session for 20 people, computer projector

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 Sep-12 with 4 members and 6 guests.
The group discussed following items from the report:

1. Troubleshooting: It was highlighted that some configuration tools utilize hexadecimal for representing GOOSE APP ID while some use decimal. Herb Falk made a point that all configuration tools should only use Hexadecimal format and mentioned the problem does not exist in IEC 61850 certified products.
2. Engineering process: A used case diagram for protection control engineering process in a traditional (non-IEC 61850) was compared with IEC 61850 engineering process. Difficulties and complications arising from managing single SCD file for a substation during design, testing and commissioning steps were analyzed. The group decided to take this feedback to IEC Working Group 10 meeting in October-2017.
3. Documentation: The group highlighted the need for establishing the best practices for documenting IEC 61850 based substation automation system. Couple of best practices and examples were discussed. It was mentioned that ENTSOE in Europe and Christoph Brunner (Chair-IEC WG10) are working to develop tools and establishing best practices in this domain.
4. Firmware comparison tool and report: The need for having firmware comparison tools was discussed which would allow to users to analyze the impact of any IEC 61850 related upgrades prior performing in field. Specific features of such a tool were also discussed.

Details of these discussion points can be obtained from R006 report.

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 Sep-13th with 4 members and 1 Guests.
The group reviewed the common parameters identified in all protection & protection related logic nodes in IEC 61850 standard. Following items were discussed regarding the parameters:

- Duplication of signals and setting (Same attribute multiple definitions)
  Ex: BlkV attribute in FrequencyProtectionLN and PowerFactorProtectionLN
- Multiple signals& definitions to represent same type of signal
  No signal/setting should be represent twice
- Lack of clear understanding of behavior of every signals and parameter
  Inconsistent implementations by vendors
  Behavior should be clearly specified in standard
- Addition of new parameters and attributes
  Ex: Blkpos

The group discussed whether to take holistic approach in analyzing all parameters/attributes of protection & protection related functions or to study function-by-function. It was decided to focus on function-by-function investigation it is not

important to understand and analyze the categorizations of existing IEC 61850 attributes into different classes-subclasses for this effort.
It was also highlighted that identification and representation of all parameters should be done utilizing common IEEE nomenclatures and minimize the usage of IEC naming conventions as most people are not familiar with them.

The parameters and models of Overcurrent and under frequency functions are expected to be discussed in detail in next meeting.

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

H32: Performance Requirements for Ethernet Circuits Applied to Teleprotection
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.

The WG met on Tuesday, with 6 members and 3 guests in attendance.

We reviewed the edits and contributions of the WG assignments from the January meeting. All edits were accepted as written or revised at the meeting to the approval of the WG members in attendance.

The working group agreed that the draft 8 is ready for submission to the Subcommittee for review and approval.

The attending members agreed that the content was complete and agreed to submitting the document for approval. There was a concern raised by one of the members who could not attend the meeting about the order of the topics discussed in the report. This concern was raised with the members in attendance. Thus, we reviewed the document in this context and agreed that a few sections seemed out of sequence. These sections were reordered. This draft will be re-distributed to the working group members for final approval. There will be a three-week deadline for feedback. We understand there is a new IEEE format for WG reports. We will investigate this and ensure that we convert the format as required.

For the next meeting: We do not plan to meet in January. Reserve a room for 25 and a projector in case we must resolve any issues raised during the Sub-Committee review. If there are no edits required, we will not meet

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 Working Group met on time with five (5) members and five (5) guests in attendance.
Sparse data for COMTRADE was discussed, it was agreed that this question is best answered once a XML file format is defined. A recommendation was made that analog and digital channels should be separated so compression can be effective for non-changing data. Mario volunteered to create a file format draft for analog and digital channels.

Unicode for channel descriptions was discussed, there was consensus that UTF-8 is sufficient for this. A recommendation was made that each channel should be given a persistent ID, which would be a global unique identifier.

Variable channel size was discussed, a recommendation was made to use the IEC 61850 data types (all 14 of them), some found this beneficial and the subject will be discussed further at the next meeting.

A recommendation was made that COMTRADE should use Julian day + 2-digit year for the date field. Another was made that COMTRADE should use TAI instead. It was agreed these items are worthy of discussion at the next meeting.

Mario volunteered to be the secretary for this working group.

The group will meet again at the next meeting, a room for 20 people and a computer projector are requested.

H38: <u>Design and Implementation of Time Synchronization Distribution Systems for Substation Automation (P2030.101)</u>
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

H38 did not officially meet in September.

A recirculation ballot for P2030.101 was initiated just prior to the September PSRC meetings. The results of the ballot are expected to be distributed to H38 members by September 22.

Meeting requirements for next meeting: single session for 25 people, computer projector.

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 did not meet. It completed its assignment and was disbanded.

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.

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

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"

A brief overview of the project scope and plan of execution was presented. The draft document subject for revision is posted on iMeet. The current document normative and informative content was reviewed to better understand the tasks to be performed. For example, the figure describing delivery time needs to be replaced and/or clarified.

The chair presented an overview of the proposed technical approach consisting of 3 workstreams (WSs). The technical approach was accepted without amendment. No one volunteered to lead or participate in the workstreams.
WS 1: The goal is to determine by the next meeting the changes to existing specifications. Volunteers are requested to step up to the task by October 12th.

- WS 2: The goal is to identify new technical performance requirements.
- WS 3: The goal is to identify a replacement for the figure describing delivery time components. Solveig Ward agreed to serve as interim WS3 leader.

The chairman will reach out to IEC TC65WG10 and PSRC WG H32 to ensure that all P1646 technical specifications are either harmonized or to ensure that technical differences are adequately explained.

The chair presented an overview of H41's iMeet workspace including a demonstration on how to navigate the workspace, post documents, and post comments and responses to discussion threads.

For the next meeting: Reserve a room for 25 and a projector.

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 on Tuesday at 11:00 with 8 people, 7 members and 1 guest.

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. In the May meeting the WG voted to allow the standard to expire. The purpose of this meeting was to determine if the WG wanted to write a report.

Introductions were made and an explanation of the purpose of the WG was made by the chair. It was the assignment for the chair and vice chair to come up with ideas for a possible report. The chair felt that it would be valuable to discuss the following topics in a report:

Who is using audio teleprotection and why?
The current state of the leased phone lines
    What still works and what doesn't
        Why can't utilities get leased phone lines and why don't they meet the C37.93 standard?
    Real world problems with using the phone lines that are currently offered
            Performance issues
            Reliability, dependability and security issues
            Weather causing problems with decaying infrastructure
    Suggestions for best dealing with these issues
        Implementation
        Settings
        Troubleshooting
    Alternatives (real world)
        Leased T1

Leased Ethernet
Microwave
Satellite
Radio
Etc…

How do the alternatives compare to the existing audio, on performance?
After some in depth discussion about the value of such a report and what should be included, including the possibility of creating a standard on leased Ethernet, it was determined that the group should proceed with a report with the following abstract:
Abstract: A report on the current state of leased protection circuits, why they may not meet IEEE C37.93, and alternatives available to the traditional leased audio circuit.

The group then discussed whether the work should continue in H42 or if it would be more appropriate in the P0 SC of the PSRCC. Opinion was divided but it was agreed that the group would follow the recommendations of the PSRC, H SC, and PSCCC officers. Ken Fodero, the PSCCC Vice Chair felt that is probably belongs in the PSRC H SC. Marc Benou, the PSCCCP SC Chair felt that it would belong in the P SC.
The meeting adjourned.

After the meeting and after conferring with PSCCC Chair, Mike Dood, PSCCC Vice Chair, Craig Preuss, and PSRC H SC Chair, Eric Allen, it was agreed that the work should be moved to the P SC of the PSCCC.

The WG asked to be disbanded in the H SC meeting.

A new TF has been formed in the P SC of the PSCCC to continue the work. It has been assigned P12TF. Craig Palmer will chair the TF. Marc Benou will be vice chair.

There are no requirements for the next meeting.

HTF43: <u>Review of C37.232 IEEE Standard for Common Format for Naming Time Sequence Data Files</u>
Chair: E. Allen
Expected Output: Recommendation for WG
Established: May 2017
Expected completion date: Sept 2017

Assignment: Determine if a working group should be formed to revise C37.232 (COMNAME).

HTF43 met with 3 people at 8:00 AM on September 13, 2017 in Phoenix, AZ.
The group reviewed C37.232 IEEE Standard for Common Format for Naming Time Sequence Data Files (COMNAME) and concluded that no changes to the standard are needed or recommended. Accordingly, the standard can be submitted for re-approval as is prior to its scheduled expiration in 2021.

Meeting requirements for next meeting: none

HTF44: <u>Enhancing GOOSE I/O Monitoring</u>
Chair: A. Martin
Expected Output: Recommendation for WG
Established: May 2017
Expected completion date: January 2018

Assignment: Determine if a working group should be formed to assess enhancing GOOSE I/O monitoring

Task Force met with 17 attendees. Aaron gave a presentation regarding GOOSE monitoring and Condition Base Maintenance Scope discussion included 61850 GOOSE I/O Monitoring for Condition Based Maintenance, Cyber Security Monitoring, and improved Commissioning.

There was a high level of interest to document GOOSE monitoring in terms of for Condition Based Maintenance, Cyber Security Monitoring, and improved Commissioning.

Much of the discussion of the meeting focused on the possible of the scope.
Towards the end of the meeting there was a suggestion that this Topic could be a good fit for 2030.100 as an Application Guide. Therefore I would like to continue as a Task Force for January with a focus on deciding on a PAR.

Meeting requirements for next meeting: a room for 20 people and a computer projector.

HTF45: Guide for Centralized Protection and Control (CPC) Systems within a Substation
Chair: R. Das
Expected Output: Recommendation for WG
Established: May 2017
Expected completion date: January 2018

Assignment: Explore the possibility of a Working Group to develop a "Guide for Centralized Protection and Control (CPC) Systems within a Substation".

The task force met on Sep 13, 2017 with 34 participants (6 members and 28 guests) and 14 task force members could not join the meeting but provided their inputs before the meeting. 3 guests expressed interest to join the task force bringing the total task force membership to 23.

Chair provided the background for the formation of the task force HTF45 and the work done by the WG K15. Chair then provided the work done by earlier task force KTF24 based on WG K15 work to explore the CPC guide preparation. Chair presented the timeline of activities of HTF45 done between May and this meeting.

All task force members agreed to carry forward the pre-PAR activity towards the formation of the WG to develop a guide on CPC. We had a very lively discussion on comments and wording of the scope. Final draft has been agreed by all participants including guests attended the meeting. Agreed draft scope will be provided to other task force members who could not attend the meeting for their comments/agreement.

HTF45 requests the subcommittee membership to approve the formation of the WG with the assignment To Develop a Guide for Centralized Protection and Control (CPC) Systems within a Substation as per the guidelines of IEEE. I am enclosing the copy of the proposed scope for the working group along with the presentation used during the meeting. HTF45 requests the subcommittee to change its assignment now to "Complete the pre-PAR activity for the working group To Develop a Guide for Centralized Protection and Control (CPC) Systems within a Substation".

HTF45 will meet in the January meeting as a task force to finalize the PAR for the working group. We will need a room for 50 people. I am willing to chair the working group and Mital Kanabar agreed to be the vice-chair.

Requirements for next meeting: meeting room for 50 people with a computer projector.

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
No report.

I: RELAYING PRACTICES SUBCOMMITTEE

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

The I Subcommittee met on Wednesday, September 13th, 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 May 10th, 2017 were approved. Motion to accept the minutes by Jeff Pond and second by Mike Meisinger.
- Coordination & Advisory Committee Meetings Items of Interest
    - 224 attendees, 19 newcomers
    - Future Meetings:
        - January 2018 – Jacksonville FL
        - May 2018 – Pittsburgh PA
        - September 2018 – Minneapolis MN
        - January 2019 – Orange County (Garden Grove) CA
    - For PAR related work, please present patent slides and record *in your minutes* whether essential patent claims exist. If there are none, please write this into the minutes. ***Do this at every working group meeting***.
    - ***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 as part of Global Outreach
        - Availability of WebEx for presentations by IEEE. Every WG that has completed their work is encouraged to present it to the IEEE community through WebEx which will project our work. Please contact Cathy Dalton, Chair of Publicity group or Pratap Mysore, Russ Patterson, or Murty Yalla.
    - PAC World has published two articles from PSRCC. If you have any possible articles from your working group, please contact Cathy Dalton
    - Looking for presentations for the Main Committee meetings – please contact Andre Uribe or Brian Mugalian – I24 may want to present in Jan
    - For September 2017, I Subcommittee will have a total of 17 WGs and TFs

- Administrative Items
    - From IEEE-SA: WG/TF Agendas and Minutes: "***The 14-calendar-day rule" – the Standards Association requirement in O&P***
    - 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 January 2018 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 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 the changes made – must match up to the CSV file!
    - 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. Steve Turner volunteered
    - 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. New web pages working groups/task forces have been added as of September 2017
    - ***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 ***November 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 January 2018 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.

The I2 working group, chaired by Fred Friend, met on Wednesday, September 13, 2017 with 8 members and no guests, including 2 new members: Mario Ranieri and Dominick Fontana.

Quorum was achieved and minutes from the May meeting in Albuquerque, NM 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.

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: <u>IEC Advisory Working Group</u>

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 September 12 with 7 members and 2 guests to review TC 95 standards activities. The May 2017 minutes of meeting were approved. Main discussion points are as follows:

- IEC SA will not perform IEC TAG role from Jan 2018. Search for the new sponsor is ongoing. UL, NEMA, NIST, CSA Group, IEEE PES, and one US vendor are the candidates we pursued. UL, NEMA, and PES have declined. CSA Group has not confirmed the final decision to us. They recently took over the Technical Advisory Group (TAG) Administrator role for TC 57. So, there is some hope here. NIST is also considering it. If no one comes up, we can always go back to the US vendor. One of the members suggested to see if IEEE USA would consider the TAG Admin role. This will be investigated.
- 60255-1 Edition 2, CD, Common requirements (revision). This standard is the IEC parallel to IEEE C37.90, which is also now in revision. Comments from USNC were submitted. The comments from USNC were reviewed in the

meeting for better understanding. At the request of the TC 95 Chair, we are attempting to arrange US participation in the IEC drafting team meeting, in the person of Oscar Bolado, who also leads the revision of IEEE C37.90. Many of the comments are aimed at harmonizing IEC 60255-1 and IEEE standard C37.90.

Murty Yalla gave an update on the upcoming TC 95 MT1-4 meeting which will be held in London during October 23-27, at 389 Cheswick road, London, UK W4-4AL (BSI office in Hammersmith).

- IEC 60255-26 (EMI) and IEC60255-27 (Safety) standard revisions will be discussed at the TC-95 MT1 meeting during October 23 and 24. It's important that someone from PSRCC side be present to explain our comments in relation to C37.90.
- IEC 60255-118-1 CDV: Synchrophasor standard – is out for vote. The votes are due by 11/24/2017.
- IEC 60255-187-1: Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers – CDV is newly out for vote – comments and vote are due on November 17.
- IEC 60255-187-2: Functional requirements for busbar differential protection – The first meeting will be held in UK during October 25-27 by TC-95 MT4.
- IEC 60255-187-3: Functional requirements for biased (percentage) differential relays for transmission lines - first draft of the standard will be presented and discussed during the TC-95 MT4 meeting in London. It will be available for PSRCC meeting in January 2018.
- TC 95 AHWG for relay response to sampled values from 61869-9 merging unit may meet during the TC-95 meeting. Murty to confirm.
- On behalf for TC 95, Murty thanked Eric for the excellent work performed in keeping everyone informed about the IEC activities and keep both standard activities in synchronization.

I11: <u>PC37.241 – Guide for Application of Optical Current Transformers for Protective Relaying</u>

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"

Working Group did not meet and will be submitting their Guide to IEEE-SA for the December 2017 meeting. They will disband in January 2018.

I23: <u>Revision of C57.13.1 – Guide for Field Testing of Relaying Current Transformers</u>

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

Document will be submitted to RevCom by October 16, 2017 submission date

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 Wednesday, Sept 13, 2017 in Phoenix, AZ in a single session chaired by Jim Niemira with a total of **6 attendees**, (5 members and 1 guest). Quorum was met.

John Buffington motioned and Jeff Long seconded the motion to approve the minutes from the May 2017 meeting. Motion passed.

The working group reviewed the balloting comments provided by members of the working group for Draft 10.1 of the report. All comments were resolved and Draft 10.2 was created.

Draft 10.2 of the report was motioned for approval by Mario Ranieri, and John Buffington seconded the motion. Motion carried to send the final draft for approval/balloting review to the I-subcommittee, and ask for permission to post to the PSRC website.

The working group is looking for a volunteer to present the report at relay conferences. Mario Ranieri moved to adjourn, John Buffington seconded the motion. The working group voted to adjourn.

I25: Disbanded at Subcommittee meeting

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

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.

Agenda
1. Introductions
2. Approval of minutes from May 2017 meeting
3. Discussion of existing data

4. New assignments

Many new tasks assigned last week.

Amir Makki has converted all the Alstom test files to Comtrade. Amir is to email these files to Steve Turner so they can be stored to the appropriate folder in the IEEE PSRC website. The test cases will be examined for flux by converting the RMS data to the B-H curve. I need the corresponding test cases from RTDS (Peter McLaren, Dean Ouellette).

Demetrious Tziovaras will model test system in ATP and rerun select cases for comparison. ATP was chosen since it is a common platform. Peter McLaren will send Demetrious the necessary test data. Demetrios to account for change in CT remnance flux during simulations.

Steve Turner to send the RTDS PPT file and other test documents from WG C5 to Alejandro Avendano, Demetrious Tziouvaras and Jean –Nicolas Paquin.

Steve Turner and Jean-Nicolas Paquin to develop equations that CCVTs accounting for transients. If anyone has existing primary measurements from any actual events send them.

Ljubomir Kojovic to develop model for Rogowski coils.

I27: <u>Investigation of Protective Relay Self-Monitoring Capabilities</u>

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

Assignment: Investigation of Relay self- monitoring capabilities

Meeting Notes:
Prior to this September meeting the latest draft document was sent to the membership for review and comments. During this meeting, received comments were reviewed and the draft document was updated as determined by the membership present.

I29: <u>Revision of C37.110 Guide for Application of Current Transformers for Protective Relaying Purposes</u>

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 convened with 14 attendees, 7 members and 7 guests. The working group achieved a quorum.

The patent slides were reviewed, and no patent concerns were raised.

The working group reviewed the meeting minutes from the May 2017, and voted to approve the minutes with the motion from Alla and second from Jim. The working group reviewed the meeting minutes from the September 8 WebEx meeting, and voted to approve the minutes with the motion from Alla and second from Jim.

The working group reviewed Jim's drawings for figures 26-30. Jim will update figure 29 to reflect aesthetic comments from working group, and change lead size to #10.
Michael discussed reproducing the figure 31 and 32 graphics. Work will continue after this meeting.

Jackie described his work with the time to saturation calculations. The working group provided comments on Jackie's contributions.
Michael and Joseph will ensure that the corrigendum edits are incorporated.

The working group will plan to ask the main committee to initiate a sponsor ballot at the January 2018 PSRC meeting.

The working group plans to ballot internally starting September 30th. Comments are due by October 31st.

WebEx meetings will be held every other Thursday at 3:00 PM starting November 2nd to review and resolve comments from the internal ballot.

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

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

I-30 met on Tuesday, September 12, 2017 with 5 members and no guests. The May meeting minutes were reviewed and approved without change.

The patent slides were reviewed.
Scott Short presented his and Edgar Flores' contribution on testing of Rogowski Coils and the specifics of each test required. Scott will finalize his and Edgar's documentation and then re-submit it to the working group with the addition of figures showing test setups for each test.

The scope of the guide currently only covers Rogowski Coils proper. However, consideration was given to expanding the scope to include the analog-to-digital conversion process. The thought being that Rogowski Coils are frequently tested as a "system" rather than a component. Ultimately, it was decided the scope of the Guide would remain as-is.

We will need room for 20 people in January. This meeting should not conflict with I-30.

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

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
After introductions and showing of the patent slides where no patent claims were made and reviewing the copyright policy, the Secretary announced quorum was achieved. Mal Swanson made a motion to approve the minutes from the May 2017 meeting, which was seconded by Mike Meisinger and passed.

Next, the Secretary introduced the Vice Chair and liaison to the EMC Society, Jerry Ramie, who made a presentation entitled "Immunity Testing for Intelligent Electronic Devices in Transmission & Distribution Facilities". The presentation provided background material on how and why the work on 1613 was developed and will be provided with the distribution of the meeting minutes to all members and guests.

Discussion ensued regarding appropriate test levels, some of which will be changed per input from the working group. Discussion began on regarding 5 proposed approaches to move forward, of which only one was covered during the meeting: the removal of protection relays from the scope of the document. It was discussed how this proposal solved only half of the problem and does not address how protection relays would have the requirements and tests that would be applicable under the current draft be otherwise applied to protection relays so as to not weaken their reliability and the reliability of the system they are communicating with in a substation automation system.

It was proposed as an action item to have future working group meetings via web conference to continue the discussion and reach consensus.

Review of the action items from the previous was not accomplished due to the meeting reaching its scheduled ending time.

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.

Working group did not meet and will not meet in January 2018. They will be working on the survey that they created.

I33: <u>Review of Relaying Testing Terms</u>

Chair: Jay Gosalia
Vice Chair: Amir Makki

Output: Report
Established: 2015
Estimated Completion Date: September 2017
Draft: 1.4

The Working Group met on time with 6 members in attendance (quorum was established). So far, 26 terms have been identified (spanning 2 standard documents and 4 subcommittee reports). Previously compiled draft definitions were discussed but not in great details.

Vice chair requested the attendees for a volunteer for the secretory position for this working group. Mike Bloder is now appointed as the secretary of the group.

Jerry Jodice agreed to send few documents to the chair, that can help in deciding the relay testing terms.

Chair suggested that list of terms need to be defined first and then with collaborative efforts of the members, definitions of the terms will be created. The WG agreed to focus on test types first and then the test definitions for the different tests.

During the meeting, the proposed format of the report was discussed. The format with a heading of the term and what it is in a paragraph below seem the most appropriate formats used in IEC and IEEE documents. It was decided to follow this format.

The group plans to meet again at the next meeting. A room for up to 20 people and projector is requested.

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 5 attendees with one member to discuss the status of PC37.1.1.

After introductions and showing of the patent slides where no patent claims were made and reviewing the copyright policy, the chair discussed the action item from the May meeting, which was to address the pros and cons of the following options:

- Incorporating draft 3.0 into a PC37.90
- Pros
    - C37.90 requirements will be significantly expanded and improved to cover more than protection relays
    - More inputs and outputs will be included (i.e., DC milliamp inputs and outputs)
    - Testing requirements that presently do not exist would be added
    - 61850-3 would have a standard it could reference to cover the requirements and tests
- Cons
    - C37.90 scope will expand to cover more than just protection relays

    - The I/O requirements would significantly dwarf the other content (draft 3 is 56 pages with limited testing procedures, C37.90 is a total of 31 pages)
- 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)
- Pros
    - C37.90 requirements will only apply to protection relays, probably need to make that VERY clear, so the existing brand will remain
    - C37.90 scope will be maintained
- Cons
    - 61850-3 would likely reference C37.1.1 for its requirements and tests, likely diminishing the C37.90 brand
    - C37.90 testing requirements would not exist, but this would maintain the status quo (but is that really good?)
    - C37.90 inputs and outputs coverage will not change (i.e., DC milliamp inputs and outputs)
    -
- Maintain the brand of C37.90 and create a new C37.90.4 for I/O requirements from what is in C37.90 now and PC37.1.1 draft 3 (pretty much draft 3)
- Pros
    - More inputs and outputs will be included in C37.90.4 (i.e., DC milliamp inputs and outputs)
    - Testing requirements that presently do not exist would be added
    - 61850-3 would have a standard it could reference to cover the requirements and tests with the C37.90 brand
- Cons
    - C37.90 requirements will be reduced, as I/O requirements are transferred to C37.90.4 (is this really a con?)
    - C37.90 scope in general will expand to cover more than just protection relays (is this really a con?)

Also discussed was the C37.90 status:

- August 2 meeting that confirmed creation of C37.90.4 is preferred
- That is the question being resolved in the next meeting time slot
    - TF37 Review of C37.90 - Standard for Relays and Relay Systems Associated with Electric Power Apparatus
    - Crescent II
- Coordination is happening and must continue
    - Appropriate updates in PC37.90 draft must occur
    - New PAR for PC37.90.4 is required

The preferred approach is to transfer the work from PC37.1.1 into a new PC37.90.4 and let the PAR for PC37.1.1 expire and figure out how to address the I/O requirements in C37.90 related to what appears to be primarily electromechanical relays.

A new task force meeting would be scheduled for January to kickoff that work and a call for participation through IEEE-SA put out well before the January meeting. Whether that work includes the old I/O requirements from C37.90 is awaiting guidance from the I subcommittee and new C37.90-related working group ITF37.

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

Chair: Mike Dood
Vice Chair: Marc Lacroix
Output: Comments resolution for an updated version of the standard
Draft: 1.02
Established Date: October 2014
Completion Date: December 2018

I35 met with 4 members and 3 guests to discuss the comments to prepare an upgraded version of the C37.2 standard.
The patent slides were shown and no one indicated that they are aware of a patent that would be pertinent to this effort.

Highlights:

> **3.1.78 We should change 78 (**phase angle measuring relay**) from:**
> A device that trips for unstable power swing, or that functions at a predetermined phase angle between two voltages, two currents or a voltage and a current to: A device that trips for unstable power swing, or that functions at a predetermined phase angle difference between two voltages, two currents or a voltage and a current.

Discussed an effort that is going to be started by the PSCC to develop a standard for function numbers that align to cyber security functions. In order to differentiate the two different numbers that could be on the same drawing it would seem to be appropriate to introduce a prefix. Thus we will most like reserving a suffix for future use by this standard that will be created from this effort.

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

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 September 12, 2017 with 9 participants. Four (4) who have become members. Reviewed SA Pre-PAR Patent Slide.

The WG reviewed the recommendation of ITF36 for revision of the standard and agreed scope. Developed draft PAR and reviewed. The PAR is ready to submit for approval.

I37: <u>Revision of IEEE C37.90 Standard for Relays and Relay System Associated with Electric Power Apparatus</u>

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 second and last time on September 12th, 2017 in Phoenix, AZ with 1 member and 8 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.

The working group formation will be requested at the I subcommittee meeting to be started in January 2018.

We identified the harmonization efforts required. We provided comments to IEC 60255-1 on discrepancies. We're also revising IEEE 1613, C37.1.1, and other IEC 60255 parts. A table will be developed to present at the next meeting including these standards to consider during the revision of C37.90.

Also, an initial document outline will be circulated before next meeting as a starting point.

With no additional business to discuss the meeting was adjourned.

The Subcommittee agreed to convert the Task Force to a Working Group starting in January 2018

I38: <u>IEEE 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

The Chair gave an updated presentation on the technical features, specifics, and application of C37.92, Standard for Low-Level Analog Interface Between Electronic Sensors and Protective Relays. We also discussed our focus on maintaining alignment and avoiding conflicts with IEC TC 38 standards, and that the specifications of C37.92 could be a valuable addition to the TC 38 requirements set. We have input from Farnoosh Rahmatian, who is active in IEC TC 38 standards development, confirming that the range and other specifications are aligned with no conflicts.

The attendees reviewed today's range of applications for the standard interface, as given in the presentation, leading to some new points of application:

- Repeated high-current testing saturates iron of isolating current transformers in relays and causes response shifts – this problem is avoided with low-energy testing.

- Users can run RTDS or test-set tests overnight or for long times, unattended, with no concern of amplifier heating or fire safety risks.
- A potential new application is monitoring of dc signals from Hall or optical sensor systems on generator fields and on transformer neutrals experiencing GIC. These are quasi-dc with some harmonics or high frequency components we want to see.
- Traveling-wave relays and fault location systems may need more bandwidth than the rest of the applications considered in legacy C37.92.
- Metering applications require review of system inaccuracy contributions and validation/update of C37.92 specifications.
- I2 detection of turn-to-turn faults in machines may need very fine distinction of I2 component and high accuracy (which may also be affected by normal CT errors and system I2 contributions; suggested I2 change detection can wash out these error problems).

There was consensus of the task force meeting attendees to recommend writing a PAR for review, and send the existing standard out for balloting. With affirmative voting result and comments, we will determine how to proceed. This means establishment of a WG I38 to run this review process, chaired by Robert Frye, which may or may not revise the existing standard. The SC is requested to approve the establishment of this WG and project. The Subcommittee agreed to create a Working Group starting in January 2018.

Meeting Notes:

- 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, 2022, and 2023

        - General update and review of Standards Coordination spreadsheet – no new task force assigned.
        - Request volunteers that participated in the existing revision
        - ***Note that Task Force Chair does not need to become the Working Group Chair***
    - Update: IEEE Std. C37.98 – IEEE Standard for Seismic Qualification Testing of Protective Relays and Auxiliaries for Nuclear Facilities and IEEE Std. C37.105 – IEEE Standard for Qualifying Class 1E Protective Relays and Auxiliaries – *submitted to NesCom for their September 12, 2017 for review to determine whether to forward to the Nuclear Power Engineering Committee*
    - Scope revision of our Subcommittee – Look at the revised PSRCC Scope, suggestion to form a Task Force with SC members and past MC Officers – first meeting held on September 11, 2017. *Please provide feedback by October 31, 2017.*
- New Business
    - Anyone in interested in CTF33 – Investigate joint work with PELS on Hardware in Loop Testing – contact Gene Henneberg
    - New PAR: Technical specification for general interface of relay protection tester. Any interest from our Subcommittee?
    - A Survey of Protective System Test Practices – Andre Uribe discussed
    - Subcommittee membership – new members Robert Frye and Mike Dood
- Motion to Adjourn, see you in Jacksonville Florida in January! Motion Mike Meisinger, Seconded by Jeff Pond

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 19/36 members and 23 guests, reaching quoarum.

May 2017 J SC meeting minutes were approved.

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:	**14th 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 11 members and 10 guests present.

The Chair stated that the report was complete and was balloted upon by the WG. The ballot was conducted via email with 91% Yes/Approval votes, passing the 75% approval requirement. Some members provided comments with their ballot. There were no disapproving votes.

The Chair stated that the comments will be addressed as much as possible and the updated report circulated to the J subcommittee for SC ballot. A summary paper will then be written.

A single session with space for 35 people and a computer projector is requested for the Jan 2018 meeting.

J12: <u>Improved Generator Ground Fault Protection Schemes</u>
Chair: Dale Finney
Vice Chair: Manish Das
Established: Jan 2013
Output: Report to subcommittee
Status: 13th Meeting

Assignment: To review new methods related to generator ground fault protection

The group met on Tuesday 9/12/2017 with 6 members and 7 guests. The quorum was not met.

The Chair presented the agenda and minutes from the last meeting. There were no comments to the past minutes.

The latest report draft(7.0) was presented and newly added materials reviewed.
A Table for definitions has been added in Section 1; it will be reviewed to ensure it is complete and follows C37.100.

- Some introductory material added to Sections II and III were reviewed.
- The group agreed that the sub-harmonic injection test results table be updated to remove 3 out of the 4 frequency columns in order to make it more generic. A figure will be added to this section. It was suggested that the term ‘reliability’ to replaced with ‘dependability’.
- The figures shown in the Isophase bus protection will need to be updated.
- It was suggested that the nomenclatures used (such as intermittent, arcing) be consistent.
- Recommended pickup and dropout settings will be added to the timer logic schemes.

There is only one assignment pending, on VT Grounding Variations, which is expected to be received very soon.

The Conclusion section of the report has been written. The Appendix has been updated with sample calculations performed in Mathcad for faults at different locations.

The Chair stated that the report will be completed with all remaining items in the next few weeks and will be balloted upon by the WG prior to the Jan 2018 meeting.

The working group will have its 14th meeting in Jan 2018, with the need for a single session, computer projector and seating for 35 people.

J13 : Modeling of Generator Controls for Coordinating Generator Relays
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 16 members and 16 guests present. A quorum was achieved (16 members present out of 25 total members).

The working group approved the minutes of the May 9, 2017 meeting.

Phil Tatro reported that two members of PSDP have offered assistance in response to Jim Feltes liaison report at the PES meeting in Chicago. Bikash Pal has submitted comments that will be incorporated into the next draft.

Juan Gers reviewed recent progress on the report, which includes a draft of Section 3 by Onur Usmen, a revision of Section 6 by Gene Henneberg, and additions to Section 8 by Juan Gers.

Phil Tatro proposed a revised outline to restructure the report to improve the flow of information. The working group endorsed the proposal and Phil Tatro will update the draft to reorder the material.

Demetrios Tziouvaras recommended that the working group model a sample system for common use in all examples and to demonstrate the impacts of the controls on protection settings. The working group agreed with this approach.

Sudhir Thakur expressed concern that the details in the report may exceed what is required to demonstrate compliance with NERC reliability standards. The working group will include a statement that the methods in the report are not presented for the purpose of demonstrating compliance and that multiple approaches to demonstrating compliance may be valid.

Juan Gers reviewed the content of Draft 3 of the report and requested volunteers to review each section. Phil Tatro will send a list of assignments to the working group

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: 10th Meeting

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

I. Chair kicked off the meeting with introductions.
II. Chair reported that all writing assignments and reviews have been completed. Only minor editing related to the references needs to be finalized.
   a. Will English noted that the report contains a direct quote from IEEE C37.102 describing the operation of the single-blinder out-of-step scheme. He asked that, since C37.102 is a copyrighted document, if this created any issues. There was some discussion but, ultimately, they Chair will forward the concern to either someone on the PSRC Main Committee or directly to IEEE for a final ruling.
   b. Chair thanked the Working Group members for their contributions.
III. Next Steps and Assignments. Chair will finalize the document in the next few days and forward to the Working Group members for approval. Responses should be provided no later than December 1st. Chair will collect any comments and either incorporate them or assemble them to be addressed at the January meeting. Once 75% approval is received, the Chair will forward to the J subcommittee for approval. Depending on the comments received during both ballots, one or two additional meetings are required to finalized the report.

I. Chair requests a single session at the Jacksonville meeting for 25 people with a computer projector.
II.
V. Adjourn – Meeting adjourned at 5:05pm.

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: 9th Meeting

Assignment:
1. Review, compare and contrast NEMA MG-1 with ANSI C50.41 regarding transfer criteria.
2. 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.
3. 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.

4. 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.
5. 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).
6. Produce a Report to Subcommittee with findings of the above.

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

Activity:

1) The WG met September 13th, 2017 with 8 members and 7 guests.

2) Vice-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.

3) Arman Vakili reviewed his Motor Bus Transfer Simulation results noting torque trends when changing phase angles on the motor transfer bus breaker. Arman modeled phase angles of 0, 30, 60…..330 for fast, in-phase and residual voltage transfers. The Intent was to see how observations of live transfer torque and modeling correlate.

a) The group noted that there are many parameters that can vary with the end-users specific motor bus that can affect the modeling findings. (Inertia of the load, breaker closing time, relay operation, voltage, mechanical loading, phase angle etc.) It would be prudent to include in the report that each motor bus system should be modeled by the end-user to analyze these varying parameters to help select their transfer criteria.

Assignments:

1. Normann Fischer to compare his MathCAD motor model simulation to the MATLAB results from Dale Finney's modeling results from the May 2017 meeting, review torque impacts to the single motor model and provide a brief summary.
2. Arman Vakili to provide a brief summary of his Motor Bus Transfer Simulation results for inclusion in the group report.
3. Chair and Vice-Chair to start integration of accomplished literature review assignments and field result observations into a first draft of Report.

• Assignments 1-2 are to be provided to the Chair and Vice-Chair by October 27, 2017.

Next Meeting:

• Single session; projector, 30 people, Avoid conflict with WG I-29.

J16: Revision of C37.101, Guide for AC Generator Ground Protection
Chair: Nate Klingerman
Vice Chair: Sudhir Thakur
Established: Jan 2017
Status: 4th Meeting

The group met on Sept 9, 2016 in Phoenix AR, with 11 members and 7 guests in attendance. Session was Chaired by Vice Chair who was assisted by Dale Finney,

PAR has been approved by the committee and now will go to the standards board.

There was good technical discussion on the scope of standard on issues like focus of the standard on unit connected machines rather than on all types of connections and

better guidance for multiple generators sharing a common bus, need for a summary paper which will be discussed with Nate, need to address single point vulnerability for the schemes, testing considerations for special schemes like current injection, issues with 27N scheme etc. and the need to address these in the standard.

A group of common J16 and J17 members are looking into the topic of material overlap between C37.101 and C37.102 and a decision is expected soon.

The following assignments were made:

Ground methods	Sudhir		
1-4,6,7,	Dale Finney	Sungsoo	Kelvin
5s and 8s	Dale Finney		
9-12	Sudhir	Mircea	
13-17	Chris/Ryan	Kelvin	Hasnain
18	Steve T	Ritwik	
22	Hasnain		
A	Will English		
B	Ritwik Chaudhary	Steve C	

We would request a single session with space for 35 people with a computer projector for January 2018 session.

J17: <u>Revision of C37.102, Guide for AC Generator Protection</u>
Chair: Manish Das
Vice Chair: Gary Kobet
Draft: 0
Established: Jan 2017
Status: 2nd Meeting
Working Group J17 held its 2nd meeting in Phoenix in a single session on Tuesday, Sep 12, 2017.

There were 19 out of 37 members present. A quorum was not initially reached so a motion to approve the minutes was not made. Twenty-one guests attended the meeting, of which 7 accepted assignments and are new WG members. New WG membership stands at 44.

The IEEE patent requirement slides were presented, and attendees were given the opportunity to identify any known patent claims. No claims were made.

The Chair discussed the status of the subclause review assignments made in May 2017. Out of the 29 assignments, 6 were completed, 16 had partial contributions and no responses were received for 7.
All remaining subclause assignments are to be completed by October 27, 2017. Each assignee group is responsible for all current and future matters associated with their subclause for the entire timeline of this WG (e.g. coordinate with the Figures group, NERC standards review groups, J publications Chairs, etc)

Assignees that have not responded or contributed will be removed from the WG membership and their assignments re-assigned. This is to ensure the WG continues to make timely progress.

A group of assignees (with 2 new members added from this meeting, shown below) has agreed to help update figures in C37.102 for consistent formatting, nomenclature

and accuracy. Subclause assignee groups should coordinate with this group to have their figures updated, if needed.

A group of common J16 and J17 WG members is looking into the topic of overlapping material between C37.101 and C37.102 and their conclusion is expected soon. The J subcommittee leadership is helping to make available for C37.102 materials from recent J publications.

Assignments were made for reviewing NERC standards (shown below). The purpose is to determine if these standards should be alluded to in C37.102 Subclauses or in Annex A calculations. The WG consensus seemed to be that some generic verbiage be used suggesting that when calculating generator protection settings the user consider any limits or requirements for coordination specified by any regulatory body. The specific NERC standards do not need to be named or discussed, instead the verbiage can point to the NERC standards in the references (Annex B). Initial review comments are due October 27, 2017.

A member asked if the protective devices list with hyperlinks to the clauses/subclauses could be moved to the beginning of the guide.

Brief reviews of the assignments received for Subclauses 4.1 and 4.2 were made, with full WG reviews to begin via double sessions starting Jan 2018 and Web meetings between the PSRC meetings, as needed.

Having accepted assignments, guests becoming new WG members include: Ritwik Chowdhury, Luis Polanco, Nader Safari-Shad, Arman Vakili, Meyer Kao, Steve Conrad and Matthew Rhodes.

Next meeting requirements: Double session for 50, with computer projector.

To avoid potential rework, instructions below should be followed for all subclause review assignments.

Subclause Review Assignment Instructions:

- Start with a full word copy of the C37.102 (181 pages, available in iMeetCentral folder C37.102/Drafts/Drafts in Progress" as "PC37.102_9 May2017.doc) to make review comments. Do not remove sections that you are not reviewing.
- All comments must be made using "tracking on" and include your proposed new verbiage. In general, comments without a suggested resolution will not be considered.
- Address the comments in the following 2 files available in C37.102/Comments from previous revisions:
    - C37.102 -2012 Reaffirmation – ALL comments.xlsx
    - C37.102_Comments_Alla Deronja_20110509.docx
- Address any formatting, editorial or other comments made by the IEEE-SA team (Daniella Martinez and Michelle Turner) in the C37.102 word document. Note that there's one major change since the 2006 version which is that all figures have been renumbered to appear in the draft sequentially rather than by clause #.
- Each group must only upload to iMeetCentral a single commented word copy with input from all group members. Identify the clause/subclause # in the filename.

- All new uploads after the Sep 2017 meeting and prior to Jan 2018 meeting must be made into the C37.102/Assignments/2017-10-27 folder.

***

Latest Subclause Assignments (new assignees from Sep 2017 shown in green):
(Any pending assignments are due October 27, 2017).

Subclause	Description	Assignees
Figures	Consistency of Figures throughout C37.102	Mircea Rusicior, Don Burkhart, Jason Espinosa, Dale Finney, Meyer Kao
3.0	Description of gen, excitation systems, and gen station arrangements	Onur Usmen, Rich Bauer, Trevor Sawatzky
4.2	Field Thermal Protection	Onur Usmen, Doug Weisz, Trevor Sawatzky
4.4	Generator Rotor Field Protection	Onur Usmen, Doug Weisz, Trevor Sawatzky
4.8	Excitation System Protection	Onur Usmen, Doug Weisz, Trevor Sawatzky
4.1	Generator Stator Thermal Protection	Dale Finney, Nate Klingerman, Russ Patterson
4.3	Generator Stator Fault Protection (Excluding 4.3.3)	Dale Finney, Nate Klingerman, Russ Patterson
4.3.3	Stator GF w/ concurrent review of C37.101	Gers, Uchiyama, Beckwith, Hartman, Klingerman, Finney, Nader
4.5.1	Loss of Field	Gary Kobet, Doug Weisz
4.5.2.	Unbalanced Currents	Russ Patterson, Bob Pettigrew, Sudhir Thakur
4.5.3	Loss of Synchronism	Jason Espinoza, Doug Weisz, Dennis Tierney
4.5.4	Overexcitation w/ concurrent review of C37.106	Will English, Jason Espinoza, Murty Yalla
4.5.5	Motoring	Kelvin Barner, Mike Bloder, Jason Espinosa, Doug Weisz
4.5.6	Overvoltage	Ryan Carlson, Prem Kumar, Manish Das
4.5.7	Undervoltage	Ryan Carlson, Prem Kumar, Manish Das
4.5.8	Abnormal Freq w/ concurrent review of C37.106	Jason Espinoza, Mircea Rusicior, Lifeng Yang
4.6	Backup Protection	Phil Tatro, Mike Thompson
4.7	Gen BF w/ concurrent review of C37.119	Phil Tatro, Mike Thompson, Matthew Rhodes
4.9	Power Transf Prot through mechanical fault detection	Don Burkhart, Zeeky Bukhala
5.1	Current Transformers	Hasnain Ashrafi, Zeeky Bukhala
5.2	Voltage Transformers	Hasnain Ashrafi, Zeeky Bukhala
5.3	Protection during Startup or Shutdown	Sungsoo Kim, Ratan Das
5.4	Inadvertent Energizing	Russ Patterson, Derrick Haas
5.5	SSR	Steve Conrad
5.6	Transmission Line Reclosing w/ review of J7 output	Gary Kobet, Chris Ruckman

5.7	Synchronizing	Randy Hamilton, Mike Thompson
6.0	MGPS	Gustavo Brunello, Kelvin Barner
7.0	Protection Specification	Manish Das, Sungsoo Kim
Annex A	Sample Calculations	Onur Usmen, Juan Gers, Ritwik Chowdhury

NERC Standards Review Assignments (made in Sep 2017):
(Initial review comments are due October 27, 2017).

NERC Document	**Assignees**
SPCS Technical Reference Document - Power Plant and Transmission System Protection Coordination - Revision 2	Arman Vakili
PRC-001-1.1(ii) System Protection Coordination	Matthew Rhodes, Luis Polanco
PRC-004-5(i) Protection System Misoperation Identification and Correction	Kelvin Barner
PRC-005-1-1b Transmission and Generation Protection System Maintenance and Testing	Kelvin Barner
PRC-006-2 Underfrequency Load Shedding	Mircea Rusicior
PRC-019-2 Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection	Juan Gers
PRC-024-2 Generator Frequency and Voltage Protective Relay Settings	Sudhir Thakur, Mircea Rusicior
PRC-025-1 Generator Relay Loadability	Sudhir Thakur, Ritwik Chowdhury
PRC-026-1 Relay Performance During Stable Power Swings	Meyer Kao

JTF1: Impact of Renewables on Synchronous Generators
Chair: Normann Fischer
Vice Chair: (Acting) Dale Finney
Scope of the Task Force: "Investigate the effect of inverter-based sources on rotating machinery protection and control"

After much discussion, the assignment of the task force will be as follows:
"Investigate the effect of inverter-based sources on rotating machinery protection and control"

The Chairman will recommend to Mike R that the task force becomes a working group with the above assignment.

The first task for members of the task force will be to do a literature research to see if there are any documented cases of inverter based sources on rotating machine protection and control systems.

The chairman will extend an invitation to James Schetter from Renewable Impacts to possible give a presentation at our next meeting in January.

Volunteers to do literature searches: Mike, Ritwik, Bob Cummins, Gene Henneberg, Dale Finney. Nuwon Perera: will follow up on a study of different types of wind turbines had on OOS settings

Some comments made during the meeting were as follows:

- Protection could include reverse power, out-of-step, turbine (SSR)
- Charlie: 1) A lack of published literature doesn't mean that there is no problem 2) If the inverter means I need additional protection then that's an impact.
- Murty: a loss of renewables could result in the loss of conventional generation.

Assignment of the Task Force:
Penetration of renewable energy resource and the impact on synchronous generator protection

September 12, 2017 meeting from 3-4:15pm was attended by 10 members and 19 guests.

Requirements for next meeting: Room for approximately 40 people and a projector

Liaison Reports

Murty Yalla IEEE PES Electric Machinery Committee (EMC):

The Electric Machinery Committee met during the July 2017 PES GM in Chicago. The following are the items of interest for the J subcommittee from the generator subcommittee of the EMC:

1. Grid Code Task Force
   Prepared a report to revise C50.13-2014 and the appropriate IEC standards in accordance with new international grid code standard. Both North American and European authors participated in the taskforce.
2. A task force was formed to revise C50.12-2005 in a manner similar to C50.13-2014.

The above work is of interest to J subcommittee as C37.102 refers to C50.12 and C50.13 standards.

Murty Yalla IEEE PES Energy Development and Power Generation (EDPG) Committee

The EDPG committee has a subcommittee "Station Design, Operation & Control Subcommittee has a WG to revise IEEE Std 666 "Design guide for Electric Power Service Systems for Generating Stations". This WG met at the July 2017 IEEE PES GM in Chicago. The standard 666 includes a section on Motor Bus Transfer. Murty Yalla and Tom Beckwith are members of the WG.

Mike Thompson NERC PRC-024-2 Revision regarding application guidlines
Old Business: Dale Finney discussed uploading the original J6 Protection of Pumped Storage Report to the J SC website

New Business: Gary Kobet approved to be J SC Vice 1 Jan 2018, J SC approved

JTF1 to be J18 WG, JTF3 Motor Protection Tutorial, JTF4: Revision of C37.106, IEEE Guide for Abnormal Frequency Protection for Power Generating Plants, JTF5: Autosynchronizing.

Ratan Das will be the J SC webmaster.

K: SUBSTATION PROTECTION SUBCOMMITTEE

Chair: D. G Lukach
Vice Chair: B.A. Pickett

The K-Subcommittee met on September 13, 2017 in Phoenix, AZ with 28 of 31 members and 28 guests in attendance. A quorum was achieved. Don Lukach requested a motion to approve the May 2017 subcommittee meeting minutes. Gene Henneberg made the motion, Charlie Henville seconded. Vote was unanimous to approve.

The Chairman briefly discussed the need to use the latest patent slides, called for any topics for possible IEEE webinars, notified all in attendance that the P&P Manual will have some changes forthcoming.

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 7.2c
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 single session. 9 members and 5 guests were present. After the introduction, a call for quorum was made, quorum was achieved. A motion was made by Abu Bapary and seconded by S Conrad to approve the minutes of the last meeting in Albuquerque, and the motion was approved. A motion was made by M Thompson and seconded by Abu Bapary to approve the minutes of the August WebEx meeting, and the motion was approved.

Current draft of the document is 7.2c. The draft for the next meeting will be 7.3a.

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. No additional patent claims were identified in this meeting.

The following was discussed:

- The status of the guide was discussed. The guide is almost complete and the working group plans to have 2 WebEx meeting (October/November) to complete final edits to the document.
- A motion will be made in the K working group meeting to move the guide to sponsor ballot pending final working group approval and SA MEC review.
- Contribution to sections 11.1.1, 11.2.1 from Mike Thompson and 11.2.2.2 from Brandon Davies were reviewed.
- Assignments were given for outstanding section reviews. Assignments to be competed ahead of October WebEx.

New Assignments (Assignments Due 10/15/17):
Final review of the following sections:

11.2.2.3 - Secondary Winding Kirchhoff's Current Law Differential (87S-KCL) – M. Thompson
11.2.2.4 - LTC and Advance-Retard-Switch (ARS) Impact on Differential Protection - M. Thompson
11.2.3 - Differential Protection of Single Core Phase Shifting Transformers – M. Hilaly
11.2.4 - Sequence component differential protection with variable phase compensation – B. Davies
11.3 - Circulating Current (Bypass off Neutral) Protection - M. Hilaly
11.5 - Ground Fault Protection – B. Davies
11.6 - Current Balance Protection – L. Sevov
11.8 - Sudden Pressure – A. Zahid
11.9 - Transmission Line Relays - A. Zahid
Annex A – F. Soudi, S. Sambasivan
Annex B – S. Conrad

Request for next meeting is a room for 30 attendees single session and a projector.

Avoid conflict with K16 working group

K10: <u>SCC21 Distributed Resources Standard Coordination</u>
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.

K10 met on Tuesday, 9-12-17 from 8:00am to 9:15am in Crescent II. There were 7 members and 10 guests. We first discussed an EPRI fact sheet that was recently published which highlights some of the key differences between 1547-2003, 1547a-2014, and what will presumably pass to become 1547-2018. This EPRI document is publicly available at the following location:
https://www.epri.com/#/pages/product/000000003002011346/.

We then discussed some highlights from the most recent 1547 and 1547.1 meetings. Regarding 1547, the Ballot Resolution Team is close to completing their work and a recirculation ballot is expected to be out in the next two weeks.

Next, SCC21 activities were reviewed and Wayne Stec provided some insight as to the status of the dot standards and the genesis thereof. Of particular interest is 1547.2, the application guide, which will be revised. The intent is to include, selectively, parts of

1547.8 which was never published because a consensus could not be reached before the PAR expired and it has not been revived since. A PAR has been taken out for 1547.2 and a workshop is being planned for the next 1547 meeting.

Finally, open discussion took place regarding the new 1547 requirements, specifically islanding criteria and voltage and frequency ride-through, until the meeting was adjourned.

The next meeting for 1547 activities will be held at EPRI in Charlotte, NC Nov 14th through 16th. The meeting will primarily cover 1547.1 activities, only an update on the status of 1547 will be given.

For the next K10 meeting we request a room for approximately 20 people for a single session.

K11: <u>Open Phase Detection for Nuclear Generating Stations</u>
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 2 members, 5 guests, and 1 SC officer in attendance for the September 13, 2017 meeting in Phoenix.

The minutes from the May 9, 2017 K11 meeting were read and approved. The working group also saw the patent slides and no objections were noted.

Charlie then went over the report draft 6.7. Most of the requested sections that were asked to be changed from the last meeting have been incorporated. He indicated that he will be asking PCS2000 for a little more clarification on their CTs.

Charlie indicated that the report will need to be put into the new IEEE style format. He is hoping it will be somewhat painless.

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 as soon as possible.

For the next meeting a single session for 30 plus PC projector is requested.

K12 <u>P1032 Guide for Protecting Transmission Static Var Compensators.</u>
Chair: Satish Samineni
Vice Chair: Martin Best
Established: May 2013
Output: <u>Guide for Protecting Transmission Static Var Compensators</u>
Expected Completion Date: December 2016
Draft 16

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 Wednesday, September 13, 2017 at 11:00 am with 2 members and no guests. Neither of the two members present knew of any patent claims that could potentially affect the implementation of the Guide. The K12 working group did not have a quorum, so the May 2017 meeting minutes will be approved after the meeting via email.

The current draft number of the I9 Guide (P1032) is 16.0. The working group reviewed miscellaneous changes and comment resolutions for Sections 6.1.2 through 7.4 that were proposed by K12 in July 2017. All changes and comment resolutions appear to have been accepted by I9.

Martin will obtain the latest I9 meeting minutes as information to the K12 membership.

There being no further business, the WG meeting was adjourned.

The next K12 meeting will be a joint meeting with Substations WG I9 at the January JTCM in Jacksonville.

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 1.10
Assignment: Revise IEEE C37.116 "Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks**"**

1. WG met on Wednesday, September 13th, 2017.
2. Draft 1.10 is considered final and was sent to members for approval for voting.
3. Wednesday, September 13th, 2017 we got enough votes to start balloting.
4. Wednesday, September 13th, 2017 with a help of Michael Kipness of IEEE SA we successfully Initiated Invitation Request to join balloting body.
5. After slight cleaning up of the latest draft we'll initiate a Mandatory Editorial Coordination process within 1-2 weeks.
6. Current draft is 1.10
7. For next meeting a meeting room for 25 persons is required a with AV capabilities

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: 9
Assignment: To revise and update C37.91, IEEE Guide for Protecting Power Transformers to correct errors and address additional protection related topics.

The chair displayed and reviewed the required patent information slides related to the PAR activity of the WG, and provided opportunity for participants to identify patent claims. No one acknowledged or identified having a patent claim. 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 achieved throughout the meeting.

The January and May minutes were approved at this meeting since quorum was not achieved at the May 2017 meeting. May motion by Claire Patti 2nd by Abu Bapary, January motion by Mike Thompson, 2nd by Pat Carrol.

Clause 8.2, modify to add negative sequence differential protection - Mike Bloder.
Clauses 8.2.3.1.1 & 8.2.3.2.1 review Mike Thompson edits to remove specific relay design discussion. -Renee Midence and Randy Hamilton.
Clause 8.2.9 Mike Thompson edits were discussed and accepted.
Clause 9.3.2 Sudden gas/oil pressure edits accepted.
Clause 10.1.4 Modern Refinements renamed to Calculated thermal models, Pat Carroll to again review statement about C57.91.
Clause 11.3.3 HSG Switch was discussed and recommended to be retained as legacy information.

New material to be added by Lubo Sevov on protection of multi-winding transformers. Also to be added is a discussion on transformers with the high voltage side breaker located at a remote substation as discussed in C37.113 – Don Lukach and Bruce Pickett.
The document will be edited to remove source – load references to transformers. – Claire Patti.

The use of CAUTION statements are to be removed from the document and edited appropriately, unless the CAUTION is for safety. – Will English

New member to the WG Mike Bloder. Luis Polanco, Nef Torres and Suparat Pavavicharn resigned from the WG

Annex B was considered for removal and voted to be removed, however after the meeting Rene M volunteered to consolidate the Cigre and CEA data and provide a summary for consideration to replace the present Annex B information.

All assignments are due to the chair prior to December 1, 2017. The chair will then upload 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: 5

Assignment: To submit a WG report to the PSRC K Substation Subcommittee evaluating the performance of protection systems during Geomagnetic Disturbances

1. K17 met on Tuesday September 12th 2017 with 15 participants (5 guests and 10 signed members).

2. Meeting minutes of the K17 May 2017 meeting was previously approved via email.

3. Chair reviewed the latest updates to TPL-007-2 and discussed the GMD monitoring guidelines developed by NERC GMD Task Force.

4. Chair provided updates on the WG report, went over the outline of the report, and reviewed content covered in each chapter. It was recommended that a section be added to provide a high level overview on GIC impacts on transformers with related references. It was also proposed to expand Chapter 4 to discuss GIC and magnetic field data requirements and to possibly add a discussion on GMD impact on Spectrum Ratio. It was recommended to remove the word "Recommendations" from Chapter 5.

5. WG discussed 2nd round of revisions on the draft document, solicited volunteers to review the report with the focus on identifying redundant content, providing any clarification/expansion on identified topics, and proofreading/polishing for typos & grammar errors

6. Chair/vice-chair will follow up with team member on review assignments to make sure all assignments to be completed as scheduled.

7. The next steps are to have January meeting for reviewing comments provided before the meeting, incorporate final comments between January and May meetings, and submit to K Subcommittee by May 2018 meeting

8. For next meeting chair requests a single-session and a meeting room for 30 persons, with AV capabilities.

9. The WG report draft # is 5.0.

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

Chairman Adi Mulawarman opened the meeting with introductions. Patent slides were presented. It was mentioned by SA representative Michael Kipness that a question should be asked if there are any patent issues. The question was asked and there were no responses.

Quorum was met with seven members attending along with twelve guests. A possible new corresponding member, Thomas An volunteered to help edit the final document if his management approves.

Motion to approve the previous May meeting minutes was made by Bruce Mackie and seconded by Charlie Sufana. The motion passed unanimous.

Adi mentioned the title, scope, and purpose as being:

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.

PAR status was discussed and presented:
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.

Michael Kipness warned that if the active status of the existing standard expires, then the existing PAR would also expire at the same time. This would occur at Dec 31, 2018. The group discussed ways to expedite the schedule to avoid PAR expiration.

Review of section 6 has not yet been completed. Both Bruce Pickett and Michael Thompson agreed to provide a review of this section to Adi by January 2018, before next meeting.

Adi reported that he has received no word back yet from Ben Kazimer about the request to drop a reference in standard 1547 to our section 9 that has been removed.

There was discussion about the authority of standards C57.12.40 and C57.12.44 that each describe aspects of "Requirements for Secondary Network Protectors" to describe protection issues? The documents presently describe the power transformer, the switch and the relay. It has been asked that K18 workgroup members be aware of content of these documents. Comments might be added to the guide regarding these standards. Adi to post C57.12.44 to central desktop location (Imeetcentral).

(Follow up : Adi has emailed Bill Wimmer for latest copy of draft on Sep 12 2017).

One issue mentioned by Bruce Mackie regarded high arcflash energy due to slow blowing of fuses for bus faults. The manufacturer might add a maintenance switch to make the relay temporarily non-directional so that arcflash energy could be reduced during maintenance. The question arose, can the network protector switch handle fault current? Michael Thompson mentioned that the C57.12.40 /44 standard describes that the switch can interrupt the fault current, and we can thus rely on this being the case.

It was decided that document review can proceed in parallel with coordination/review activities with the C57.12.4x workgroups as this should not prevent progress for revision of this guide (PC37.108).

Bruce Mackie, Raluca Lascu, and Thomas An volunteered to perform a complete editorial review of the latest draft. Adi mentioned that this activity can begin immediately and become final once section 6 review is received.

Don Lukach mentioned the need to provide clarity of the figures as this would be required by IEEE-SA final editorial reviews. There was discussion about how to reproduce figures showing fault current details on logarithmic scale charts. Some suggested using the .tif or .jpeg files. These might become illegible when re-copied. Others suggested using the original fault current applications (Aspen)

to reproduce this “artwork”. Adi described that only several figures exist and that figure 1 already exists as a visio file. Visio files are most desirable. Adi agreed to reproduce or re-create any figures if necessary, after checking with IEEE-SA to see if they can provide.

(Mike Kipness did a quick check and found nothing in SA system). (Adi will plan to recreate all the Visio).

It was verified that the terminology review by Roger Whittaker of I2 workgroup is complete with many existing definitions within the standard being consistent with the IEEE database definitions and to include one new definition.

Adi mentioned that once these reviews are complete then the document will be ready for the final workgroup vote to present the document to K subcommittee for request to go to final ballot. Michael Kipness mentioned that to save time it might be desirable to begin the ballot invitation process in parallel with other review activities.

PLEASE DOWNLOAD LATEST DRAFT FROM THIS LINK BELOW

https://ieee-sa.imeetcentral.com/psrcktf18/folder/5770883/#folder:4361073

K19 Advisory to IEC 60255 -187-1 Functional Requirement for Restrained and Unrestrained Differential Protection of Motors, Generators and Transformers

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

K19 WG met on Tuesday Sept.12/2017 morning with four members and one guest.

Chair of this working group could not make this meeting due to some emergency business need. Introductions were made. No quorum was required for this meeting and there was no May/2017 meeting minutes to approve. A discussion happened in the meeting to circulate the latest CDV to the WG members and other interested volunteers for further comments. Any comments received will be provided to IEC through respective IEC national representatives.

For next meeting a room of 20 people is requested with a projector with no conflict with K22.

K21 C37.112 Standard Inverse-Time Characteristic Equations for Overcurrent Relays

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 met for the second time on Tuesday September 12, 2017 with 5 members and 5 guests. The working group has 14 members and we did not make quorum. One guest, John Seuss, agreed to become a new member. This standard was originally written in 1996, reaffirmed in 2008, and is due to expire the end of 2018.

After introductions, the working group reviewed the patent slides and did not identify any patent issues.

We successfully balloted the document with 110 balloters in the pool, had a 83% response rate which was greater than the 75% minimum requirement. We received 80 affirmative votes for a 90% approval rating, 8 negative votes, 4 abstaining votes, and 172 overall comments. The majority of comments received were related to editorial errors associated with converting the 1996 document into the new IEEE style format.

The working group members present decided to proceed with revising the document to address the review comments. Since we did not have quorum for an official vote, the working group chairman met with several absent members after the meeting and received their approval to proceed. The Chair/Vice Chair will revise the document and correspond with the negative balloters. We will need to re-ballot the revised document.

For the next meeting, we would like to request a single session, room for 20 people, and a computer projector.

K22 C37.234 IEEE Guide for Protective Relay Applications to Power System Buses

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 Tuesday, September 12th with 26 of 41 members and 12 guests. Two attendees agreed to join the working group bringing the roster to 43 members. Introductions were made.

Don Lukach motioned to approve the minutes of the previous meeting. Jeff Barsch seconded the motion. The minutes to the previous meeting were approved by a quorum of the working group.

A call for notification of essential patents was made and none were brought forward.

Ilia Voloh introduced the subject of adding a new section to the guide that discusses distributed bus protection systems that use remote data acquisition modules to communicate current information from each of the zone boundary CTs to a central relay. In the past, there have been proprietary solutions. But, today, with IEC 61850 9-2 Sampled Values protocol, distributed bus differential protection systems can be applied using an international standard approach. There was wide ranging discussion of the proposal. The scheme seems to be particularly appealing for large buses where the concentration of CT circuits to a panel can be significant or for complex applications requiring advanced zone selection capability. The following is a summary of some of the discussion.

The term “distributed bus protection” is not clear. We used centralized protection and control in the K10 working group report to describe a similar approach where remote data acquisition units communicate to a centralized processor for protection and control functions. It was determined that the industry has historically used the term “distributed” to describe these systems so it is probably acceptable to continue using that term.

There was some discussion as to what is inherently different about such a system besides separation of the current inputs from the physical location of the relay. Are the protection algorithms different? Are there special considerations when applying these systems? It was determined that a draft of the section would be necessary to explore these questions.

Ilia Voloh made a motion to add a section on distributed bus protection. Brian Boysen seconded the motion. The motion carried. Ilia Voloh and Charles Sufana accepted the assignment. A draft of the new section is due for discussion at the next meeting.

WG discuss the use of shall/must/may/recommended/suggested. As C37.234 is a guide, WG decided to use “may” instead of shall and use “suggested” instead of recommended.

Jeff Barsch presented the team’s findings on review of section 5 of the guide. Alla Deronja also discussed her findings on review of section 5. The working group agreed that Table 1 of the guide will replace recommended with suggested. Alla suggested reducing the introduction of clause 5 to reduce repetition with similar material in clause 5.3.

WG also decided to conduct one/two web meeting. One in Oct. and the other in Nov. to review the comments clause by clause. A request is made to all the volunteers to submit all the past due assignments by Oct.15/2017.

The status of the assignments is contained in the following. The vice chair offered to create a tracking spreadsheet to keep track of assignments going forward. The outstanding assignments are highlighted in bold font.

- Section 4, S. Conrad, L. Sevov, A. Deronja (Comments received from Alla. Waiting on Lubo.) L. Tulaladhar
- Section 5, J. Barsch, N. Gulczynski, H. Lander (Received 3/31/2017) (Discussed in September 2107 meeting) A. Deronja (Received 6/20/2017). D. Burkart,
- 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) D. Maragal, A Martin
- Section 8.1-6, G. Ryan, D. Lukach, I. Voloh (Received 4/27/2017) B. Macke, P. Dongale, N. Gulczynski
- Section 8.7-12, R. Crellin, A. Mulawarman, B. Boysen, R. Hedding, P. Dongale, N. Gulczynski
- Section 8.13-18, G. Moskos, C. Suffana, P. Dongale, N. Gulczynski
- Annex A, M. Nagpal (No report.)
- Annex B, Alla Deronja and L. Sevov.
- Annex C, J. Barsch (Received 3/31/2017. No changes required.)
- Figures, Compare tif to vsd files to determine if SA editors had modified from the vsd files that were obtained from B. Kasztenny. M. Thompson, S. Conrad.

- 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.

We request a single meeting with room for 50 and a computer projector for January 2018 no conflict with K/WG16 & K/WG21.

K23 Summary Paper for C37.119 IEEE Guide for Breaker Failure Protection of Power Circuit Breakers
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 were made and the roster sheet was passed around. There were eight members and seventeen guests in attendance and a quorum was achieved. The may/Albuquerque meeting minutes were approved: Motion made by Jeff Long, Seconded by Adi Mulawarman.

A majority of the 15 members voted unanimously to approve the summary paper Draft 4b and send it on to the K subcommittee for final approval. The electronic ballot result was: 12 approvals/12 total votes of 15 members. (100% approval by a majority) All comments incorporated.

Volunteer presenters are: Roger Whittaker at WPRC, Mike Thompson at Texas A&M, Bruce Mackie at Georgia Tech, and Adi Mulawarman at Mipsycon.

Dates are estimated from 2017 conferences, the presenter will need to verify the actual deadlines for 2018 and 2019 conferences. The WPRC abstract submittal deadline is April, 2018 for the October, 2018 conference. The Georgia Tech abstract submittal deadline is Sep 30th, 2017 for the May, 2018 conference and will be done by Bruce Mackie. The Mipsycon due date is February 2018 for the Nov 2018 conference and this will be done by Adi Mulawarman. The Texas A&M call for paper due date is August 2018 for the March 2019 conference.

The WG approved to ask the K Subcommittee to review and vote on the paper. Roger will send Don and Bruce a copy of the final summary paper. Don will give 30 days for review.

The decision is also made to start with the same base template. Roger will start this as a Powerpoint document and the other presenters will be able to modify as they see fit according to their style and presentations.

Bruce Pickett will check into if the summary paper can be posted under pes-psrc website.

Roger will request 1 more meeting in case the subcommittee members have some comments to make.

Claire shared a breaker failure event on the 13kV system.

Liaison Reports:

Pratap Mysore gave a report on the Capacitor Subcommittee. The Transformer Subcommittee did not meet. Information can be found at the following web addresses for T&D and the Transformers Committee.

T&D Committee, Capacitor Subcommittee
Pratap Mysore
http://grouper.ieee.org/groups/td/cap/

TX Committee
Fred Friend
http://www.transformerscommittee.org/

Old Business:

A motion was made by Mike Thompson to disband KTF24 as the work has been moved into the H Subcommittee. Seconded by Charlie Henville and passed unanimously.

New Business:

Motion made by Lubo Sevov to form a balloting body contingent upon final draft approval of the K1 working group. Seconded by Bruce Pickett. Vote was unanimous. [Subsequent motion made by the subcommittee Chairman at the Main Committee meeting].

Gene Henneberg presented information on Working Group CTF33 about Point–On-Wave Switching.

Ratan Das agreed to be the K Subcommittee webmaster to help bring this portion of the PSRC website more current.

Pat Carroll gave a presentation on flooding and the effects on electrical contacts.

Motion to adjourn made by Bruce Pickett. Seconded by Charlie Henville and passed unanimously.