POWER SYSTEM RELAYING AND CONTROL COMMITTEE
OF THE IEEE POWER AND ENERGY SOCIETY
MINUTES OF THE MEETING
January 7-12, 2018Jacksonville, FL

A. Call to order/ Introductions Pratap Mysore

Chairman Pratap Mysore called the meeting to order at 8:00 am on Thursday, January 11, 2018.

All attendees introduced themselves. A quorum check was conducted and it was verified that the quorum was met 66 members attended out of a total membership of 129. Main Committee Attendance sheet was routed.

B. Approval of Minutes & Financial Report Murty Yalla

1. Meeting minutes from May 2017 meeting in Albuquerque, NM were circulated via email for approval. Seventy-six members out of 121 responded with approval from 74 members. The remaining two members abstained. The meeting minutes were approved (74/121).
2. A call for a motion to approve Phoenix, AZ September 2017 meeting was made by Phil Winston and seconded by Roger Hedding. Meeting minutes were approved unanimously.
3. The financial status of PSRC is in good standing.

C. Chairman's Report Pratap Mysore

I thank you all for making our January 2018 meeting a successful event. It is your participation and contribution that makes Power System Relaying and Control Committee a very special group. We completed one full year with the new name and we also successfully met jointly with Power System Cyber Security and Communications (PSCC) committee.

I welcome nine new members to the main committee and thank former Chairs of the PSRC, Mr. Roger Hedding and Mr. Bob Pettigrew, who became Honorary members. I personally thank them for their guidance during my tenure.

We lost one of our long-standing members during the past year, Mr. John Tengdin, who passed away after a brief illness. His mentorship to youngsters and his significant contributions to C37.1, Standard for SCADA and Automation systems and IEEE 1613, Environmental testing requirements for communication networking devices document will be remembered.

We also had a successful year in presenting our work to the world through IEEE arranged webinars and actively participated in regional conferences and transferring reports from our website to IEEE Resource center for wider use.

I hope to see you all again in May at Pittsburgh meeting and thanks again for your contribution to the industry.

Sincerely
Pratap Mysore

Reports of Interest

A. Report from the Vice- Chair – Russ Patterson

a. Technical Paper Coordinator's Report.

PSRC Main Committee members reviewed 58 papers, 21 were accepted for the 2018 PES CM Conference and 15 were accepted for transaction papers. Reviewing papers is a requirement of main committee membership. Thank you to those who have helped with this task.

b. Future Meetings

- May 2018 meeting will be held from May 5-12. 2018 Pittsburg, PA at the Pittsburgh Marriott City Center
- September 2018 meeting will be held from September 10-14, 2018, Minneapolis, MN at the Hyatt Regency.

B. CIGRE B5 Activities Report – Rich Hunt
CIGRE Report
Rich Hunt
January 11th, 2018

The recent B5 Colloquium was held in Auckland, New Zealand September 11th-1th, 2017, concurrent with the September PSRC meeting. I made a strong statement about scheduling conflicts between B5 and PSRC meetings, as many people are active in both bodies.

The general outline of the 2019 B5 Colloquium was determined. The meeting will be held in Tromso, Norway in June 2019. Preferential Subjects were determined to be:

- Time in Protection Applications - Time Sources and Distribution Methods
- Future technologies for inter-substation communication. Migrating digital teleprotection channels to Packet-Based Networks
- Leveraging PMU Data for Better System Protection

Look for a call for papers to come out in 2018. Also, this was Iony Patriota de Siqueira's last meeting as Convener of B5. Rannveig Loken of Norway will be the new Convener of B5.

One new B5 Working Group has been approved. B5.66 Cyber Security requirements for PACS and the Resilience of PAC. Dennis Holstein of the US is the Convener, and the first

meeting of the WG was held this week. If you're interested in joining, please contact the USNC Technical Representative, John McDonald johnd.mcdonald@ge.com, and copy Rich Hunt (rich.hunt@ieee.org) on the email.

CIGRE 2018 General Session
The 47th CIGRE General Session will be held in Paris, France from August 26th through 31st, 2018. The U.S. will have 3 papers published, all authored or co-authored by members of PSRC.

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

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 creates 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 Conveners. Dr. Murty Yalla of PSRC 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. Eric Udren is the Technical Advisor (TA) to the USNC for TC 95.

USNC requires an official TAG Administrator outside the TAG in order for our TAG to participate in international standards development. TAG Administrator IEEE Standards Association withdrew from this role in 2017; our TC 95 TAG was turned down for support by six industry organizations, with one visionary vendor who was generously willing to take on the role and expense. However, we now report that the new TAG Administrator going forward is Pacific Northwest National Laboratory (PNNL), under the US Department of Energy. The TAG Administrator will be Jeff Dagle of PNNL.

Standards projects of interest:

- IEC 60255-26 Ed. 4: Measuring relays and protection equipment – **Part 26: *Electromagnetic compatibility requirements***. The MT has published a CD, which includes higher-frequency RFI testing, more severe ESD and power frequency magnetic field testing, among other changes. Vendors should focus and help with review and comments, due by Feb. 23. Contact Eric Udren for a copy of the draft.
- IEC 60255-21, ***Vibration, shock and seismic tests: Part 21-1 – Vibration tests; Part 21-2 – Shock and bump tests; Part 21-3 – Seismic tests*** - MT3 has begun a project to revise these standards. An opening draft (not yet an official CD) has been published, presenting the existing state with proposed changes described. Most vendors could be impacted by any changes to these type-testing standards; this early stage of development is the best opportunity for US and North American input to standards development. Contact Eric Udren for a review copy.

- IEC 60255-181: *Functional requirements for frequency protection* – comments from national committees on CD are published, and a CDV is expected in January for further comments and voting.
- IEC 60255-187-1: *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – MT is reviewing CDV comments.
- IEC 60255-187-2: *Functional requirements for busbar differential protection* – Project leaders have been appointed and the work is underway.
- IEC 60255-187-3: *Functional requirements for biased (percentage) differential relays for transmission lines* – first draft of the standard continues in development, with PSRC K34 awaiting the draft for review.
- Update to IEC 60255-27 Ed. 2: Measuring relays and protection equipment – Part 27: *Product safety requirements*. Revision work in process by MT3.
- TC 95 Ad hoc working group (AHWG) 3 is investigating 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.
- Chinese participants in TC 95 have introduced the concept of developing requirements for relays installed in switchyard locations. A presentation from StateGrid of China is available.

The next TC 95 MT1-4 meetings will be held in Oslo, Norway during April 9-13.

The next TC 95 Plenary Meeting will be held in Frankfurt, Germany on November 9, with MT meetings November 5-8 at the same venue.

E. Standard Coordinators Report – Adi Mulawarman

PSR Standards Coordinator's Report Fall Winter-January, 2018

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

RevCom = Revision of existing standard
NesCom = New Standard

Updated Par and Pre-Par Patent Slides with January 2018 revisions from IEEE-SA distributed to SC chairs for distribution.
New P&P approved. Link available from pes-psrc.org website (point to SA website location).

Revision to Existing Standards Completed

- C37.241 IEEE Guide for Application of Optical Instrument Transformers for Protective Relaying.

- C37.248 IEEE Guide for Common Format for Naming Intelligent Electronic Devices (COMDEV)

- C57.13.1 IEEE Guide for Field Testing of Relaying Current Transformers

PAR for revising existing standard or creation of new standard Approved

- PC37.90.2
- PC37.101

- PC37.120

Standards due for 10 year review

- **see list below for standards expiring 2018, 2019, 2020.**

Ballot Activity:

See attached spreadsheet.

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

PAR Number	Project	Commit	Title	Scope	Purpose	Approval Date	PAR Expiratio	Invitation Cl	Ballot Close Date	Status
PC37.237	New	PE/PSRCC,	Standard f	This stand	This stand	5-Dec-2012	12/31/2018	2/20/2016	10/28/2017	Sponsor Ballot: Comment Resolution
PC37.247	New	PE/PSRCC,	Standard f	This	The purpo	8/23/2013	12/31/2018	11/17/2017	12/27/2017	Sponsor Ballot: Ballot
P60255-118-1	Revision	PE/PSRCC,	Measuring	This standard is for s		6/14/2013	12/31/2018	10/28/2016	7/15/2017	Sponsor Ballot: Comment Resolution
PC37.116	Revision	PE/PSRCC,	Guide for	This	The	12/11/2013	12/31/2019	10/13/2017		Sponsor Ballot: PreBallot
PC37.112	Revision	PE/PSRCC,	Standard f	The scope	The purpo	3/23/2017	12/31/2021	5/11/2017	8/11/2017	Sponsor Ballot: Comment Resolution

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

PAR Number	Project	Commit	Title	Scope	Purpose	Approval Date	PAR Expiratio	Invitation Cl	Ballot Close Date	Status
PC37.245	New	PE/PSRCC,	Guide for	This Guide	The purpo	8-Jun-2012	12/31/2018			WG Draft Development
PC37.237	New	PE/PSRCC,	Standard f	This stand	This stand	5-Dec-2012	12/31/2018	2/20/2016	10/28/2017	Sponsor Ballot: Comment Resolution
PC37.249	New	PE/PSRCC,	Guide for	This guide	This guide	6/24/2014	12/31/2018			WG Draft Development
C37.94	Revision	PE/PSRCC,	Standard f	This stand	This stand	6/12/2014	12/31/2018			Complete
PC37.91	Revision	PE/PSRCC,	Guide for	The	The purpo	3/27/2014	12/31/2018			WG Draft Development
PC37.230	Revision	PE/PSRCC,	Guide for	This guide	This guide	3/27/2014	12/31/2018			WG Draft Development
PC37.250	New	PE/PSRCC,	Guide for	This docur	This Guide	3/27/2014	12/31/2018			WG Draft Development
PC37.247	New	PE/PSRCC,	Standard f	This	The purpo	8/23/2013	12/31/2018	11/17/2017	12/27/2017	Sponsor Ballot: Ballot
P60255-118-1	Revision	PE/PSRCC,	Measuring	This standard is for s		6/14/2013	12/31/2018	10/28/2016	7/15/2017	Sponsor Ballot: Comment Resolution

PARS expiring at the end of 2019-2020 (all already have PARs and in various stages of work.)

PAR Number	Project	Commit	Title	Scope	Purpose	Approval Date	PAR Expiratio	Invitation Cl	Ballot Close Date	Status
PC37.108	Revision	PE/PSRCC,	Guide for	Devices ar	This guide	5-Dec-2015	12/31/2019			WG Draft Development
PC37.233	Revision	PE/PSRCC,	Guide for	This guide	This guide	5-Dec-2015	12/31/2019			WG Draft Development
PC37.242	Revision	PE/PSRCC,	Guide for	The	This guide	10/26/2015	12/31/2019			WG Draft Development
61850-9-3	New	PE/PSRCC,	Communi	This		6/11/2015	12/31/2019			Complete
PC37.110	Revision	PE/PSRCC,	Guide for	This guide	The purpo	6/11/2015	12/31/2019			WG Draft Development
PC37.235	Revision	PE/PSRCC,	Guide for	This	This	6/11/2015	12/31/2019			WG Draft Development
PC37.116	Revision	PE/PSRCC,	Guide for	This	The	12/11/2013	12/31/2019	10/13/2017		Sponsor Ballot: PreBallot
PC37.251	New	PE/PSRCC,	Standard f	This stand	The purpo	5-Feb-2016	12/31/2020			WG Draft Development

PARS expiring 2021

PAR Number	Project	Commit	Title	Scope	Purpose	Approval Date	PAR Expiratio	Invitation Cl	Ballot Close Date	Status
PC37.90.2	Revision	PE/PSRCC,	Standard f	The scope	The purpo	6-Dec-2017	12/31/2021			WG Draft Development
PC37.101	Revision	PE/PSRCC,	Guide for	The guide	This guide	9/28/2017	12/31/2021			WG Draft Development
PC37.120	New	PE/PSRCC,	Protectior	This guide	A guide to	9/28/2017	12/31/2021			WG Draft Development
PC37.118.2	Revision	PE/PSRCC,	Standard f	This stand	The purpo	5/18/2017	12/31/2021			WG Draft Development
P1646	Revision	PE/PSRCC,	Standard (	This stand	Uitilities w	3/23/2017	12/31/2021			WG Draft Development
PC37.102	Revision	PE/PSRCC,	Guide for	This	This Guide	3/23/2017	12/31/2021			WG Draft Development
PC37.112	Revision	PE/PSRCC,	Standard f	The scope	The purpo	3/23/2017	12/31/2021	5/11/2017	8/11/2017	Sponsor Ballot: Comment Resolution
PC37.234	Revision	PE/PSRCC,	Guide for	Concepts	The purpo	3/23/2017	12/31/2021			WG Draft Development

Additional notes:

PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:
Meeting schedule
Deadlines for submittal to RevCom or NesCom

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

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

We would like to highlight the following new work in the PSCC that started 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.

We will be starting up new work soon:

3. IEEE Streaming Telemetry Transport Protocol (STTP) (used to be) Advanced synchrophasor protocol.
4. S8 will be moving from task force to a working group

An interesting presentation from Joe Weiss who is a nationally recognized expert on cyber security on level 0 and 1 cyber security vulnerabilities. Level 0 and 1 is the sensor level, such as IEC 61850 process bus. He is initiating work in ISA 99 that is related to IEEE PSRC and PSCC work.

Finally, we would like to thank the members of the PSRC Committee and its subcommittees for their continuing support of the PSCC. The attendance at our meetings at all levels has been amazing and we believe this is because of the PSRC support.

G. NERC Report - Bob Cummings
NERC Report to IEEE PSRC - Bob Cummings
11 January 2018

1. **1. Fault-Induced PV Inverter Disturbances**
    - Inverter Task Force Report released 8 June 2017

- 1200 MW Fault Induced Solar Photovoltaic Resource Interruption Disturbance report (Blue Cut Fire)
- Back-calculated ~2,500 MW loss based on the interconnection-wide inertia

- 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
- Alert survey results – filed with FERC on 29September 2017
  - 6,244 MW of 16,771 MW (37%, 7,150 units) susceptible to erroneous frequency calculation
    - 68% of those have already implemented manufacturer's recommendations
  - 14,113 MW of 16,771 MW (84%, 11,821 units) cease output during abnormal voltages

IRPTF ongoing work

- Low 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
- Another Inverter-based event occurred on October 9, 2017
  - Detected about a 900 MW resource loss
  - Back-calculated ~1,479 MW loss based on the interconnection-wide inertia
  - No evidence of frequency-based tripping
  - New failure mode: sub-cycle high voltage spikes – sensing unfiltered voltage and operating on the fast transient for instantaneous trip a 1.2 pu voltage
  - Event Analysis report underway
- IRPTF working on NERC Inverter-Based Resource Performance Guideline
  - Target completion in March 2018

2. Single Point of Failure (FERC Order 754)

- Completed 45-day formal posting September 8 – October 23, 2017
- Third draft is being finalized for Additional Comment Period and Ballot.
- Next posting scheduled for week of February 19, 2018.

- Next SDT meeting is scheduled for January 23-25, 2018 at Duke Energy Florida.

3. 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

4. System Protection Coordination (Phase 2)

- PRC-027-1 – Coordination of Protection Systems for Performance During Faults PER-006-1 – Specific Training for Personnel
- Addresses Requirements R1, R2, R5, R6 of old PRC-001-1.1(ii)
- Both were filed with FERC 9/2/2016 Note: FERC-approval of PRC-027 and PER-006 will retire PRC-001-1.1(ii)
- Notice of Proposed Rulemaking was issued by FERC November 16, 2017.
    - Proposing to approve PRC-027-1 and PER-006-1.
    - Proposing to direct NERC to develop certain modifications to PRC-027-1:
        - Require an initial protection system coordination study to ensure that applicable entities will perform (or have performed), as a baseline, a study demonstrating proper coordination of its protection systems.
        - Direct NERC to submit the modified Reliability Standard for Commission approval within 12 months following the effective date of a final rule.
- Comments on the NOPR are due January 29, 2018.

5. 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 Order No. 837 on September 20, 2017 approving PRC-012-2
- Effective date of Standard PRC-012-2 is January 1, 2021.
    - **Requirement R4**: Evaluation of each RAS every 5 years
        - For existing RAS, initial performance of obligations under Requirement R4 must be completed within sixty (60) full calendar

months of the effective date of PRC-012-2. (i.e., by 01/01/2026)

- For new or functionally modified RAS, the initial performance of Requirement R4 must be completed within sixty (60 months - 5 years) full calendar months of the date that the RAS is approved by the reviewing RC(s) under Requirement R3.

- **Requirement R8**: Each RAS-entity shall participate in performing a functional test of each of its RAS
  - For each RAS not designated as limited impact, initial performance of obligations under Requirement R8 must be completed at least once within six (6 years) full calendar years of the effective date for PRC-012-2. (i.e., by 01/01/2027)
  - For each RAS designated as limited impact, initial performance of obligations under Requirement R8 must be completed at least once within twelve (12 years) full calendar years of the effective date for PRC-012-2. (i.e., by 01/01/2033)
- **Requirement R9:** Each Reliability Coordinator shall update a RAS database at least once every twelve full calendar months.
  - For each Reliability Coordinator that does not have a RAS database, the initial obligation under Requirement R9 is to establish a database by the effective date of PRC-012-2. (i.e., by 01/01/2021).
  - Each Reliability Coordinator will perform the obligation of Requirement R9 within twelve full calendar months after the effective date of PRC-012-2. (i.e., by 01/01/2022)
- Recommend seeing the Standard and its Implementation Plan for details.

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

- The PRC-025-2 standard will be posted for final ballot from January 9 through January 19, 2018.
- Modifications 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

7. 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 technical brief.
- The intent of the technical brief 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. The technical brief will include recommendations for industry next steps.
- NERC and the DER subgroup have completed an educational video on DER. The video is about 10 min long and highlights information from the DER February 2017 Issued report. An announcement is anticipated to be sent out soon with a link to the video.
- NERC is collaborating with IEEE on an International Task Force dedicated to TSO-DSO 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. A panel session has been proposed for the IEEE PES GM meeting in August.
- 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. The 1st report on the project is complete and the information will be presented at the IEEE T&D conference in April. Additionally NERC plans to inform the ERO with a webinar which is tentatively slated for February.

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

Jan 2018 Meeting Minutes:
The B1 Working Group met on Monday January 8, 2018 in Jacksonville, FL with 8 members and one guest (IEEE PES Awards Chair Vahid Madani). The September 2017 meeting minutes were discussed and approved.

The following items were discussed during this meeting:

IEEE PES Individual Awards – To expand our reach for PES level awards the WG discussed and identified a number of awards that we would like to search for potential nominees from our PSRC members. Starting this WG meeting and moving forward, we will select one or two PES awards to discuss in each meeting to identify and if possible

select nominees. During this January meeting we were able to discuss and select nominees for the following two PES awards:

a. IEEE PES Charles Concordia Power System Engineering Award
http://www.ieee-pes.org/charles-concordia-power-system-engineering-award
b. IEEE PES Leadership in Power Award
http://www.ieee-pes.org/leadership-in-power-award

PSRC Awards

c. 2017 PSRC Career Service Award
d. 2017 PSRC Certificate of Appreciation

The following awards were announced or issued on Thursday January 11, 2018 during the PSRC Main Committee Meeting

e. Outgoing Subcommittee Chair Awards

i. J Rotating Mach: Mike Reichard
ii. H Relaying Communications: Eric Allen

f. 2017 PSRC Prize Paper Award

- **Mukesh Nagpal**

Title of Paper: Nontraditional Protection Solutions Permit Tap Transmission Connections of Nonutility Generators
Journal: IEEE Transactions of Power Delivery, Vol. 31, No. 5, October 2016

g. 2017 PSRC Outstanding Standard or Guide Award

PSRC WG K5
C37.119-2016 IEEE Guide for Breaker Failure Protection of Power circuit Breakers

- **Roger Whittaker (Chair)**
- **Adi Mulawarman (Vice Chair)**
- **K5 WG Members:**

Jeff Barsch	Heather Malson	Phil Tatro
Bob Beresh	Aaron Martin	Dennis Tierney
Brian Boysen	Alexis Mezco	Michael Thompson
Alla Deronja	Dean Miller	Ian Tualla
Michael Fleck	Roy Moxley	Eric Udren
Rick Gamble	Pratap Mysore	Johan Van Den Berg
Charles Henville	Claire Patti	Jun Verzosa
Craig Hiemenz	Jeff Pope	Don Ware
Alex Lee	Dan Reckerd	Ray Young
Jacob Lien	Sam Sambasivan	Rich Young
Jeff Long	Lubomir Sevov	Joe Uchiyama
Don Lukach	Charles Sufana	John Wang
Bruce Mackie		Phil Zinck

h. 2017 PSRC Outstanding Technical Report

PSRC WG J7
"Avoiding Unwanted Reclosing on Rotating Apparatus (AURORA)"

- **Mike Reichard (Chair)**
- **Steve Conrad (Vice Chair)**
- **J7 WG Members:**

Matt Basler Gerald Johnson Gabriel Benmouyal Chuck Mozina Zeeky Bukhala	Pratap Mysore Dale Finney Cristian Paduraru Dale Fredrickson Phil Tatro	Rafael Garcia Tom Wiedman Gene Henneberg Joe Uchiyama

i. IEEE SA Standards Medallion Awards (Announcement)
- **Mark Adamiak, IEEE Fellow**
  For Contributions to the Development of Communication Standards for Protection and Control in Power System Applications
- **Jeffrey A. Burnworth, IEEE Senior Member**
  For Contributions to the Development of Standards for Protection and Control in Power System Applications

j. 2018 IEEE Fellows (Announcement)
- **Sherman Chan**
  For contributions to power system modeling and analysis tools for protective relaying
- **Phillip Winston**
  For development of standards in power system protection reliability

k. 2017 PSRC Career Service Award
- **Roger Hedding**
  For contributions to power system modeling and analysis tools for protective relaying

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 Jacksonville meeting was 215, which meets our higher than normal attendance track record.

14 new attendees were in our Newcomers Orientation meeting on Tuesday. Cathy Dalton sent a pre-meeting welcoming email and a follow up to each newcomer for first impressions.

Retention Program:

One gentlemen Mentor attended the Newcomers meeting and offered assistance to one attendee.
Cathy Dalton did not conduct a ladies attendee luncheon.

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.

No Service Awards were presented.

Regards,

Malcolm J. Swanson
Membership Chairman

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

No activity to report.

Chair: R Hunt: WG Training:

No report given.

Chair: C. Dalton
Vice Chair: M. Swanson

Assignment: The B5 working group's scope was newly defined in January 2017, then presented and approved at the May 2017 meeting, with continued goals identified for 2018 to build upon 2017 progress.

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 committee working group activities about the art of relaying, and the work of the PSRCC.

Working Group Chair: Catherine Dalton.
Working Group Vice Chair: Malcolm Swanson.

In 2017, Cathy provided IEEE PSRC Updates for PAC World magazine to Alex Apostolov. These were published in March 2017, June 2017, September 2017 and December 2017 issues of PAC World. These updates covered awards and recognition, webinars, working group updates and articles of technical interest. These updates will now be provided on a regular basis. Cathy is also encouraging Subcommittee Chairs to provide input for the PSRCC update, as well as articles of technical interest for inclusion in PAC World.

In 2017, PSRC 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. We have numerous ideas for 2018 in the queue.

At the January 2018 Jacksonville, FL meeting, Cathy 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. Also, the PSCC may have its own dedicated space in the PAC World magazine for its updates.

The Women's Mentor team decided not to meet at JTCM, and will be reconvening in May 2018 in Pittsburgh. Cathy advised Solveig Ward that she will be unable to attend due to a work schedule conflict; Solveig agreed to lead the May luncheon discussion. Cathy will schedule a conference call with the eight ladies who attended the September 2017 luncheon to further discuss the mission and goals of the group. 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.

Related to PSRC Membership initiatives, Cathy is also working with IEEE's Sue Koval on updating the slide deck for Newcomer orientation that is held each Tuesday of scheduled PSRC meeting week. This slide deck is a way to get the word out to our new members and provide them with the tools they need to be successful with their volunteering commitment to PSRC.

Cathy is also developing an IEEE PES PSRC Marketing Flyer to be used for the upcoming IEEE PES General Meeting in August 2018. This will be drafted and distributed to Pratap Mysore, Russ Patterson, Murty Yalla, and Mal Swanson for their review.

As described above, continued progress is being made in all areas of providing visibility for IEEE PES PSRC. Webinars, PAC World articles and updates, slide decks for group discussion, mentor program/ladies group and overall PSRC, Marketing flyer, etc.

Regards,

Catherine Dalton
Publicity Chairman
Membership Vice Chairman

B8: Long Range Planning

Chair: Mike McDonald
No report from the Long Range Planning

B9: PSRC Web Site

Chair: Rick Gamble

The website is current undergoing maintenance to clean up broken links and consolidate some information that appears in multiple places in effort to get ready to for the new subcommittee webmasters. Subcommittee webmasters will be sent a packet of information containing relevant passwords and instructions in the coming weeks.

Any website correction, concerns, or suggestions should be directed to webmaster@pes-psrc.org."

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 Galina Antonova (H SC Chair): "Mr. Chair, the Relaying Communications Subcommittee H, requests the submission of a PAR with the following details. Prior to the main committee meeting, the H SC Chair provided required documentation to the PSRC Officers, including HTF44 meeting minutes, attendees list, proposed PAR and voting results.

   HTF44
   Proposed title: Monitoring and Diagnostics of IEC 61850 GOOSE and Sampled Values based systems
   Proposed Assignment: Produce a guide titled: Monitoring and Diagnostics of IEC 61850 GOOSE and Sampled Values based systems
   Proposed Output: IEEE Guide
   Proposed Chair: Aaron Martin (approved by PSRC Chair).

Proposed PAR:
Scope: This guide provides information about what factors to consider when applying IEC 61850 GOOSE and Sampled Values to monitor and diagnose communication of automation systems.
Purpose: A guide to provide information on applying IEC 61850 GOOSE and Sampled Values features to support the implementation of condition based maintenance, cyber security monitoring, and improved commissioning of communications of automation system.

The motion was seconded by Mark Adamiak. There was a request to amend the motion by Jim Niemira to replace "automation systems" "protection" and control systems" in the scope and purpose, but the amendment was not accepted as majority were against the amendment to the motion.

Then the voting took place on the original motion with all members approving except one vote against. The original motion passed.

2. The following motion was moved by Galina Antonova (H SC Chair): "Mr. Chair, the Relaying Communications Subcommittee H, requests the submission of a PAR with the following details. Prior to the main committee meeting, the H SC Chair provided required documentation to the PSRC Officers, including HTF45 meeting minutes, attendees list, proposed PAR and voting results.

HTF45
Proposed Title: Centralized Protection and Control (CPC) Systems within a Substation
Proposed Assignment: Develop a guide for Centralized Protection and Control (CPC) Systems within a Substation
Proposed Output: IEEE Guide
Proposed Chair: Ratan Das (approved by PSRC Chair).
Proposed PAR:
Scope: This guide for Centralized Protection and Control (CPC) systems addresses the realization of various protection, automation and control functions within a CPC system utilizing data collected from intelligent electronic devices. This guide includes all protection, automation and control functions in a substation including interconnecting circuits using devices and their interconnections with suitable communication protocols.

This guide includes references to existing standards applicable to protection, automation and control applications for various types of circuit elements such as generators, transformers, bus bars, shunt and series capacitor banks, reactors, transmission lines and distribution lines.

The guide addresses CPC system architectures for typical substation configurations. The guide addresses the reliability and maintainability of each architecture, along with their respective testing requirements. The guide also addresses CPC development, installation, commissioning, troubleshooting and maintenance.

Purpose: This Guide summarizes the generally accepted practices for the use of centralized protection and control systems within a substation.

The motion was seconded by Ken Fodero. The motion was approved by the majority. Normann Fischer voted against.

3. The following motion was moved by Brian Mugalian (I subcommittee chair): Mr. Chair the Relaying Practices subcommittee I, requests the submission of a PAR with the following details:

I38
Title: Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers
Output: IEEE Standard
Scope: The scope is to specify the requirements for analog signals from electronic voltage and current transducers to be used as inputs to protective relays. Requirements to be specified include signal level, frequency bandwidth, and dynamic range. The standard recognizes that other substation electronic devices utilizing voltage and current waveform measurements may connect to the same transducers.
Purpose: This Standard provides interface connectivity of modern power-system signal transducers based on electronics, such as magneto-optic current transducers, and electronic relays. The existing standardized levels from familiar magnetic current and voltage transformers are not readily generated by new types of electronic signal transducers.

The motion was seconded by Fred Friend. Then the voting took place with all members approving the motion. The motion passed. The I subcommittee chair has the documentation on file. The working group I38 meeting minutes, attendance roster, and PAR approval voting results.

B. Motions during September 2017 meeting.

1. As the quorum was not reached during the September 2017 meeting, the following motions were circulated via email approval to all 121 members.

(1) 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. Seventy-six members out of 121 responded The motion was approved by 74 members out of 75 respondents (one abstained). The motion passed.
(2) The following motion was moved by Don Lukach (KSC 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. Seventy-six members out of 121 responded. The motion was approved by 74 members out of 75 respondents (one abstained). The motion passed.

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 January 10, 2018 in Jacksonville, FL. The participants introduced themselves, a quorum was achieved (29 of 50 members and 46 guests), and the September 2017 minutes were approved (Mike Meisenger made motion, Randy Cunico seconded).

Advisory Committee Items of Interest

- WG Chairs required posting their agenda at least two weeks prior to the meeting.
- WG meeting minutes due to Fred and Gene by this Friday, January 12.
- WGs that complete their work are encouraged to present it to the IEEE community through WEBEX. Contact PSRC officers or Cathy Dalton (Publicity Chair) for further information.
- Jessica Harris volunteered to be the new C Subcommittee web master.
- PSRC is encouraging all IEEE Member grade attendees to apply for Senior Member status. On line application is straightforward and there are lots of existing Senior Members available to provide references.

Working Group Reports
The minutes of the Working Groups follow.

WG C-18 has submitted PC37.246 IEEE Guide for Protection Systems of Transmission to Generation Interconnections to IEEE-SA for publication. Publication has been delayed due to their current backlog.

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

CTF-36 (IEEE transactions paper development from C2 reports Role of Protective Relaying in the Smart Grid) was approved to become a working group (C36).

Old Business
There was no old business.

New Business
The CTF-37 Task force was formed to follow up the work of WG C-20 with an assignment to write an IEEE transactions paper on the Impact of HVDC Transmission on Protective Relays.

The CTF-38 Task force was formed to investigate the need to create a Guide for the Design of Microgrid Protection Systems as requested by the leadership of IEEE P2030.7.

General Discussion
There was no general discussion.

C-18: <u>Transmission to Generation Interconnection Protection Considerations</u>

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 28, 2017 and is awaiting publication. The Working Group will be disbanded by the Subcommittee in May 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: 2.46
Established: September 2011
Expected Completion Date: May 2018
Assignment: Develop a standard for Phasor Data Concentrators for power systems.

14 Attendees: 5 members, 4 corresponding members & 5 guests attended.

- New Patent/IP related IEEE slides were shown
- We had quorum. However, previous meeting minutes had already been approved electronically.
- WG C19 PAR, Assignment, Purpose, and Scope were presented
- Vice-chair presented summary of Ballot results received on Jan 2nd
- Next step, WG will continue bi-weekly web meeting to work on comments resolution tasks
- Two major areas of Ballot comments were discussed
    - Testing section
        - Usually standard doesn't define testing aspects. However, it can include one statement saying that "these requirements to be tested" – refer PMU standard
        - PDC guide has detailed sections on various functions, PDC standard does not include all the functions from the guide, and whichever it includes are not specified exactly same
        - WG can look at testing sections from the guide and may consider including relevant sections/sentences
        - Discuss with ICAP (Ravi/Jason) if they are willing to start forming ICAP committee for this standard.

- Footnotes
  - As per IEEE P&P manual, footnotes are information except for figures and tables
  - Example shown as Footnote-3 should be part of normative section, and requirements on 1 micro-second accuracy from PMU standard for rounding-off error to be considered for the standard

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

No future meeting requirements.

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: 0.54
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, January 10, 2018 in Jacksonville, FL in single session chaired by Yi Hu and Gene Henneberg with 11 members and 5 guests attending (one guest became a member). 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 PC37.250 Guide.
The proposed agenda was approved.
A quorum was not achieved. The September 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 assess the progress by May 2018 meeting and will probably ask for a PAR extension after the May meeting.

Draft 0.54 was recently distributed to the working group members reflecting recent changes and additions made by the editing team. Additional comments have since been received from a few WG members, but not yet included.

The meeting discussion centered on the following specific items in the draft guide (with names for follow up assignments)

- Figure 2 – "Other Controls" (Gene Henneberg) add words to refer to the section 4.2 list
- Clause 5 – various NERC references -- minimize these, even as examples (Gene Henneberg)
- Clause 5.1.3/4 – Comm network capacity and design as an iterative process (Vahid Madani)
- Clause 5.2.1 – SIPS vs load dispatch system reliability (edited during meeting)
- Clause 5.2.6 – Comm network security section or language to be added (Robin Byun)
- Clause 5.2.6 – much repetition with clause 4.1.4 (Alex Apostolov)
- Clause 5.2.8.2.3 – use of Fail Safe vs Supervision per IEEE Dictionary [Robin Byun]
- Clause 5.8 – Redundancy (Gene Henneberg)

Yi and Gene will be scheduling web meetings with WG members to complete the further editing of the document prior to the May meeting.

Requirements for next meeting: Room for 20, single session and projector.
Meeting minutes by Gene Henneberg and Yi Hu 01/10/2018

Requirements for next meeting: Room for 20, single session and a projector.

C-23: Coordination of Synchrophasor Related Activities

Chair: Mahendra PatelVice Chair: Allen Goldstein
Output: Ongoing Liaison
Draft: N/A
Completion: Ongoing Liaison

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

- Liason with NASPI (North American Synchrophasor Initiative) (specifically the PRSVTT (Performance Requirements, Standards and Verification Task Team)) to keep the PSRC in sync with the changes and needs in the industry with respect to the development and usage of PMU devices. Formalize transfer process of PRSVTT developed documents to PES PSRC including making recommendations which PRSVTT activities should be transferred to IEEE reports, guides and standards.
- Make recommendations to PSRC for assignments that would require the creation of working groups in PSRC and also recommend what the output of those working groups might be (Guides, reports, etc.) based on the needs of the industry.
- Coordinate related activities with other IEEE PES committees.

Meeting Agenda

1. Introductions
2. Sept. 2017 meeting minutes Approval
3. NASPI Update
    a. NASPI Work Group Meeting - April 24-26, 2018, Albuquerque, NM
4. IEEE Workgroup Activity

	Title	Status

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

5. Old Business
6. New Business
    a. I am no longer a member of the NASPI leadership team and will not be able to attend due to a slight job change. Does someone want to take over the leadership of this group or do I remain? Proposed New Chair: Mahendra Patel
7. Adjourn

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: 1.2
Established: January 2014
Completion: December 2019

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

Agenda

1. Introductions
2. Approval of minutes of the September 2017 meeting
3. Vestas Type IV WTG data discussion

4. ASPEN Type III WTG model
5. CAPE WTG model updates
6. Review draft report
7. Adjourn

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

First, the data provided by Vestas on their Type IV WTG were described. These include simulated fault response data for three-phase and double-line to ground faults based on the tabular format requested by the WG. The following were noted and discussed during the meeting:

a) For the three-phase faults results, for voltages 0.1 pu and below, the max current is quite below the limit (around 1.1pu)
b) For the unbalanced fault results, it seems that the low-voltage ride through capability is not activated

Vestas will be contacted to clarify these observations, and also request data for their Type III WTG.

Then the impact of the accuracy of the models to protection studies was discussed, for example how distance protection is desensitized for tapped lines and how protection is affected by negative sequence contribution from WTGs being close to zero. These topics are addressed by the C32 WG.

Then Sherman Chan from ASPEN presented the Type III WTG model that he implemented in ASPEN OneLiner based on the EPRI model. The model parameters were described and the model was demonstrated in a test system. The model includes a crowbar option. It was discussed that the crowbar option assumes aggregated WTGs response in the wind park.

Then an overview of the report outline was provided. The report includes several contributions and it is close to completion. Volunteers (Mukesh Nagpal and Ritwik Chowdhury) were identified for a few missing sections on Type III WTG. Contributions are expected by mid-March. Also volunteers (Ritwik Chowdhury & Jim Van de Ligt) were identified to review the draft report. Review is expected by mid-April. It was discussed that the target for the final report to be ready is January 2019.

Finally a quick update of the status on the WTG models implementation in CAPE was provided by Electrocon.

There were total 33 attendees in the meeting, 7 members and 26 guests.

For the next meeting in May 2018, we need a room with capacity of 30, and a computer projector. Please avoid conflict with WG C30, C32, C34 and C25, in that order.

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

Chair: Martin Best
Vice Chair: Keith Houser
Output: PSRC Report
Draft: 3.4
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 Jacksonville, FL, on Tuesday, January 09, 2018, at 1:30 PM. The meeting was chaired by Jim Niemira at request of the chair due to planned absence of the chair and vice chair. There were 9 members and 16 guests in attendance. A quorum was not attained. Martin Best to send Minutes from the September 12, 2017, meeting in Phoenix to the membership for balloting by e-mail. Revisions to Draft 3.4 of the Report were reviewed and discussed.

It was commented and agreed that excessive references to NERC and FERC may limit readership of the paper so generally, such references should be made to "regulating authorities" and citing of FERC and NERC requirements is appropriate as examples of such regulatory requirements in effect in the USA and North America. Martin Best should make appropriate revisions throughout the document (or appoint an editor to do so) to generalize the references to regulating authorities.

Duane Buchanan will clean up figures from C37.91 to aid legibility. Perhaps some figures should be redrawn or Duane may be able to get original artwork from the C37.91 WG.

Ritwik Chowdhury will revise sections 3.1.1.2 and write first draft of paper conclusion section 4. Charlie Henville will collaborate and review section 3.1.1.2 as well.
Charlie Henville will revise section on line protection 3.6 and 3.3.1.
Jim van de Ligt will review and revise section 3.1.4.
Juan Gers will review and revise section 3.5 including fleshing out remaining sections 3.5.1 and 3.5.2.

Martin Best to be sure that all the contributors have copy of the latest draft to make their additional contributions.

ALL MEMBERS should review the paper and send comments to Martin for incorporation into the next draft.

The group requests a single session, meeting room for 25-30 at the May 2018 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 @ 2:45 pm.

Minutes Submitted 1-9-2018,
Jim Niemira, member of WG and acting chair.

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

Chair: Don Ware
Vice Chair: Matt Black
Output: IEEE Guide, C37.233
Draft: 2.9
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 9, 2017 with 18 members and 7 Guests.
When attendance was taken at the beginning of the meeting quorum was not satisfied; therefore, minutes from the May and Sept. 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 pushing our focus on making use of Adobe Connect to work through the remaining comments before the May meeting. We have plans to work with working group members with access to Adobe Connect.

The section 6.0 on type of tests was reviewed in the working group and discussion on wording associated with transmission line tests as a system test.

Action items:

Jerry Jodice has volunteered to research older IEEE documents associated with tests types.

Scott Cooper volunteered to research the NERC/Doc PRC-005 on the subject of relays having continuous internal testing to evaluate the relay's integrity forgoing preventive maintenance tests.

Vahid suggested referencing the commissioning report recently completed by Rafael's group.

Terminology Liaison, Tony Seegers, will consult the IEEE dictionary for the official definition of system tests.

New member Nina Selak is to review to Section 6 due to her interest in improving that section.

Jeff Brown is review section on Power Line Carrier.

New business is to continue the use of call in Adobe Connect to site created by Matt Black on various days and times to accommodate more participation.

We brought on 6 new members to the working group.

The version of the Guide C37.233 is v2.9 as of Jan. 9, 2018.

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: 20180109
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.

1) Introductions:
   a. 7 of 16 members (no quorum)
   b. 3 contributing members
   c. 13 guests.
2) Reviewed the patent slides, no one mentioned any potentially essential patents.
3) Minutes of last meeting will be submitted to an email vote for approval
4) Reviewed status of work, including the status of the 118 update
5) Move to go to a bi-weekly meeting via webex.
6) Discussed the formation of a ballot group potentially at May meeting.
7) Alex Apostolov volunteered to lead a task group on Application related testing:
   a. Dean Quellete
   b. Rene Dience
   c. Nuwan Perere
8) Started to edit the document at Section 6.6.3
   a. Next conference call should review the cybersecurity and the standards associated (i.e. 62351, C37.240, 1686(?))
   b. Pick up at Table 3 Instrument transformer application (page 24)
9) New business:
   a. Does the P10 (STTP/APS) belong in this document?
10) Adjourn

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: December 2020
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.

The working group did not meet.

Requests for next meeting: Projector and Room for 40 people

Avoid conflicts if possible with J5, D29, C26, and D37 and (not) 0800 on Tuesday, if possible.

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

Chair: Michael Higginson
Vice Chair: Fred Friend
Output: PSRC Report
Draft: 3
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 44 attendees, including 23 members (2 new members) and 21 guests.

The Chair opened the meeting with introductions. The meeting minutes for the September 2017 meeting were reviewed and approved.

DOE and 2030.7 have requested that PSRC sponsor a guide on Microgrid protection, as there is industry need. There was presentation on the demand from Professor Geza Joos, chair of 2030.7. The working group discussed this request, and it will be discussed in the C subcommittee meeting.

Since last meeting, several assignments were received. Review comments and new contributions were integrated by Michael. The following sections were updated:

1. Revised Section 3.1 (Variable Fault Current Levels): Sukumar Brahma
2. New Section 3.3 (Loss of Source Detection): Xiangyu Ding
3. Section 4.1 Protection Design Considerations: Jean-Nicolas Paquin, Cat Wong, Prem Kumar
4. Revised Section 4.2.1 (Adaptive Relay Settings): Amin Zamani
5. Annex A (Real world microgrid case study): Mukesh Nagpal

There are a few open assignments, and the contributors have agreed to submit them in the coming weeks. The open assignments are as follows:

1. Michael – Introduction and Conclusion
2. Mukesh – References
3. Wayne – Figures

The working group discussed terminology usage, which Michael will edit to make consistent across the document. Terms discussed were:

- Grid-Isolated and Grid-Interconnected to describe the microgrid operation mode
- Area EPS to describe the system that the microgrid interconnects to, in alignment with the terminology used by IEEE 1547
- Grid-Isolating Device to describe the device interconnecting the microgrid to the area EPS
- Voltage levels were decided to be described functionally (e.g. distribution voltage)

After making the edits, Michael will send the report to the working group (at least one month prior to the next meeting). We hope to discuss the comments with the next meeting.

Next meeting: Computer projector and room for 50 attendees. Please avoid conflict with I2, I29, C32, and CTF38.

C-31: Guide for Protection System Redundancy for Power System Reliability

Chair: Solveig Ward
Vice Chair: Alla Deronja
Output: IEEE Guide
Draft: 2
Established: January 2017
Expected Completion Date: December 2021
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, January 10, 2018 at 11:00 AM in a single session with 20 members and 27 guests attending. 7 of the guests became members and 2 – corresponding members. The quorum initially was not met so the September 2017 meeting minutes will be approved via email.

The WG chair displayed the IEEE patent slides as required for the working group with PAR related activities. There were no objections from the meeting participants.

The Chair reviewed the status of the writing assignments made at the September 2017 meeting.

- Transfer of old report into new outline – Alla Deronja. Status: completed.

Review of sections:

- Clause 4, General Considerations. Status: not completed.

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)

- Clause 5, Protection Scheme Redundancy. Status: completed.

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)

- Clause 6, Redundancy Applications Considerations. Status: not completed

Craig Palmer [review sub-team lead] (cpalmer@hubell.com)
Lynn Schroeder (lschroeder@mkec.com) (Lynn provided her comments – completed)
Aaron Martin (akmartin@bpa.gov)
Xiangyu Ding (xiangyu.ding@sandc.com) – distribution protection (Xiangyu provided his contribution – completed)
Writing assignments from the September meeting were:

- Firmware Considerations: Roy Moxley. Status: completed.
- Network Redundancy: Solveig Ward. Status: completed.
- Crossover/mixed use SIPS/primary protection/automation: Aaron Martin. Status: not completed.
- Refurbishment Considerations. Need a contributor.

Review of relevance of other documents:

- NERC SPCTF 2009: Bob Cummings. Status: not completed.
- C16 PSRC Report Relay Scheme Design Using Microprocessor Relays, 2014: Robert Frye. Status: not completed.
- NERC Directory 1 (2016): Bob Cummings. Status: not completed.
- Ancillary functions K5: Alla Deronja. Status: not completed.
- NPCC directory 4 - redundancy requirements: Jeff Pond. Status: dropped.
- WECC RAS: Aaron Martin. Status: dropped.
- NERC RAS: Solveig Ward. Status: completed.

The WG decided that, with the new NERC RAS (PRC-012-2, which replaced old 012 – 016 standards), we will not need to look at old WECC and NPCC RAS requirements.

The WG also agreed to limit NERC mentioning in the guide so the review of the relevant NERC/regional councils documents is no longer needed.

Don Ware suggested adding substation design redundancy considerations to Clause 4. He could do so while reviewing Clause 4 per the September 2017 reviewing assignment.

Jeff Brown and Alexis Mesko volunteered and were assigned as Figure Managers. Jeff will contact John Miller, who did the figures for two other guides but since retired, to get his guidance on managing the figures.

Figure 13 appears to be incorrect, and Craig Palmer volunteered to investigate it based on the available power line carrier technical documentation.

New assignments made at this meeting:

- Qiaoylin Yang will extend sub-clause 5.2.3 *Sampled Value Systems and/or non-conventional instrument transformers* on digital sample redundancy.
- Qiaoylin Yang will extend sub-clause 5.7.2 *Ethernet LANs*.
- Alan Goldstein will provide new material on redundant synchronization time.
- Craig Palmer will investigate the available power line carrier technical documentation and correct Figure 13 *Two PLC channels, coupled together via phase to phase*.
- David Morrissey will revise the list presented on pages 15 and 16 in the general part of Clause 5 *Protection system redundancy*.

Alla Deronja will incorporate the latest contributions and mail the updated draft 2.1 to the WG members by January 15th.

All the outstanding and new assignments are due to the Chair by March 15, 2018. Please email them to sward@quanta-technology and aderonja@atcllc.com.

For next meeting, the WG needs a room for 50 people, single session.

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

Chair: James Deaton
Vice Chair: Mukesh Nagpal
Output: PSRC Report
Draft: 1
Established: January 2017
Expected Completion Date: December 2019
Assignment: Write a report that addresses protection challenges and practices for the interconnection of inverter based generation to utility transmission systems.

Working Group C32 met with 21 members, including 4 new members, and 51 guests present. The following items were discussed:

1. The meeting agenda was reviewed.
2. Minutes from the September meeting were reviewed and approved.
3. The report introduction was discussed.
    a. It was suggested that the phrase “inverter based generation” be replaced with “inverter based resources” to match evolving terminology used in other documents. This would require a change in the working group title and assignment. Proposed changes to the WG title and assignment will be discussed during the C subcommittee meeting.
    b. The operating voltage range, 46kV and above, was removed from the description of the sub-transmission system.
4. Volunteers were recruited for writing assignments. The status of outstanding writing assignments was discussed. All writing assignments are due on April 15 and should be submitted to Mukesh and Jimmy. The following is a summary of writing assignments:
    a. Section 1.2 Description of Typical Wind Plant – Marilyn Ramirez
    b. Section 1.3 Description of Typical Solar PV Plant – Nina Selak
    c. Section 1.4 Interconnection Configurations – Jimmy Deaton (Assignment made May, 2017)
    d. Section 2.2 Interaction of inverter controls and impact on protection - Yu Xia (Assignment made May, 2017)
    e. Section 2.3 Interaction of inverters with control of shunt capacitor banks, SVC’s – Bob Cummings
    f. Section 2.4 High Penetration of Inverter Resources, Low System Fault Current, Low Inertia – Jim van de Ligt, Wayne Stec
    g. Section 2.6 Response of traditional protection elements to fault currents produced by inverters – Evangelos Farantatos, Athula Rajapakse, John Seuss
    h. Section 2.7 Inverter Setup and Configuration Considerations – Michael Higginson, Bob Cummings, Mukesh Nagpal, Steve Miller
    i. Section 3.1 Utility Owned Transmission Line Relaying (Tie Line/Adjacent Lines) - Hillmon Ladner, Addis Kifle (Assignment made May, 2017)
    j. Section 3.3 Solutions for Control Interactions – Nuwan Perera
    k. Section 4.1 Short Circuit Model - Kevin Ridley (Assignment made May, 2017)
    l. Section 4.4 Islanding Considerations – Duane Buchanan
    m. Section 5.7 Utility Procedure and Documentation Requirements to Place Site in Service – David Morrissey
5. A meeting room with capacity of 50 with a projector is requested for the May meeting.

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.

CTF33: Support for WG-P2004 "Recommended Practice for Hardware-in-the-Loop (HIL) Simulation Based Testing of Electric Power Apparatus and Controls"

Chair: Michael "Mischa" Steurer
Vice Chair: Georg Lauss
Temporary PSRC Chair: Gene Henneberg
PSRC Chair: Dean Ouellette
PSRC Vice-Chair: TBD
Output: Coordination with WG P2004
Established: September 2017
Expected Completion Date: December 2021
PSRC Scope:
Support the development of this IEEE recommended practice in cooperation with PELS, IAS, and IES efforts.

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).

Meeting Minutes

The task force met via web teleconference and in-person meeting in Jacksonville, FL, USA, 9 January 2018, 9:30-10:45 EST. There were 9 in-person and about 27 web attendees.

Roll call—for those on the phone only (not logged into Web meeting with your name), please announce yourself or e-mail Blake.Lundstrom@nrel.gov to ensure you are on the participant list for today.

Patent slides were shown and all participants asked to speak up about any patent claims at this time. The patent slides are always available on the IEEE P2004 collaboration website for review.

Review of P2004 group and its aims for IEEE PSRC CTF-33

- Gene Henneberg (temporary chair, CTF-33) noted that CTF-33 may soon be converted to a working group and their first "product"/aim will be to assist with P2004 recommended practice

Upcoming P2004 Meetings

- Next meeting Feb. 2, 2018 – in person at IESES in Hamilton, NZ and via web conference
- Possible future meeting locations could be held concurrently with upcoming IEEE PSRC meetings:
  - May 7-10 Pittsburgh, PA, USA
  - Sept 10-13 Minneapolis, MN, USA

Review of past P2004 progress, ongoing discussions

- Summary of Cincinnati meeting presentations
  - learned about an existing "HIL Standard" for marine control systems (by DNVGL)
  - considered stability in the design of PHIL simulations
  - discussed several approaches to structuring the document
  - started the conversation about

        - Definitions and terminology
        - Rapid Control Prototyping vs. HIL
- Subsequent web-meetings focused on definitions and terms
    - DRTS: digital real time simulator (as adopted from RT-Sim TF) – to be revisited
    - HIL Simulation:
        1. A simulation model of a system executed on a DRTS in real-time mode
        2. One or more salient components of that system existing outside of that DRTS
        3. The DRTS simulation interacts with the salient component(s) outside the DRTS and vice versa
    - Seek PSRC CTF-33 input on definitions and terms above

Presentation: "Digital Real Time Simulation for Utility Protection", (Krishnanjan Gubba Ravikumar, SEL)

- See presentation posted on P2004 collaboration website
- CTF-33 room comment: may want to also consider how one documents HIL simulation in a standard way
- Mischa: presentation included many "generic" simulation practices – important, but we may not be able to address as part of P2004 given limited time/scope
    - E.g., simulation validation is certainly important for HIL, but is important for any simulation
- Charles Adewole: "aside from the validation of the models, are there specific procedures taken in calibrating the hardware itself before testing the DUT?"
- Krishnanjan: "Yes there are and it is a very important step. Could be a good topic for future discussion"
- Joern: "Commissioning processes might be of interest as well"

Approval of Meeting Minutes from 12/5/2017 meeting – motion was made and seconded to approve minutes from the last meeting.

Subsequent to the meeting, Dean Ouellette volunteered as permanent chair for the CTF-33 Task Force.

The next joint PSRC CTF-33/WG-2004 meeting is scheduled in Pittsburg, PA in May 2018. We will need a room for 20, a computer with audio and web access, and a projector.

Minutes prepared by Blake Lundstrom and Gene Henneberg.

CTF34: <u>Inverter-Based Short Circuit Current Impacts</u>

Chair: Kevin W. Jones
Vice Chair: Gary Kobet
Output: PSRC Report
Draft:
Established: September 2017
Expected Completion Date: May 2018
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.

ATTENDANCE

40 Total with 3 members and 37 Guests. 19 guests volunteered to become task force members, bringing the total TF membership to 22.

GENERAL ITEMS

WG CTF34 met in single session on January 10 in Jacksonville, FL with 3 members and 37 guests.

In the absence of the Chair, Vice-Chair Gary Kobet reviewed minutes from the September 2017 meeting in Phoenix AZ which were subsequently approved.
The Vice-Chair then reviewed the NERC Statement of Work regarding the PES/NERC joint task force (JTF) addressing Low Short Circuit Current Impacts, and displayed the JTF membership, as well as related IEEE/PES/PSRC working groups (C32, C24, C25, J18).

The Vice-Chair then displayed the draft document being developed by the JTF, including the outline of both sections on large system issues and protective relay issues.

There was some discussion over making PSRC CTF34 into a working group, but with the very short timeline it was decided it will remain a task force, which is acceptable given this is not a PAR-related effort.

The Vice-Chair noted the JTF timeline, which requires the work to be completed by June/July of this year 2018. To this end, the JTF has plans to complete the first draft by end of January 2018, with WebEx meetings in February 2018 to discuss/revise/etc.

The Vice-Chair requested volunteers to assist in reviewing the JTF document and provide comments, stressing the short time line and stating that they should only sign up if they are able to accept and complete assignments by the May 2018 PSRC meeting. On receiving permission of PES (Miriam Sanders) and the JTF co-chairs (Pouyan Pourbeik and Kevin Jones), the Vice-Chair will distribute the present document (in .pdf format) to CTF34 members on approval of PES/NERC. CTF34 members will then respond by February 1 that: (1) they received the document, (2) indicate which sections they are willing and able to review and provide input, and (3) inform the Chair/Vice-Chair of any industry activities already addressing the issues (e.g., PSRC C32, C24, C25, J18). Those who do not respond will be dropped from the CTF34 membership. Note that CTF34 members should limit their comments to the protective relay issues, and disregard the large system issues section. They can comment on that on their own if/when the document is submitted for public review in June/July 2018 (assuming that is the plan). The JTF needs their expertise at this time on only on protective relaying.

When the JTF initial draft is complete (mid-February), it will be distributed to CTF34 members to review. Assignments will be due by mid-March, and a CTF34 WebEx will be scheduled for first week of April, prior to the May 2018 PSRC meeting, to discuss assignments and comments. This work will continue at the May 2018 meeting. The CTF34 comments will be fed into the JTF work.

Note the above schedule is flexible based on the progress of the JTF.

The Vice-Chair reiterated that this work is high level and intended only to identify issues, not provide details or mitigation.

The Vice-Chair mentioned related work by NERC involving the development of a Reliability Guideline titled “Integrating Variable Energy Resources into Weak Power Systems”. This work is to be available for public comment this spring 2018.

The Vice-Chair also mentioned that the JTF will be represented in a panel session at the upcoming IEEE/PES T&D meeting in April 2018, concerning the Impact of Renewable Integration and Low Fault Current (following the initiation of this high profile TF, an introductory discussion by the TF leaders would be a timely update to the industry on this topic, scope of work and call for support, etc.)

A question was raised concerning the output of the JTF, specifically if the output document will be available publicly as a NERC document or for purchase as a PES document. Bob Cummings of NERC indicated it would likely be publicly available at no charge and distributed by NERC. The Vice Chair will check with Miriam Sanders to confirm.

REQUIREMENTS FOR NEXT MEETING:
For the next meeting, CTF34 will need a room for 50 and computer projector.

CTF35: IEEE Transactions Paper Development for C37.246 Guide for Protection Systems of Transmission-to-Generation Interconnections

Chair: Alla Deronja (aderonja@atcllc.com)
Vice Chair: Keith Houser (keith.houser@dom.com)
Output: Conference and IEEE transactions paper
Draft:
Established: January 2018
Expected Completion Date: December 2019
Assignment: Write a conference and IEEE transactions papers for C37.246 IEEE Guide for Protection Systems of Transmission-to-Generation Interconnections.

Task force CTF35 met on Wednesday, January 10, 2018 at 8:00 AM in a single session with 1 member and no guests attending.

The Chair and a member, who attended, reviewed the abstract and outline of the future conference paper. The attending member, Yuan Liao, previously volunteered to contribute to Sections III and IV of the paper.

The Chair will reach out to other members of the original WG for help on developing the paper, specifically assigning the following sections of the future paper:

I. Background – Alla Deronja
II. Introduction – Alla Deronja
III. Establishing interconnection – Keith Houser (to be confirmed). Additional contributor welcome.
IV. Transmission-to-generation interconnection configuration – Yuan Liao. Additional contributor welcome.
V. System studies for interconnections – Yuan Liao
VI. Overview of protection system settings for interconnections
    A. General considerations – Alla Deronja
    B. Synchronism check function – Alla Deronja or another contributor
    C. Degraded grid voltage protection – Need a contributor
    D. Reverse power protection – Alla Deronja
    E. Breaker failure protection – Alla Deronja
    F – Power transformer ground time overcurrent protection – Need a contributor
    G. Frequency protection – Need a contributor
    H. Bus differential protection – Alla Deronja or another contributor
    I. Tie line differential protection - Alla Deronja or another contributor
    J. Protection performance and redundancy – Alla Deronja

K. Line autoreclosing function - Alla Deronja or another contributor
L. Communication channel aspects – Need a contributor
M. Protection considerations for tapped connections – Mukesh Nagpal
N. Protection considerations for interconnections with renewable energy sources – Need a contributor

VII. Summary – Alla Deronja or another contributor

For next meeting the WG needs a room for 20 people, single session.

CTF36: IEEE Transactions Paper Development from C2 report: Role of Protective Relaying in the Smart Grid

Chair: Alex Apostolov
Vice Chair: Roy Moxley
Output: IEEE transactions paper
Draft:
Established: January 2018
Expected Completion Date: December 2019
Assignment: Prepare IEEE transactions paper developed from the C2 report: Role of Protective Relaying in the Smart Grid.

The task force met on Tuesday, January 9. 19 people were present at the meeting.

The goal of the meeting was to determine if it is necessary to establish a WG to develop an IEEE transactions paper based on the C2 report “Role of protective relays in the Smart Grid”.

After a short discussion there was consensus that there is a need to educate the industry outside of the protection community about the availability of multiple features in protection IEDs that can be used successfully in different smart grid applications.

It was decided that there is a need to establish a WG and 14 people volunteered to become members of the WG.

This was followed by discussions on the assignment. The following is the proposed assignment of the new working group:

The working group will develop an IEEE Transactions paper, a reduced size conference paper and a PPT presentation based on the material of the C2 Report “Role of protective relays in the Smart Grid”. The presentation and conference paper will be used at different conferences where allowed.

The goal is to complete the work by the January 2019 meeting.

We plan to have a single session in May 2018, room for 25 people and a projector.

D: LINE PROTECTION SUBCOMMITTEE

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

The Subcommittee meeting was called to order on Wednesday, January 10, 2018 with 28 members and 15 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 September 2017 meeting in Phoenix were approved after motion made by Phil Winston and seconded by Roger Hedding.

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 : 1.22
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 did not meet at the January meeting as the group is finalizing the document for balloting.

For the next meeting, D28 will need a room for 40 and an overhead projector.

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 January 9 in Jacksonville, FL with 11 members and 18 guests.

The vice chair reminded and pleaded with the members to complete their writing assignments and send them to himself and the chair ASAP (possibly before April in time for the May meeting).

Karl Zimmerman kindly agreed to assist Heather Malson with the definitions in the document (Karl to coordinate with Heather to see how he can assist). Gene Henneberg agreed to craft the section on multiple Lens characteristics. Manish Patel agreed to review the previous 2005 document (D6) and craft a summary of the relevant material. Jun Versoza agreed to craft the section with respect to the Alstom setting less OOS section. Luis Polanco agreed to review his section and provide feedback before the May meeting.

Kevin Jones (chair) was not able to attend the meeting but reported he made good progress with respect to the dynamic PSSE model (fixed all errors) and the results are looking good. He will discuss the model and his result at the May meeting.

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 (Karl_Zimmerman@selinc.com)
Vice Chair: Ted Warren (JTWARREN@southernco.com)
Output: Tutorial
Established: January 2014
Expected Completion Date: December 2018
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 Jacksonville on January 9, 2018, with 12 members and 9 guests.

The WG Chair distributed copies of the tutorial's most recent draft, 3.1, Date 20180105, which is available on the Line Protection Subcommittee website.

The WG reviewed some extensive comments from Gary Kobet, which significantly improved the consistency of the tutorial. (e.g. moved Figure 15 to Section II, added or revised language between sections)

Two application challenges were added: 1) Ground distance elements looking through an auto-transformer, 2) Ground distance elements on tapped lines with a Z0 source. Josh Lamb and Gary Kobet, respectively, volunteered to write these two sections.

Aaron Martin agreed to write section on basic setting considerations

Jack Wilson added some revised figures (Fig 55 and 56) to show increasing fault resistance with mho and quadrilateral characteristics.

Josh Lamb and Luis Polanco joined the Working Group.

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 May 2018 in a single session for 30 attendees with a computer projector.

D34: Coordinate with IEC 60255-187-3 Functional Specification for Line Current Differential

Chair: Normann Fischer
Vice Chair: Joe Mooney

D34 did not meet in Jacksonville and has no minutes to report. It is unclear if there will be a meeting in May 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, January 10th, 2018 at 8:00am in a single session with 19 members and 10 guests.

After introductions, we started reviewing the Series Compensated line section of the document. This section will be updated to discuss using Power Line Carrier with a bypass. Nuwan Perera will make this update.
The comparison chart example from the Series Compensated Line section was presented. The group agreed it was a useful format.

The working group reviewed a flowchart from a Westinghouse document for pilot channel selection. The working group will evaluate using a similar format in this report. Mat Garver will investigate.

Should we evaluate communication speed times only or should zone 1 be considered? Decision was to only evaluate communication tripping without zone 1 in all applications.

Add discussion of which schemes make sense for each communication medium. Nathan Gulczynski will complete.

Move cost comparison to path technology section. Contact Jeff Brown to update.

For the next meeting, WG D35 will need a room for 40 and a computer projector.

Action Items:
Nuwan will add Power Line Carrier bypass option to series compensated line section.

Mat Garver will investigate creating a flowchart for channel selection.

Nathan Gulczynski will add discussion of which communication schemes make sense for each communication medium.

For the next meeting, WG D35 will need a room for 40 and a computer projector.

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 on January 9th 2018 with 12 participants (9 guests and 3 signed members). D37 Chair was not present this time at IEEE PSRC, and communicated to Vice-chair to run the meeting and provided draft outline and initial contributions within the draft. Meeting

minutes of the D37 September 2017 meeting was presented and will follow up with chair to see if previously approved via email or to send and seek approval.

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 coordinated for a future meeting. Vice-chair Luis Polanco had a potential candidate for this presentation but unfortunately was not able to support this meeting.

Vice-chair presented a draft of the report outline to the WG members/guests for feedback during the meeting and WG members went over the outline of the report and provided valuable feedback with respect to expand outline and add more detail to include section on modelling of Instrument transformers, new technologies (Ex:. traveling waves, etc.), Impact on communication assisted protection schemes with respect to fix series compensation, and impact on surrounding transmission lines when series compensated lines are in the vicinity with respect to topology, multiple parallel compensated lines, infeed, etc.;

In addition to discussing the draft outline, the Vice-chair shared some writing assignments received based on commitments from September meeting is Phoenix, AZ from Charlie Henville, Mike Kockott, Nuwan Perera and Luis Polanco. WG members volunteer to provide overall feedback and/or expand on the write-ups provided once they received the draft outline with the writing assignments received incorporated. WG members that volunteer to provide review/comments for specific sections are: Normann Fischer (3.2.1.2 Low Frequency Oscillations), Roy Moxley (3.2.2 Fault Levels) and John Lane (3.1 Understanding Series Capacitor).

Vice-chair will update draft based on comments received during this January meeting and will share with the WG members within the next couple of weeks. The goal is to have an acceptable content outline completed by May 18’ meeting so that we can move forward with more WG team members on volunteering for writing assignments.

Chair and Vice-chair will look into guides C37.116 (K13) and C37.113 (D36) to ensure there are no overlaps on details to be included on D37.

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

The WG report draft # is ongoing (1.0)

Submitted to the Subcommittee on January 10th, 2018

D38: <u>Impact of Series Compensation on Transmission Lines</u>

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

Working group D38 met on January 10, 2018 with 10 members and 13 guests.

Meeting started with introductions. The meeting minutes from the task force in Phoenix are not required to be approved.

Michael Thompson opened the meeting with his presentation. A pdf copy of his presentation will be shared with the working group. Michael fielded questions about his presentation. Discussion centered on the transmission line guide.

Pratap Mysore presented next. Pratap fielded questions. Discussion centered around either using SIR or using relay manufacturer information and evaluating the accuracy of the relay to help determine setting of instantaneous. A pdf of Pratap's presentation will be forwarded to the group.

For the next meeting in May 2018, we need a room with capacity of 30, and a computer projector.

DTF39: Revise C37.104 IEEE Guide for Automatic Reclosing of Circuit Breakers for AC Distribution and Transmission Lines

Chair: Manish Patel
Vice Chair: Brandon Armstrong
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 Wednesday, January 10, 2018 at 9:30am EST in a single session with 29 members and 11 guests.

The meeting started with introductions. The patent slides were reviewed. No one knew of any patent issues at this time. The TF reviewed and approved meeting minutes from the September 2017 meeting.
The TF then reviewed the current guide. There was some discussion about expanding sections in the guide related to following items:

- Historical info without proper reference
- Use of emerging technology for auto-reclosing, such as, travelling wave, process based etc.
- Auto-reclosing application near wind and solar generation including dispersed generation
- Auto-reclosing after UFLS and possible inclusion of after UVLS. Moving appropriate material from UFLS guide to this guide.
- Auto-reclosing for parallel lines.

The task force then voted to from a working group to revise the standard. Out of 40 in attendance, 29 voted to form a working group. There were no negative votes.

The task force then reviewed the title, scope and purpose of the existing guide. It was noted that circuit switchers and reclosers within the substation should be included in the guide. The TF revised the title, scope and purpose accordingly, which are noted below. Out of 40 in attendance, 29 attendees voted to approve the proposed title, scope and purpose. One attendee dissented.

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

Proposed Title, Scope and Purpose
Title: IEEE Guide for Automatic Reclosing for AC Distribution and Transmission Lines

Scope: This guide documents present practices regarding the application of automatic reclosing control to line circuit breakers or other line interrupting devices. Both transmission and distribution line practices are addressed.

Purpose: The guide describes benefits of automatic reclosing and includes application considerations for proper coordination with other system controls. The guide includes a section on emerging technologies and their application to automatic reclosing.

The motion was made by Randy Crellin and seconded by Russ Patterson to convert the task force to working group D39. The sub-committee chair will propose the request for PAR with title, scope and purpose as proposed at the main committee meeting.

DTF40: Future Plan for Transmission Line Guide

Chair: Jeff Barsch
Vice Chair: Don Lukach
Task Force Assignment: 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.

The DTF40 task force met for the first time with 47 people in attendance.

Jeff Barsch reviewed the content of C37.113-2015 as well as published D Subcommittee reports that contain information relevant to the material covered in the line guide. Discussion primarily centered around two ideas: 1) breaking C37.113 into smaller guides, and 2) keeping C37.113 largely the same while creating reports or tutorials that provide more detail related to this subject. Some of the comments that were made include the following:

- Roger Hedding noted that it would be more economical for someone to purchase one guide as opposed to having to purchase multiple guides. Charlie Henville responded that the purchase of a compilation of standards might be a better value than buying multiple guides.
- Phil Winston proposed that the existing line guide be kept intact. He suggested that tutorials be developed which could utilize information in the line guide and subcommittee reports. As a working group creates a tutorial, they can collect and document comments and proposed changes for the next revision of the line guide. Charlie Henville added that working groups who develop reports (as opposed to tutorials) could provide the same type of comments and proposed changes to be used in future revisions of the line guide. Phil mentioned that even if we break the line guide into smaller pieces, C37.113 will still need to be revised concurrently as material is removed from it.
- Alla Deronja and Karl Zimmerman suggested that a working group could be formed to manage proposed changes to the line guide. These proposed changes would be created by working groups that are reviewing the line guide while developing new reports or tutorials. Bruce Mackie suggested that this working group could be set up similarly to the terminology working group.
- Claire Patti liked the idea of breaking up the guide into smaller pieces so that the line guide was more manageable. One possibility is to create smaller guides such as C37.113.1, C37.113.2, etc. If this were to be done, Gustavo Brunello suggested that informative annexes could be added to these smaller guides as a means of providing more details and application examples. Alla said that if the guide is broken into smaller pieces, it's important to keep a guide which covers the fundamentals of transmission line protection.

- Walter McCannon supported the idea of developing tutorials and having those working groups collect notes which could be used in future revisions of the line guide.
- Randy Crellin suggested that if tutorials are developed, it must be made clear exactly what is expected to be developed and in what format.

The May 2018 meeting will require a single session, computer projector, and a room for 40 attendees.

Coordination Reports

T&D Committee / Distribution Subcommittee

The next T&D Committee / Distribution Subcommittee meeting will occur during the IEEE PES General Meeting August 5 - 10, 2018 at the Oregon Convention Center, Portland, OR.

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 resolved.
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 late this year.

Working Group on Switching & Overcurrent Protection
http://grouper.ieee.org/groups/td/dist/sop/
Fred Friend, Chair Casey Thompson, Vice Chair Joe Viglietta, Secretary

Continued working on the "Guide for Reliability Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment", P1806 with the plan to go to ballot in late 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 discussed a request for experts to comment on a working group WG P1870. The topic of the working group is measuring line impedance. If anyone is interested, they can contact the chair.

The chair informed the group an errata is being developed for the Line Protection Guide. Some of the figures were incorrect when published and need to be corrected. A discussion ensued to discuss the reasons for the error and how to prevent. Erin Spiewak will bring someone from the editorial group to the next meeting.

Russ Patterson discussed a concern regarding the sub-synchronous oscillation (SSO), particular the sub-synchronous control interaction (SSCI) involving series compensated line and renewable power generations, is a growing concern to many utility companies. A possible task force to review these concerns will probably be started in J sub-committee and our sub-committee are welcomed to participate.

General Discussion - None

Line Protection operations of interest - None

The meeting adjourned.

H: RELAYING COMMUNICATIONS SUBCOMMITTEE

Chair: Galina Antonova
Vice Chair: Aaron Martin

The Subcommittee met on January 10, 2018. The meeting continued with 21 members of 42 total, comprising a quorum. Twenty-six (26) guests were also present. Minutes of the September 2017 meeting were approved without objection.

The Chair presented new several announcements

a. New items from May Adcom Meeting
i. Encourage Webinar presentations
ii. IEEE PES Report format to be used for PSRC Reports
iii. Encourage SC members to become Senior IEEE Members

b. New items from standards coordination meeting
i. Per recently approved P&P initial PAR and PAR modifications to be approved by the Main Committee
ii. Meeting minutes and list of attendees including affiliation to be provided to the SC with PAR request

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. Standard format for SC H vote mailings (Subject line example):
PSRC VOTE REQUIRED SC H [WG HXX] (2014-1) by May 31, 2014

WG business:
WG H22 needs a PAR extension and an update to WG Chair in IEEE-SA system.
WG H27 has new Chair: Mario Capuozzo and new Vice-Chair: Benton Vandiver.

Old business:
None.

New business:
HTF44 Chair Aaron Martin made a motion to form a Working Group with an assignment to produce a guide titled "Monitoring and Diagnostics of IEC 61850 GOOSE and Sampled Values Based Systems", subject to the proposed PAR approval. Alex Apostolov seconded the motion. HTF44 Chair asked SC Chair to present the proposed PAR at the Main Committee meeting for approval. HTF44 Chair presented required documentation: meeting minutes, a list of attendees with affiliations, and proposed PAR text below:

Scope:
This guide provides information about what factors to consider when applying IEC 61850 GOOSE and Sampled Values to monitor and diagnose communication of automation systems.

Purpose:
A guide to provide information on applying IEC 61850 GOOSE and Sampled Values features to support the implementation of condition based maintenance, cyber security monitoring, and improved commissioning of communications of automation system.

There was no discussion. The formation of the motion was approved unanimously. HTF44 Chair selected a Vice Chair: Qiaoyin Yang.

HTF45 Chair Ratan Das made a motion to form a Working Group with an assignment to develop a "Guide for Centralized Protection and Control (CPC) Systems within a Substation", subject to the proposed PAR approval. HTF45 Chair asked SC H Char to present the proposed PAR at the Main Committee meeting for approval. HTF45 Chair presented required documentation: meeting minutes, a list of attendees with affiliations, and proposed PAR text below:

Scope:
This guide for Centralized Protection and Control (CPC) systems addresses the realization of various protection, automation and control functions within a CPC system utilizing data collected from intelligent merging units. This guide includes all protection, automation and control functions in a substation including interconnecting circuits using devices and their interconnections with suitable communication protocols.
This guide includes references to existing standards applicable to protection, automation and control applications for various types of circuit elements such as generators, transformers, bus bars, shunt and series capacitor banks, reactors, transmission lines and distribution lines.
The guide addresses CPC system architectures for typical substation configurations. The guide addresses the reliability and maintainability of each architecture, along with their respective testing requirements. The guide also addresses CPC development, installation, commissioning, troubleshooting and maintenance.

Purpose:
This Guide summarizes the generally accepted practices for the use of centralized protection and control systems within a substation.

Discussion followed on the term “intelligent merging units”. It was suggested and agreed to use the term “intelligent electronic devices” instead. Alex Apostolov made a motion to change the wording from intelligent merging units to intelligent electronic devices. Christoph Brunner seconded the motion. With the above change in scope wording, the motion was approved.

A new HTF47 was formed with assignment to determine if working group should be formed on Impact of Digital Communications on Protection & Control Applications, and Mital Kanabar as a TF Chair.

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 2018
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 5 members and 4 guests. The patent policy slides were shown, and no issues were identified.

The standard draft was recirculated last fall and we have received two comments from this process. One of the comment was accepted and the member of the working group have approved the changes done by Bill Dickerson. The second comment was related to an annex that was not modified in the last recirculation and was rejected.

The document will be submitted to another 10-day recirculation and we will be able to process to the final stage for the release of the standard.

The working group will meet in May to discuss the opportunity of preparing a paper.
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 2018
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.

No Meeting no report

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 2018
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 in 3 sessions: Monday January 8, 9:30 – 10:45 & 11:00 -12:15 and Tuesday January 9, 13:30 – 14:45.

Monday sessions:

The attendance was 9 members, and 11 guests. Attendees introduced themselves, the patent announcements were made, and a sign-in was circulated. No comments were received back from the attendees regarding the patent announcements. The chair reviewed the current status which is:

> In October the IEC editorial staff sent the standard back to the WG with extensive editorial changes and over 100 comments. The convener (chair) went through the editorial changes and comments and was able to accept or resolve most of them. This included working with IEEE staff on several that weren't clear or seemed to conflict with IEEE policy. Allen Goldstein also made a careful review and helped resolve several issues. At the end of November the IEC CDV ballot closed and the WG received the results which included about 60 comments. There was 1 negative ballot on the CDV circulation because the standard had not been circulated through TC8. In response, TC95 initiated a TC8 circulation of the CDV that will be complete on January 26. No significant comments are expected, so TC95 expects to proceed to the FDIS in February. The WG held 2 conference calls in December to resolve the comments resulting from the IEC editing and the CDV circulation. Most of the editor responses and 1/4 of the comments are resolved. The WG received the IEEE PAR extension that goes through the end of 2018.

The WG discussed the impact of the changes and whether IEC or IEEE recirculation is required. While listed as "editorial", several of the changes are in the normative parts of the standard and affect the requirements. Erin Spiewak from IEEE-SA recommended a recirculation. The WG agreed that an IEEE recirculation should be done. The chair will contact the IEC secretary to determine if they want to have another CDV.

The WG resolved 26 more of the 56 IEC circulation comments, leaving 17 remaining to resolve. Resolution of these comments included addressing differences between IEC and IEEE definitions and how they are listed. The IEC format is being followed as the IEEE has committed to being flexible on this, but the WG kept the essential content unchanged. Rather than change the definition for UTC, it was dropped. The term is defined and the definition is well known. The remaining comments were accepted or the meaning was clarified.

Tuesday session:

The attendance was 9 members, and 3 guests. Attendees introduced themselves, the patent announcements were made, and a sign-in was circulated. No comments were received back from the attendees regarding the patent announcements. The chair reviewed the current status which is listed above.

The WG resolved the 17 remaining comments of the 56 comments from the IEC circulation. Dean corrected the errors in Figure 2. Allen and Dan raised the concern that all the provisions in the cited standard 60255-1 may be assumed to apply to all qualification under the standard where only certain provisions are cited. After examination, the standard was found to be precisely worded in this regard which should avoid the problem. The chair will check with IEC on this. In response to comment 46, the WG also decided to re-write the formulas using the angular frequency symbol "ω" to the "2πf" notation to maintain consistency through the requirements section.

The ongoing plan is to make the remaining corrections over the next 10 days and then submit to IEEE for a recirculation. This could be done about the end of January. The IEC circulation to TC8 will complete on Jan 26, so we could be complete with IEEE balloting and ready to go to the FDIS in the IEC in mid-February.

The WG requests a meeting space for 20 people, single session, and computer projector for the next meeting in May.

H17: Establishing Links between COMTRADE, IEC 61850 and CIM

Chair: C. Brunner
Vice Chair: A. Apostolov
Output: Report
Established: 2010
Expected completion date: January 2019
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.

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

Chair: A.Makki **Chair C19: Denis Holstein**
Vice Chair: C. Calix
Secretary: H. MonterrubioOutput: Guide
Established: January 2014
Expected completion date: December2018
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 8 members and 11 guests in attendance. The working group has a total of 12 voting members, quorum was established. After introductions the IEEE SA Patent slides were discussed and no claims of any potential patent infringement were recorded.

The Guide is now at draft 9.0. Thanks to the latest contributions from Mario, Hugo, Tony, and Cesar, the working group is pleased to report that all of the issued assignments are complete. The final count stands at 18 categories of files. The volunteer of the day award was presented to Mario Capuozzo for completing 3 assignments in one meeting cycle (equipment ratings, environmental ratings, and seasonal ratings).

The Group discussed the expected completion date for the Guide. The date is at the end of this year which may not be enough time for the balloting process. The Group therefore agreed that a PAR extension should be filed by the Chair.

The group plans to meet again at the next meeting. The meeting requirements are: Single session, meeting room for up to 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: December 2017
Assignment: Develop an IEEE Guide for naming Intelligent Electronic Devices (IEDs) based on the report of Working Group 10.

The WG completed its assigned and did not meet. Work on summary paper continues via teleconferences.

H27: Standard File Format for IED Configuration Data (COMSET)

Chair: C. Chelmecki
Vice Chair: Bharadwaj Vasudevan
Output: Standard
Established: September 2013
Estimated Completion Date: January 2020
Assignment: Develop a standard XML based file format for exchange of protection and control configuration data between engineering tools and asset management tools. The modeling and naming conventions should be based on the definitions and extension rules defined in IEC 61850.

The working group met with 7 members and 10 guests in attendance.

Craig Preuss presented a slideshow with the aggregated use-case information that was requested in the last meeting.

The group utilized this use-case information to nail down the scope, which is to focus on the structure of the file format, whilst leaving the setting nomenclature considerations to H31.

Mario provided a demonstration of a technology that he has worked on for the past several months: a universal XML setting file format for sharing settings across the various vendor tools that require setting information. He also presented an XML Schema Definition (XSD) file that is used to validate and restrict the XML setting file. A C# application demonstrated how this validation occurs in code.

This universal format is currently a superset of all of the various fields that can be found in 35 setting file formats from major relay manufacturers. Therefore, it is safe to say that this can be considered a good model format for the configuration settings from these vendors (logic information not included).

It was discussed that the logic portion of the COMSET file should utilize (or harmonize with) the upcoming 61131-3 standard from the IEC, which is an XML representation of PLC logic, that is hopefully extensible, such that custom model information may be embedded in the file.

Action Items:
Mario to continue development on the new XML format. A GoToMeeting will be held in the interim between this January meeting and the next meeting in May to review the file format, the XSD, and the 61131-3 standard.

Erin, in his role as IEC liaison, is going to get us a copy of the draft 61131-3 standard.

Status: Draft 0.3 (no change)

H30: IEC 61850 User Feedback

Chair: D. Maragal
Vice Chair:
Output: Recommendation on formation of a Working Group
Established: September, 2014
Estimated Completion Date: N/A, an on-going Working Group 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.

H30 working group made a presentation in IEC WG10 in Oct, 2017 providing feedback to the standard development committee on the following items:

1. Requirements of Edition Compatibility : Feedback accepted
2. Naming Convention: Manufacturers/tool vendors to change & standard to make it more clearer.
3. Documentation : Coordinate with other IEC work group
4. Engineering process: Open discussion and new processes and formats to be created for automating checks.

The feedback received from IEC WG10 meeting were discussed in the current meeting.
Alex Apostolov and Deepak Maragal discussed adding custom names, which Alex said is available in Prefix. Joseph Brunner confirmed that design and documentation working group in TC57 did not get approved due to lack of interest.

Additionally, current time synchronization issue with process bus was discussed. PSRC H30 will work with NIST for collaboration to review this matter in detail and come with recommendations for overcoming the anomaly.

Deepak request to collaborate with IEC for creating guide to document 61850. One of the guests suggested to look for CIGRE report B5 addressed visualization of 61850.

Subject of ENTSOE 61850 profile was discussed. ENTSOE is utility only task force. ENTSOE formed task force to identify missing signal and parameters required for applications identified by ENTSOE members in order to produce a profile. No such entity such as ENTSOE exists in North America. Discussion led to investigate need for joint collaboration between ENTSOE, and PSRC user feedback group to make optional logic nodes required. The role of the PSRC user feedback would take feedback from other working groups such as WECC or NPCC or NATF. Deepak to check with NPCC regarding forming an ENTSOE type working group. Aaron to talk with WECC to gauge interest in developing common profile of 61850.

To simply understanding of IEC 61850 and ease its adoption, H30 undertook a new item to generate tutorial comparing traditional design with IEC 61850 and highlighting the usage of configuration tools along the design & testing process.

Herb Falk, presented the UCA proposal to update the IEC 61850 QAP regarding discontinuing conformance testing of retired editions. UCA to guarantee 10 years of conformability. For example edition 2 device will no longer be conformance tested after 2022. Also all n+1 editions will be tested to be back word compatible to the n edition. Edition 1 is out of the process so current date that UCA will no longer certify conformance testing after December 31, 2020. Attendees were asked to provide feedback

H31: Common Protection & Control Parameters for COMSET

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 Jan-10th with 4 members and 7 Guests.

Mario Capuozzo presented under and over frequency implementations from ABB, Basler, GE, GE-Micom, Schneider, Siemens and SEL manufacturers. Group concluded to limit the H31 analysis to relay manufacturers primarily utilized in North America due to limited experience and lack of contributions from other manufacturers.

Alex Apostolov presented a new concept of classifying and tabulating various protection and protection related parameters.
Following assignments are discussed and agreed by the attendees:

- Deepak Maragal to send the revised spreadsheet to tabulate the analysis.
- 50, 51 (PIOC and PTOC) functions and parameters will be review by David Busot.
- Power related functions will be reviewed by Todd Martin
- Voltage related functions (PVOC, PVUC) will be reviewed by David Aldrich
- 87L, 87T (PDIF) functions will be reviewed by Mario Capuozzo
- 21 Distance function will be reviewed by Jun Verzosa

H32: Performance Requirements for Ethernet Circuits Applied to Teleprotection

Chair: K. Fodero
Vice Chair: W. McCannon
Output: Report
Established: September, 2014
Estimated Completion Date: September 2018
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 11 members and 8 guests in attendance.
Draft 8 was submitted to the sub-committee for approval and acceptance. We received many comments and edit requests. At this meeting, we did get through most of the comments. We have more issues to resolve between now and next meeting.

We did not have a quorum in the current approval vote. The revised draft will be resubmitted for acceptance when completed.

H35: XML Translation for COMTRADE

Chair: M. Adamiak
Vice Chair:
Output: Report
Established: May, 2015
Estimated Completion Date: December 2019
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 with 14 in attendance (the member/guest information was not recorded on the sign-in sheet).

Mark Adamiak provided a presentation on a list of features that he wanted to include in the new format.

A large discussion then followed regarding 61850 and certain aspects of the data types in that format that should be used in the new COMTRADE format. For example: bit strings, quality flags, variable sample rates, among others.

Mario Capuozzo demonstrated an initial XML translation of the .CFF file contents, along with an XML Schema Definition to match it. A C# validator tool was demonstrated.

It was proposed that this working group should not only provide a new file format, but also some reference implementations of the code that can be used to perform XSD validation and parsing of the XML. This would help greatly to speed up adoption of the technology.

Raw/unformatted minutes are attached below.

Mark/Mario/Zach will work together to continue development of the XML model proposal, the XSD, any XSLTs that may be necessary. There is a list of technologies that they have agreed to investigate for inclusion, such as CIM, SVG, and HTML. They also volunteered to read and familiarize themselves with the H5C document from the IEC.

It will be determined whether or not to use Github or Bitbucket as the source code repository, and whether or not to use Mercurial or Git as the version control software. Mark/Mario/Zach will look into this.

A meeting will be held before the next PSRC meeting in May to discuss the improvements to the model.

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

Chair: J. Bougie
Vice Chair:
Output: Guide
Established: 2017
Expected completion date: May 2018
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

WG did not meet. After resolving recirculation comments, P2030.101 draft was added to Jan 2018 RevCom Agenda for approval.

H40: Databases used in SAS

Chair: J. Bougie
Vice Chair:
Output: Guide
Established: 2017
Expected completion date: December 2020
Assignment: This recommended practice presents general requirements, design, and lifecycle costs versus performance for databases associated with substation automation systems. Also included are specifications for database elements that should be standardized to ensure interoperability. Example designs are included for reference purposes, which are not intended to prescribe a definitive database design. Applications utilizing databases can be very different and may have vastly different requirements.

The meeting was ran by SC H Chair. There was 1 member and 5 guests in attendance. Title and scope of the document were discussed. SC H chair suggested clarifying the scope and soliciting help from data base experts in power industry community.

Two attendees expressed interest in becoming WG members. Participation calls were made at SC H meeting and at the Main Committee meeting.

H41: Revision of IEEE 1646 Communication Delivery Time Performance Requirements

Chair: D. Holstein
Vice Chair: N/A
Output: Recommendation for Assignment for Formation of New Working Group
Established Date: 2017 January
Completion Date: January 2020
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 work streams (WSs). The technical approach was accepted without amendment. No one volunteered to lead or participate in the work streams.

- 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.

HTF44: Enhancing GOOSE I/O Monitoring

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

Chair presented IEEE standard related slides
Background discussed
Chair asked for interest in subject
Task force voted to consider a requesting submitting PAR
Task force then proceeded to develop the following assignment, scope and purpose.

Assignment produce a guide titled: Monitoring and Diagnostics of IEC 61850 GOOSE and Sampled Values based systems

Scope: This guide provides information about what factors to consider when applying IEC 61850 GOOSE and Sampled Values to monitor and diagnose communication of automation systems.

Purpose: A guide to provide information on applying IEC 61850 GOOSE and Sampled Values features to support the implementation of condition based maintenance, cyber security monitoring, and improved commissioning of communications of automation system.

The task force then voted to request to the H-subcommittee to request to the Main committee to request permission to submit a PAR for the purpose of forming a working group

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 January 10, 2018 with 42 participants (11 members and 31 guests). 12 task force members could not join the meeting but provided their inputs before the meeting.

Chair started the meeting by discussing the IEEE pre-PAR slide after the introduction of participants. The minutes of meeting of the previous meeting approved by email was then discussed for the new guests to have the background of the HTF45 work.

We then have discussion about the PAR approval - 18 members of the task force have approved the enclosed PAR including email approvals, four members did not respond and were absent, and one member did not approve the PAR.

Chair mentioned to the participants the next step of proposing to the H-subcommittee to approve the PAR and request the H-subcommittee chair to have a motion for the approval of PAR at the main committee meeting. Chair then asked all attendees to comment on the proposal – no adverse comments were received for the proposed work and many participants expressed interest to join the working group if the PAR is approved.

List of task force members are enclosed along with their affiliation and their voting on the PAR.

The assignment of the proposed working group will be:

Develop a guide for Centralized Protection and Control (CPC) Systems within a Substation

Task force chair, Ratan Das, agreed to chair the WG if the PAR is approved

.

Liaison Reports

IEC TC 57 WG 10, 17, 18, and 19 and related WGs
Ch. Brunner

For a detailed roadmap of the IEC 61850 related work, please check the IEC document 57/1882/INF.

Recently, the following parts have been published:

- Part 7-500: Technical report about usage of the Logical Nodes to model applications for substation automation
- Part 90-10: Modelling schedules

Progress has been made with regard to publication of so called code components and associated copyright. Code components are parts of standards that are intended to be used as electronic deliverables by software (e.g. XML schema files, MIBs or data models). They will be in the future available from the IEC website for free (at least a short version that contains everything what is needed). As first items, the latest valid versions of the IEC 61850-6 schema files for Ed 1 and Ed 2 are available at www.iec.ch/tc57/supportdocuments.

IEC TC57 / WG10 will meet in February in Sochi, Russia. WG10 has currently the following projects:

1. Finalisation of Edition 2 of IEC 61850:
   All parts except part 2 (Glossary) have been published as second Edition. For part 2 a CD is in circulation.

2. Preparation of an Edition 2.1 of IEC 61850 for some of the major parts
   The Amendments for parts 6 is ready for publishing, 7-2, 7-3, 7-4, 8-1 and 9-2 are planned to be circulated as FDIS in April this year; 7-1 as CDV. We are currently working on preparing an Annex with detailed discussions of compatibility between

different versions of the standard explaining the impact certain changes have and listing explicitly all the changes concerned.

3. Technical reports that are under preparation
   New work has been started to model travel wave based fault location.
   Technical report 61850-10-3 on functional testing has been circulated as a first draft.
   Work on other TRs is ongoing

4. Work on technical specifications for mappings between IEC 61850 and Modbus data (TS IEC 61850-80-5) – working on comments received on CD.

5. For IEC 61850-7-6, guideline for basic application profiles, a second draft is in circulation;

6. The schema for namespace definition files (TS IEC 61850-7-7) has been approved. Based on that schema, IEC 61850 models will in the future be available electronically.

7. Based on an ENTSO-E submission, WG 10 started working on enhancing the engineering process to include as well the specification process and to include configuration of the communication network. As a first result, it could already be demonstrated, that it is possible to describe details of a communication network in SCL.

IEC TC57 / WG17 will meet in Fredericia, Denmark in February and is working on the following topics:

1. WG17 is currently working on the revision of IEC 61850-7-420 to include modelling of grid codes.

2. Work on various technical reports is ongoing

3. For IEC 61850-90-16 – use cases for system management, a first draft will be circulated within the next few weeks

4. Mapping on web technologies – IEC 61850-8-2: FDIS is currently in translation stage and shall be circulated soon.

IEC TC57 / WG18 is working on the following topics;

Update of IEC 61850-7-410 and IEC 61850-7-510.

HTF46: <u>Recommended Practice for HMIs used in Utility Automation Systems</u>
Chair: C. Preuss
Expected Output: Recommendation for WG
Established: September 2018
Expected completion date: May 2018
Assignment: Determine if a working group should be formed to generate a Recommended Practice for Human-Machine Interfaces (HMI) used in Substation Automation Systems

The TF met on Monday January 8, 2018 for the first time. There were 27 attendees locally and 9 remotely. Twelve local attendees indicated interest in becoming members. The chair requested that remote attendees indicate via email after the meeting that they are interested in membership. Attendance and participation indicates strong industry interest in the topic.

The agenda was reviewed. Introductions were made. The pre-PAR slides were shown, and no issues were identified. The IEEE copyright policy was reviewed.

Under new business the following items were discussed:

1. PSRC task force (as study group) rules were reviewed
2. Brief history of HMIs in C37.1
3. Other related work in IEC 61850-6 and ISA 101.1 was discussed
4. New work
    a. Assignment, as above
    b. Title, as above
        i. Use “with” instead of “in” to emphasize function instead of location (“in” could be interpreted as being “located in”)
        ii. Use “electric utility” instead of just “utility”
        iii. Proposed new title becomes “Recommended Practice for HMIs used with Electric Utility Automation Systems”
        iv. Should “utility automation systems” be replaced with standard language being adopted
    c. Proposed scope

This standard applies to, and provides the basis for, the philosophy, design, implementation (including building displays, testing, training, commissioning, and verification), operation (including maintenance and decommissioning) of Human Machine Interface (HMIs) used in utility automation systems. The areas covered are screen philosophies, HMI organization and structure, menus and their hierarchies, screen navigation, graphics and color conventions, dynamic elements, popup conventions, help screens, and methods used to work with alarms. It does not specify an object model, roles and access control, alarm philosophy, and alarm management. It does not apply to HMIs now being embedded within Intelligent Electronic Devices (IEDs) with small screen sizes. It does not apply to vendor-provided IED configuration software that provides HMI-like functionality with its configuration software.

        i. Does the scope need to address new graphical theory that is not hierarchical in nature, something like “complex network graphics” used in the IT monitoring world?
        ii. What about clutter and de-clutter?
5. HTF46 report deliverables
    a. Draft PAR
        i. First rough draft of title and scope included in agenda
    b. Available information concerning intellectual property, as appropriate
        i. TBD
    c. Recommendation for liaisons with other organizations, if appropriate
        i. ISA 101?
        ii. IEC TC 57?
    d. Draft project schedule
        i. TBD
    e. Draft budget, not applicable
    f. Potential market acceptance of the standards project, including technical feasibility
        i. Yes
    g. Relationship to related standards, if known, including its distinct identity from other projects
        i. ISA 101
        ii. IEC 61850-6. Herb Falk confirmed that this work includes display and animation, how to configure using SVG; use of

61850 may not be required; most of their use cases are configuration use cases
iii. C37.2
iv. IEEE 315 was mentioned as a standard for graphics.

h. Viable volunteer leadership and participation
i. No one volunteered during the meeting to be WG chair.
ii. No one volunteered during the meeting to be WG vice-chair.

i. Realistic scope and objectives
i. Included in draft PAR

j. Opportunity to establish new areas of expertise within the PSRCC
i. Yes

k. Recommendation to utilize an existing/new working group
i. New working group

Future meetings were discussed and be held per the PSRC meeting schedule.

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, January 10th, 2018 with 27 members in attendance – a quorum was achieved.

1. Welcome and Introductions
2. Approval of Minutes of the September 2017 Meeting
    a. Motion entered by: Mike Meisinger
    b. Motion seconded by: Fred Friend
3. Coordination & Advisory Committee Meetings Items of Interest
    a. 215 attendees, 14 newcomers at the meeting
    b. Future Meetings:
        i. May 2018 – Pittsburgh PA
        ii. September 2018 – Minneapolis MN
        iii. January 2019 – Orange County (Garden Grove) CA
    c. For PAR related work, please present the new 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***. New 2018 slides available and are at http://standards.ieee.org/about/sasb/patcom/materials.html.
    d. ***Join.me*** is available for conference calls/screen sharing – Contact Erin Spiewak and an account can be set up for the WG/TF Chair
    e. Looking for Webinars to publicize our PSRCC work products as part of Global Outreach
        i. 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.

f. Looking for presentations for the Main Committee meetings – please contact Andre Uribe or Brian Mugalian. Many I WG have concluded their work and could be considered for May and September 2018.
g. For January 2018, I Subcommittee will have a total of 16 WGs and TFs
h. Recording devices during meetings – announce this at the start of the meeting. Recordings are typically used for generating minutes. This applies to in-person and on-line meetings.

4. Administrative Items
   a. **NEW PROCEDURE for PARs, new 2017 P&P (sent by email):**
      i. All PAR related activities must be approved by the PSRCC Main Committee members
      ii. Includes creation of a new PAR
      iii. Includes changes to PAR scope, purpose
      iv. Working group submits to the Subcommittee the new or revised PAR, scope, purpose, minutes of their meeting, attendees, their affiliations, any disagreements are noted in the minutes.
      v. Subcommittee reviews it, the SC Chair presents it at the Main Committee
      vi. Motion to approve the new or modified PAR is done at the Main Committee meeting
      vii. PSRCC is the Sponsor
   b. Technical Report template for working group reports – see email forwarded to the Subcommittee.
   c. From IEEE-SA: WG/TF Agendas and Minutes: "***The 14-calendar-day rule" – the Standards Association requirement in O&P***
   d. 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.
   e. Make sure that on the Meeting Room Request (MRR) form for the May 2018 meeting that you include "do not conflict with I50, D87, …"
   f. 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.
   g. 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.
   h. 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.
   i. 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!
   j. Email WG or TF Minutes *including membership list* to Brian Mugalian and Andre Uribe at: bmugalian@sandc.com and to auribe@powergridmail.com
   k. 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
   l. 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.

m. ***iMeet Central*** (formerly Central Desktop) is to be used for IEEE Guide/Recommended Practice/Standard documents with a PAR
n. Subcommittee Chair/Vice-Chair will hold progress report conference calls with each WG and TF Chair/Vice-Chair in ***April 2018***. Andre Uribe will set up the conference bridge for these calls.
o. Task Force Proposal Submission Form – two received and will be reviewed 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 Mal Swanson, met on Wednesday, January 10, 2018, with 8 members and no guests.

Quorum was achieved and minutes from the May meeting in Phoenix, AZ 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: International Standards Development [EC Advisory] WG

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 January 9 with 6 members to review TC 95 standards activities. The September 2017 minutes of meeting were approved. Main discussion points are as follows:

- IEC SA has stepped out of its IEC TC 95 TAG Administrator role. After a 2017 search among many candidate replacements, reported in prior minutes – our new TAG Administrator is Pacific Northwest National Laboratory (PNNL), under US DOE. Our TAG Secretary is Jeffrey Dagle of PNNL, based in Richland, WA. We welcome Jeff and look forward to his and PNNL's participation and support.
- IEC 60255-26 Ed. 4: Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements. The MT has published a CD, which includes higher-frequency RFI testing, more severe ESD and power frequency magnetic field testing, among other changes. Vendors should focus and help with review and comments, due by Feb. 23. Contact Eric Udren for a copy of the draft.
- IEC 60255-21, Vibration, shock and seismic tests: Part 21-1 – Vibration tests; Part 21-2 – Shock and bump tests; Part 21-3 – Seismic tests - MT3 has begun a project to revise these standards. An opening draft (not yet an official CD) has been published, presenting the existing state with proposed changes described. Most vendors could be impacted by any changes to these type-testing standards; this early stage of development is the best opportunity for US and North American input to standards development. Contact Eric Udren for a review copy.
- IEC 60255-1 General requirements - Oscar Bolado of ZIV was present to explain US comments on Part 1 draft in relation to IEEE C37.90, whose updating he also chairs.
- The WG discussed whether 61850-3 should point to 60255-26, and not to 61000 series generic environmental standards.
- Murty Yalla gave an update on the TC 95 MT1-4 meeting which was held in London October 23-27.
- IEC 60255-26 (EMI) (see above) and IEC60255-27 (Safety) standard revisions were discussed at the MT1 meeting.
- IEC 60255-118-1 CDV: Synchrophasor standard – is coming out soon for another vote. This will have a 2-month response deadline – probably due in March!
- IEC 60255-187-1: Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers – CDV was approved; FDIS coming out soon.
- IEC 60255-187-2: Functional requirements for busbar differential protection – The draft is expected by September 2018 – set up a PSRC WG to review by then.
- IEC 60255-187-3: Functional requirements for biased (percentage) differential relays for transmission lines - first draft of the standard will be available by April – not yet a CD.
- TC 95 AHWG3 for relay response to sampled values from 61869-9 impacts functional standards – Murty will provide a presentation on issues.
- Related to AHWG3 – StateGrid China participants would like to start a requirements document development for relays and other IEDs installed in switchyard near power apparatus. They are actually applying a lot of relays in this way. Murty showed a presentation from StateGrid. They would like to see classes for EMC immunity, temperature range, etc. We discussed 1980's EPRI switchyard wideband EMF data and wondered if it could be made available for standards development.

- There is a new IEEE entity-initiated standards process – a company can propose a standard, and gets one vote in the voting process.
- The next meeting of TC 95 MT1-4 is in Oslo, Norway, April 9-13, 2018.
- The next TC 95 Plenary Meeting is in Frankfurt, Germany, November 9, 2018. MT1-4 will meet November 5-8 at the same Frankfurt venue.

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

Chair: Farnoosh Rahmatian
Vice-Chair: Bruce Pickett
Output: Guide PAR-PC37.241
Established:, March 25, 2010,
Expected Completion: Dec 31, 2017
Assignment: Develop Guide for "Application of Optical Instrument Transformers for Protective Relaying"

Guide was approved at the December 2017 RevCom, and will be published in 2018. The working group Chair entered a motion to disband the working group, seconded by Jeff Pond, which was approved by the members of the Subcommittee.

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

Chair: Bruce A. Magruder
Vice-Chair: Will Knapek
Output: Revision of Guide for Field Testing of Relaying Current Transformers
Established: 2013
Expected Completion Date: 2018
Assignment: Correct errors, update with new test methods and equipment

Guide was approved at the December 2017 RevCom, and will be published in 2018. The working group Chair entered a motion to disband the working group, seconded by Will Knapek, which was approved by the members of the Subcommittee.

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: 2018

The Working Group I-24 met on Wednesday, January 10, 2018, in Jacksonville, FL, in a single session chaired by Jim Niemira with a total of **7 attendees**, (1 member and 6 guests). Quorum was not met. Minutes from the September 2017 meeting will be balloted by e-mail.

- The draft has passed ballot of the I-SC receiving 75.6% approval (31 out of 41; minimum required to approve is 75%, or 31 out of 41) – 31 ballots to approve were received, some with comments; 1 negative ballot was received with comments; and 9 members of the I-SC had not yet balloted by the time of the meeting. Most comments

are editorial in nature. The WG Chair will address the comments in final editing of the document for submittal to the Main Committee.
- For the benefit of the guests present, the paper was shown and discussed. The paper will be available to all when posted to the PSRC website.

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

Chair: Mike Meisinger
Vice Chair: Steve Turner
Secretary: Amir Makki
Output: Report
Established: January 2014
Expected Completion Date: December 2018
Draft: 1.1
Assignment: Revise Mathematical Model of Instrument Transformers and expand IEEE Transaction paper and prepare IEEE Report.

Working Group I26 met on time with 14 members and guests present. The expected completion date is at the end of this year. The Group discussed it and there were no objections if the expected date needs to be extended.

The group also discussed integrating the compiled research materials from last the 2 years into the report to produce the first draft of the updated report. The group agreed that this activity can proceed in parallel with the testing initiative of the Jiles Atherton model.

The compilation of the first update of the report was assigned to Steve Turner. Also, the group requested to ask Alejandro Avendano to use the parameters from the report of the previous working group and compare the results to the recorded waveforms.

I27: Investigation of Protective Relay Self-Monitoring Capabilities

Chair: Roy Moxley
Vice Chair: Cathy Dalton
Output: Report
Established: 2014
Expected Completion Date: 2018
Assignment: Investigation of Relay self- monitoring capabilities

We met on Tuesday at 9:30am in City Terrace 4. There were 11 members and 7 guests. We removed words that could be considered inappropriate in a report; such as “must”, “should” and others that could be considered recommendations. After the report is put into PES report format it will be voted by the WG and submitted to the subcommittee.

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

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

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

The working group convened with 14 attendees, including 8 members and 6 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 September 2017, and voted to approve the minutes with the motion from Will Knapek and a second from Jackie Wilson.
The working group reviewed the open assignments:

1. Jim Niemira to continue to revise editing section 7.4.2 after receiving the C37.234 Bus Protection Guide and provide update at the September meeting. **Jim committed to completing this revision by the end of January.**
2. Michael Higginson to investigate utilizing the PSRC calculator to reproduce Figure 25 of previous standard to replace Figure 32 in our guide. If this cannot be accomplished in a timely manner we will utilize a screenshot image to replace Figure 32. **Michael committed to completing this revision by the end of January.**
    a. Joseph Valenzuela to verify with Erin if Visio is required for final figures – C37.110 will have mostly "old" figures and some new "re-sketched". **Joseph will follow up with Erin in-person at this meeting to verify if support will be available.**
3. Equations and references need to be re-visited after formatting change. Joseph Valenzuela will talk to Erin about obtaining clerical assistance. Michael Higginson will work on updating equations if assistance is not available. – ACTION COMPLETE, awaiting Erin's Response. **Joseph will follow up with Erin in-person at this meeting to verify if support will be available.**
4. Jim will update figure 29 to reflect aesthetic comments from working group, and change lead size to #10. **Jim committed to completing this revision by the end of January.**
5. The working group discussed Alla's proposed changes to the class names (changing K to X, based on C57-13 revisions). The working group decided to look into C57-13 to ensure we evaluate the changes for of CT accuracy classes are reflected. Based on Ron Pate's feedback, it seems that K class was eliminated, but X does not match the former K class.

The working group discussed Will Knapek's appendix, updating IEC references and remanent flux data.
The following new assignments were made:

1. Joseph will consult with Erin to determine if old graph figures are required to be updated.
2. Joseph and Michael will integrate Will Knapek's appendix revisions.
3. Joseph and Michael to check that all reference standards are the newest revision. C57-13 has been revised.
4. Joseph will provide Mal Swanson with a final draft copy for terminology review.

The working group was reminded that we are in the Working Group Ballot phase, and that everyone should review the document by 1/26 and vote to approve or disapprove with comments.

WebEx meetings will be held every other Thursday at 3:00 PM starting February 1st to review and resolve comments from the internal ballot.

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

Chair: Ljubomir Kojovic
Vice Chair: Robert Frye
Output: Revise C37.235
Established: 2015
Expected completion date: 2019
Draft: 4
Output: Revised version of C37.235

I30 met on Tuesday, January 9, 2018 with 3 members and 6 guests. A quorum was not able to be obtained. The September meeting minutes were not able to be approved due to lack of quorum.

The patent slides were reviewed, and one attendee had a concern with the very specific Rogowski Coil design language in the document and we agreed to have a discussion to soften the subject language.

We reviewed, discussed, and revised Scott Short's and Edgar Flores' contribution on testing of Rogowski Coils.

One of our vendor attendees offered to supply their Rogowski Coil testing information for our review to enhance our testing section. He also offered to supply information on their product range so the working group can better understand the physical accessibility constraints of Rogowski Coils for testing.

We are on Draft 04 of the document.

I31: Standard for Environmental and Testing Requirements for Intelligent Electronic Devices (IEDS) installed in Transmission and Distribution Facilities IEEE 1613

Chair: B. Mugalian
Vice Chairs: Jerry Ramie and Craig Preuss
Output: Standard
Draft: 0.31
Established Date: 05-Feb-2016 (PAR approval date)
Completion Date: 31-Dec-2020

Working group I31 met with 27 local and 6 remote attendees (shown below).

All were introduced. During introductions Jerry Ramie and Craig Preuss were announced as co-Vice Chairs.

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 at 12 of 18 members. Mike Meisinger made a motion to approve the minutes from the May 2017 meeting, which was seconded and passed.

Next, the Secretary opened up old business from the previous meeting. Five options were discussed as follows:

1. Option 1 for moving forward in scope
    a. Change title to replace IEDs with "devices with communication ports
    b. Change scope in a similar fashion

2. Option 2 for moving forward in scope
    a. Retain title and scope for IEDs containing Device 16 elements, but remove protective relays
3. Option 3 for moving forward in scope
    a. Maintain all levels as Zone A and revise C37.90.x documents adding five gap standards identified in 1613 for Device 16 test levels
4. Option 4 for moving forward in scope
    a. Better describe Zone B and place it in an Informative Annex
5. Option 5 for moving forward in scope
    a. Once Zone B surge levels have been established by historical data, consider including Zone B in the main body of the standard.

During the discussion of old business, a question came up regarding external power supply – if it is included or not. An action item is to investigate whether the existing draft includes any language to address external power supplies.

Under New Business, the following occurred:

1. EMC Society decision. Ed Hare from the EMC Society was introduced and indicated that the EMC Society is interested in being a co-sponsor to improve their support of the work.
2. A new path forward, option 6 was discussed
    a. Switchgear Committee provided feedback on standard indicating overlap in scope (see next slide)
    b. Switchgear Committee balloting of PC37.20.9
        i. C37.100.1 is the base standard
        ii. Other standard like PC37.20.9 can reference C37.100.1
3. C37.100.1 clause applies, very short subclause
4. C37.100.1 does not apply, explanation is provided.
    a. What if 1613 becomes the base standard for environmental performance standards for IEDs installed on the power system moving forward?
    b. There is potential for overlap, but this is the Power System Relaying and Control Committee, so we are not changing any aspects of existing overlap
    c. Other Committees would reference 1613 (normative) and apply or not apply with an explanation at their own peril
        i. Already required for normative references anyway
        ii. Switchgear already does this – could modify C37.100.1 to reference 1613 where it applies and modify it where it does not apply
    d. This would require outreach to a lot of Committees and a lot of hard work
    e. Benefits
        i. Recognition of 1613 would increase as the go to standard for environmental performance for IEDs installed on the power system
        ii. There would be one environmental performance standard whose focus is on the power system
        iii. Other committees could choose which portions do not apply and when, with exceptions noted an explained
    f. Other
        i. Challenges
        ii. Other committees could drastically change the requirements, but not the base standard in 1613
        iii. Other

A motion was made by working group member Claire Patti for a new option: to restore the 1613 PAR scope as originally published to cover communication networking devices, take the new P1613 content and include in C37.90 with help from the EMC Society, and put Zone B into an informative annex.

The Secretary asked for another show of hands to confirm the number of members present at 15. A total of 9 members approved the motion and 6 against. It was announced that the motion passed.

The meeting was quickly adjourned due to the meeting running past the posted ending time.

I32: A Survey of Protective System Test Practices

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: Review of Relaying Testing Terms

Chair: Jay Gosalia
Vice Chair: Amir Makki
Output: Report
Established: 1/2017
Estimated Completion Date: 12/2019
Draft: 1.7
Assignment: Review the various definitions of relay testing terms and develop a Report with formal definitions in order to help eliminate any confusion. The Report will also be used by I2 for inclusion in the IEEE dictionary.

The Working Group met on time with 6 members and guests in attendance. Two new terms were added: interoperability, and hardware in loop testing. A total of 24 terms have so far been identified (from 2 standard documents, 4 subcommittee reports, and other undocumented industry practices).

The Group also discussed potential contributions from the work by PC37.233. The group will review their latest work and harmonize with their own report. The Group will make plans to post their work materials and draft report to the PSRCC web site.

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

Established Date: 2015/09/03 (Revised PAR approval date)Completion Date: 2017/12/31

This working group will be changed to a Task Force ITF39. The PAR has expired and will be resubmitted after review of the assignment by the Task Force. See ITF39 minutes below.

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

Chair: Mike Dood
Vice Chair: Marc Lacroix
Output: Comments resolution for an updated version of the standard
Completion Date: End 2018
Version no: N/A

Working group I35 met with 8 members and 2 guests to discuss the comments in order to prepare an updated version of C37.2 standard.

The 4 new patent slides were showed to the participants.

After, Mike Dood recalled the work that have been done on C37.2. The standard was revised and few new acronyms were added.
Next steps:

1. Mike Dood will finalize the update of the latest version of the standard by the end of January 2018.
2. The updated version of the standard will be distributed to the members for comment.
3. A WEBmeeting will be organized to discuss this new version.
4. PSCC is starting a new project to produce standard function identification (numbers or mnemonics) for communication devices. There are some discussions on the use of numbers or mnemonics. We will look at IEC-61850 to see if they have already defined function identification for communication devices.

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

Chair: Jeffrey Pond
Vice Chair: Jeff Burnworth
Output: Revision of IEEE Std. C37.90.2
Established: September 2017
Expected completion date: September 2020
Assignment: Revision IEEE Std. C37.90.2 Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

Working group I36 met on Tuesday January 9, 2018 with seven members and eight guests.

Quorum was reached: 7 members

Reviewed SA - Patent Slide set for Standards Development.

Minutes of September 2017 meeting were approved.

The PAR was approved at the December 2017 RevCom meeting. The scope of the PAR remained the same as the current standard. There were no questions on the PAR.

Reviewed the current revision of C37.90.2. Draft 1 has been converted to the new IEEE SA format for editing.

Assignments for revision of the guide are due by March 31st and are as follows:

5. Review comments from the previous ballot; Roger Ray
6. Provide a write up to incorporate testing above the 1GHz range; Jerry Ramie
7. Review the C37.90.2 to determine additional edits or revisions: All members.

Copies of IEC-60255-26 and IEC-61000-4-3 have been requested from IEEE SA. The WG also requested the latest draft version of IEC-60255-26 which is being revised.

I37: Revision to IEEE Standard C37.90-2005

Chair: Oscar Bolado
Vice Chair: Marilyn Ramirez
Output: Standard
Established: 1/2018
Expected completion date: 12/2020
Draft: 1.0
Assignment: Review the various definitions of relay testing terms and develop a Report with formal definitions in order to help eliminate any confusion. The Report will also be used by I2 for inclusion in the IEEE dictionary.

Yesterday we met for 1st time to initiate the C37 revision. We revised the attached PAR application and we have some questions.

1. Is it possible to get the current standard document in word format?

2. In the application: 5.3 IS THE COMPLETION OF THIS STANDARD CONTINGENT UPON THE COMPLETION OF ANOTHER STANDARD?

What's the implication of checking this YES in this question. Is informative or does imply potential delays until the completion of the other standard.
During the meeting it was suggested that we may have overlap with the upcoming C37.90.4

1. In the application: 7.4 Does the sponsor foresee a longer term need for testing and/or certification services to assure conformity to the standard?

Additionally, is it anticipated that testing methodologies will be specified in the standard to assure consistency in evaluating conformance to the criteria specified in the standard?

Our understanding is that we will specify testing methodologies but no certification services will be required. The proposed answers to 7.4 are NO and YES. Please confirm that this is the proper approach.

I38: IEEE C37.92: Standard for Analog Inputs to Protective Relays from Electronic Voltage and Current Transducers

Chair: Robert Frye
Vice Chair: E.A. Udren

Output: Review C37.92
Established: January 2018
Expected completion date: Meetings are continuing
Output: Approved version of C37.92 for industry use

Working group I38 met on Wednesday, January 10, 2018 with 9 attendees.

The Vice Chair reviewed the purpose, strategy, and technical features of C37.92. The Task Force (ITF-38) and the working group (I-38) attendees have identified no problems that must be fixed in the existing revision.

The revision strategy is to circulate the document as-is and obtain industry comments before making optional changes.

The working group reviewed and finalized the PAR document drafted by the Chair to initiate the strategy above.

The meeting included discussions on the broad range of applications for the C37.92 interface specification and ways it can be publicized to those who would benefit from using it.

The working group agreed to proceed with the PAR submission, subject to process coordination with the Subcommittee leadership.

The Chair of the I Subcommittee requested PAR approval at the Main Committee meeting. Prerequisites were reviewed by the Subcommittee Chair and were accepted.

ITF39: <u>Draft Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDS) PC37.1.1</u>

Chair: Craig Preuss
Vice Chair: Angelo Tempone
Output: Determine if a working group should be formed to generate a Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs)
Established: January 2018
Expected completion date: January 2019 (as a Task Force)

IEEE Std. PC37.90.4
Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs)

- Call to order
  - Introductions
  - Establishment of membership
- Review of pre-PAR patent slides
- Review of copyright material
- Approval of minutes (None)
- Presentations (None)
- Old business (None)
- New business
- PSRC task force (as study group) rules
- Brief history of I/O in PC37.1.2
- New work
- Title
- Scope

- ITF39 report deliverables
- Future meetings
- Adjournment

Brief history of I/O in PC37.1.1

- In 2007, I/O requirements for IEDs were maintained in C37.1 “IEEE Standard for SCADA and Automation Systems”
- In 2015, SUBS C0 study group reports at JTCM
    - C37.1 be split into C37.1.x, including one for I/O requirements
    - PAR to update C37.1 was revised to narrow scope to I/O and name to C37.1.1
- In 2015-2016, the IEEE PES reorganizes and the I/O work is put on hold
- 2017, the PSRCC I Subcommittee
    - Starts work on revising C37.90 (I36) and C37.90.2 (I37)
    - Agrees (?) to form a TF to re-ignite work on I/O requirements as PC37.90.4 and relocate I/O requirements from C37.90 into PC37.90.4

Other Related Work (1)

- IEC updated IEC 61850-3 in 2013
    - IEC TC 57 published an update to 61850-3 that added I/O rating requirements in 5.3

5.3 Binary input and output

5.3.1 Binary input

The manufacturer shall declare the ratings.

5.3.2 Binary output

The manufacturer shall declare the ratings.

Other Related Work (2)

- Other related work (as taken from PC37.1.1 draft 3.1)

IED Classification	C37.2	Applicable Standards	Description
Meters	MET	ANSI C12.20 ANSI C12.1	Metering standards
PMUs	PMU	IEEE Std C37.118.1 IEEE Std C37.118.2	PMU standards
Relays	Various	IEEE Std C37.90	Protection relay standard that includes requirements for I/O
PLC	LGC	IEC 61131-2	PLC equipment requirements and tests
Any	Any	IEEE Std C37.92	Low level analog inputs
Any	Any	IEC 61850-3	Standard that in 2013 added requirements for digital inputs and outputs, whose ratings are declared by the manufacturer. There is no specification of what these ratings are which shall be specified by the manufacturer.

Table 1—Other Standards Applicable to I/O for IEDs

Other Related Work (3)

- Others?
  - IEC 60255-23-1994 (contact ratings)
  - IEC 60255-1-2009
    - General requirements
    - Ratings shall be specified by manufacturer
    - Design and construction requirements for binary inputs and outputs, transducer analog inputs and outputs (references IEC 60688)
  - IEC 60688-2012
    - Transducer outputs for converted electrical quantities only
    - Secondary relay defined as being energized by the output of an instrument transformer *or transducer*
    - References the following
      - IEC 60044 series (instrument transformers, including low level)(superseded by 61869)
      - IEC 60770 series (industrial process, including an intelligent transducer)
      - IEC 61557-12 series (performance monitoring and measuring devices)

New Work – Assignment

- Determine if a working group should be formed to generate a Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs)

New Work – Title

- Proposed title
  - “Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs)”
  - Includes any and all IEDs
    - How many IEDs can you name?

- How many other standards will we stomp on? (refer to previous other related work 2 slide)
- Does I37 really agree to relocate the I/O requirements for protection relays?

New Work – Scope

- Proposed scope
  - This standard specifies the performance and testing requirements for inputs and outputs on IEDs used in utility automation systems.
- What I/O to cover now?
  - dc analog inputs
  - dc and ac digital inputs
  - Outputs
    - dc analog outputs
    - Control outputs (ac or dc)
      - Electronic
      - Electro-mechanical
- We cannot cover all I/O types for now
  - Many different types of transducers
  - Convert other quantities to an analog output
    - Temperature
    - Load cell
    - Flow
    - Level
    - Pressure
    - Vibration
    - Meteorological
    - Others

HTF46 Report Deliverable

- Draft PAR
  - First rough draft of title and scope included in agenda
  - What about Power System Instrumentation and Measurements Committee?
  - What about the IEEE Instrumentation and Measurement Society?
- Available information concerning intellectual property, as appropriate
  - TBD
- Recommendation for liaisons with other organizations, if appropriate
  - ?
- Draft project schedule
  - What is our proposal? Three years? Five Years?
- Draft budget, not applicable
- Potential market acceptance of the standards project, including technical feasibility
  - Yes?
- Relationship to related standards, if known, including its distinct identity from other projects
  - C37.90
  - Could be many others as noted on earlier slide
- Viable volunteer leadership and participation
  - WG chair volunteers?
  - WG vice-chair volunteers?
- Realistic scope and objectives
  - Included in draft PAR

- Opportunity to establish new areas of expertise within the PSRCC
  - Yes
- Recommendation to utilize an existing/new working group
  - New working group

Old Business

p. Creation of new Task Forces for IEEE standards expiring in 2021, 2022, and 2023
   i. General update and review of Standards Coordination spreadsheet
   ii. Request volunteers that participated in the existing revision
   iii. ***Note that Task Force Chair does not need to become the Working Group Chair***

q. 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. Waiting to get confirmation from NPEC*

r. 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. A smaller group will plan to meet at a later meeting in 2018.

New Business

s. A Survey of Protective System Test Practices – Andre Uribe
   i. Andre requested that the Subcommittee members participate in the survey, and provide feedback.

Motion to Adjourn entered by Fred Friend, seconded by Jeff Pond.

See you in Pittsburgh PA in May!

J: ROTATING MACHINERY PROTECTION SUBCOMMITTEE

Chair: N. Fischer
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 21/36 members and 17 guests, reaching quorum.
Sept 2017 J SC meeting minutes were approved.
Seven J SC WGs met

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: **15th 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 Chair was unable to attend this meeting so the vice chair ran the meeting.

Balloting is complete

Most of the comments have been resolved

Some outstanding comments are related to figures

Some comments require too much work and were already discussed in earlier meetings

Bob Pettigrew will redraw the LOF figure

There was a discussion on LOF scheme 2 and any possible contradiction with NERC. The group agreed the figure is OK and a clarification could be addressed in the text. It's not necessary to link to PRC 19. It's out of the scope of this report.

Some submitted figures will be incorporated.

Next meeting J5 will require a room for 30 people and a projector

J12: Improved Generator Ground Fault Protection Schemes

Chair: Dale Finney
Vice Chair: Manish Das
Established: Jan 2013
Output: Report to subcommittee
Status: 14th Meeting
Assignment: To review new methods related to generator ground fault protection

The WG met on Tuesday 1/9/2018 with 10 members and 12 guests. The quorum was not met. The Chair presented the agenda and minutes from the last meeting, which were approved.
The latest report draft R8b was presented. Several discussion points shown on the agenda were discussed.

- The WG agreed that a statement in the conclusions should be added stating a trip is recommended from detection of fractured stator bar at the neutral (Manish)
- There was a lot of discussion on the report's messaging regarding the level of arcing that is acceptable. The WG agreed that we should explain the risk of not tripping quickly. Different sections of the report will be reviewed/revised to clarify this messaging (Dale)

- The WG agrees with adding the statement in the conclusion that both the acceleration in absence of sequence current/voltage and enhanced timer logic schemes can be used simultaneously (Manish)
- The WG agreed that some extra texts should be added to provide a contrast between the HV GSU faults and VT secondary faults (Dale)

There were further discussions on 64S schemes. The WG felt that the Table 2: Subharmonic injection schemes should be updated. Dale will consider putting in some material/figures from his analysis of timer logic report.

The Chair stated that the report will be revised with the above comments and sent for balloting prior to the next meeting.

The working group will have its 15th meeting in May 2018, with the need for a single session, computer projector and seating for 35 people.

J13 : <u>Modeling of Generator Controls for Coordinating Generator Relays</u>

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

WG Report
The working group met with 14 members and 18 guests present. A quorum was achieved.

The working group approved the minutes of the September 13, 2017 meeting.

Juan Gers reported that the chair and vice chair will set up a teleconference with representatives of ESCS and PSDP in early February to discuss open issues pertaining to the respective groups.

Juan Gers discussed the criteria that will be used for listing members and guests contributing to the report. He also reviewed the assignments from the previous meeting and identified outstanding assignments. Additional volunteers were recruited to assist with the review process.

The working group reviewed the revised report, Draft 4.0. This draft reorders the material as discussed in Phoenix and incorporates review comments from five members and guests. The review focused on substantive text revisions and comments that required working group discussion and agreement for resolution. Some chapters will be expanded to provide clearer background and the example section will be added.

A due date was set for March 16 for section reviewers to submit comments. A WebEx meeting will be set for one or more dates subsequent to March 16 to continue the

document review prior to the May meeting. The working group goal is to complete the report and submit for subcommittee balloting by the end of 2018.

Phil Tatro will send a link to the latest draft and a summary of assignments as soon as the webmaster is able to post the report to the PSRC website.

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.

The working group held its tenth meeting on Tuesday, January 9th, 2018 with 5 members and 9 guests in attendance.

I. Vice Chair kicked off the meeting at 4:30pm with introductions.
II. Minutes from the September 2017 meeting were circulated.
III. Vice Chair reported that assignments and reviews have been completed. There were a couple of editing comments made:
    a. Sungsoo Kim is not listed amongst the working group members and will be added.
    b. Correct Bob Pettigrew's name to "R. Pettigrew".
IV. Next Steps and Assignments.
    a. Chair/Vice Chair will prepare and distribute the paper to working group members for balloting by 1/12/2018.
    b. All WG members need to vote (approve, provisional approval, or reject) by 2/9/2018.
    c. Chair/Vice Chair will incorporate comments as necessary and (assuming a majority of the WG has approved) forward to the J Subcommittee by 3/30/2018. A WebEx meeting will be planned to resolve any ballots, as necessary.
    d. Latest version of the paper is posted on the PSRC website – PSRC/Sub-Committees/J – Rotating Machinery/J14/Documents.

V. Other Discussion:
    a. There was some discussion about new trends around black start in the industry including use of batteries.
    b. Zeeky shared an article from Energy Storage News announcing the demonstration of the use of battery energy storage to provide a black start to a combustion gas turbine by a Southern Californian utility.

VI. Adjourn – Meeting adjourned at 4:55pm.

J15: <u>Investigation of the Criteria for the Transfer of Motor Buses</u>

Chair: Wayne Hartmann
Vice Chair: Joseph Valenzuela
Established: 2015 (1/15)
Output: Report
Status: 10th Meeting (180110)
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) field data from multiple events at the medium voltage level. Examine for current versus Volts/Hz at transfer periods to see if there is a correlation. Examine resultant torque ratio.
4. Examine published reports, papers, C50.41 and NEMA MG-1 on motor bus fast transfer criteria to reconcile the conclusions with the field-measured results.
5. Study modeling of a given motor, with varying loading, undergoing fast, in-phase and residual transfers, with reconnection of the motor to a new source at varying phase angles.
6. On a motor bus under study, examine existing motor protection oscillography voltage and current to identify which motors are generating and which are motoring. Examine v/Hz, reacceleration current and torque ratio of composite bus and individual motors (if available)
7. Produce a Report to Subcommittee with the above findings

Activity:

1. The WG met January 10, 2018 with 8 members and 8 guests.
2. 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. Derek Haas reviewed the residual Motor Bus Transfer Simulation results (D. Hass, N. Fischer, D. Finney) noting torque and torque ratio (T_{rated}/T_{peak}) trends when changing initial phase angle between the motor bus voltage and the new source voltage. There were approximately 191 cases produced with varying load from 10% to 100% then the breaker is opened, the voltage collapses to 0.25 pu and then the new source breaker is closed. The team modeled initial phase angles of 0, 30, 60…..330 for residual voltage transfers. The intent was to see how observations of phase angle and loading effected torque ratio.
    - 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.)
4. Normann Fischer presented his MathCAD motor model simulation to the MATLAB results from Dale Finney and Derek Haas' modeling results. The findings focused on modeling a residual transfer when pu voltage is below 30% of nominal and the angular difference is 90 degrees leading. Normann noted that torque did not exceed 2 pu in any case in the first cycle but could in the following cycles.

Assignments:

- Normann Fischer, Dale Finney, Derek Haas to reconcile modeling findings for unified modeling conclusions.
- Arman Vakili to provide a brief summary of his Motor Bus Transfer Simulation results and conclusions for inclusion in the Report from his presentation at the September Meeting.
- Chair and Vice-Chair to start integration of accomplished literature review assignments and field result observations into a first draft of Report.
- At the May 2018 meeting, Murty Yalla to present modeling results from an in-phase and residual transfers for a three motor system with individual and aggregated motor torque/torque ratio results.

    - Assignments 1-2 are to be provided to the Chair and Vice-Chair by April 6, 2018.

Next Meeting:

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

J16: <u>Revision of C37.101, Guide for AC Generator Ground Protection</u>

Chair: Nate Klingerman
Vice Chair: Sudhir Thakur
Established: Jan 2017
Status: 5th Meeting

The group met on Jan 9, 2018 in Jacksonville FL, with 21 members, and 7 guests in attendance.

The Chair presented the patent slides, no claims were made.

The Chair mentioned that the PAR was approved by IEEE-SA in Sep 2017.

The WG agreed to a new outline, rearranging the information in the current guide to make room for new information. The Chair proposed a new outline for the protection schemes and is seeking volunteers to review and add to this new proposed outline before the next meeting. A few new assignees were added to the review assignment previously made.

Normann Fischer will provide some material on resonant grounding.

Dale Finney/Ritwik Chowdhury have offered to present a paper via Webex discussing injection schemes.

The WG agreed to move/keep all old/legacy schemes in the Appendix and include a table summarizing those schemes.

The Chair stated that the word copy of C37.101 will be posted to iMeetCentral as soon as it is received from IEEE-SA.

The following assignments were made/updated.

Assignments:

Section	**Assignees**			
Grounding methods	Sudhir, Nate	Marcos		

1-4,6,7,	Dale Finney	Sungsoo	Kelvin Barner	Jason Espinosa
5s and 8s	Dale Finney	Zeeky	Satish	
9-12	Sudhir	Mircea	Prem	
13-17	Chris/Ryan	Kelvin	Hasnain	
18	Steve T	Ritwik	Nader	
22	Hasnain	Wayne		
Annex A	Will English	Gary Kobet	Steven JeanJulien	
Annex B	Ritwik Chaudhary	Steve Conrad	Steven JeanJulien	

The WG requests a single session with space for 35 people with a computer projector for May 2018 session. The WG also requests no conflict with other J meetings, especially J17.

J17: <u>Revision of C37.102, Guide for AC Generator Protection</u>

Chair: Manish Das
Vice Chair: Gary Kobet
Draft: 0
Established: May 2017
Status: 3rd WG meeting, Jacksonville, FL
Expected completion date: December 2021 (initial sponsor ballot by January 2021)
Assignment: Revise C37.102 Guide for AC Generator Protection

Working Group J17 held its meeting in a double session on Tuesday, January 9, 2018. This was the third meeting for this working group.

There were 25 of 44 members present across both sessions; a quorum was not reached in either session. Nineteen guests attended the meeting, two of which expressed interest in becoming members. It should be understood that those members who have made no contribution and have not responded to requests for contribution will be removed from the membership. After this meeting, membership is now at 40.

Minutes from the September 2017 meeting could not be approved without a quorum; they will be approved by email.

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

The Chair stated that the decision of C37.101 and C37.102 is that both documents will remain, with subgroups checking only for conflicts that will be resolved.

The Chair then began by initiating a review of comments received for clauses 1.0, 3.0, 4.1, 4.2, 4.3, 4.3.3, 4.4 located in the “C37.102 Draft - Subclauses 1.0, 3.0, 4.1, 4.2, 4.3, 4.4, 4.8 for Jan 2018 WG review.doc” file (in iMeetCentral C37.102/Drafts/Drafts in Progress) as follows:

- Clause 1.0 - generic verbiage in document to note compliance with relevant NERC PRC standards; comments include it is “clean”, but maybe not specifically mention NERC, need to add something about coordination with controls (which was added); suggested that this material be moved to the Introduction which is not part of the guide; general wordsmithing
- Clause 3.0
    - Subclause 3.2 accepted comment on hybrid generator grounding; editorial comments accepted

- Subclause 3.4.1, 3.4.2 IEEE-SA editorial, accepted
- Subclause 4.1.1 editorial - remove the table and add the equation with data points on the graph, accept
- Subclause 4.1.1.2 accept
- Subclause 4.1.2.1 accept
- Subclause 4.1.3.1 accept
- Subclause 4.2 - rejected, IEC machines do not have the field on the rotor
- Subclause 4.2.1 - editorial - accept; remove table, add equation and data points to plot
- Subclause 4.2.1.2.1 - accept
- Subclause 4.2.1.2.2 - concur the bullet points; reject on adding comment regarding coordinating with excitation system protection (can't tell where the protection is located) - most folks state they don't have to coordinate (or at least simultaneous operation)
- Subclause 4.2.1.2.3 - concur on OEL definition/acronym; change "it is common" to "one option is"; editorial accept
- Subclause 4.3.1 accept
- Subclause 4.3.2 accept - add "winding differential"
- Subclause 4.3.2.1 - fixed slope, dual slope, adaptive slope, concur with adding determination of restraint quantity (highest, average, sum)
- Subclause 4.3.2.2 - concur with modifying figure to show stabilizing resistor, MOV, etc.
- Subclause 4.3.2.3 accept
- Subclause 4.2.3.4 - Figure 18, only true for machines with two windings, not more than two
- Subclause 4.3.2.5.1 - concur add on bypassed coils; concur on Sills/McKeever paper on handling external faults; Dale Finney will add; move delta-connected gen diff Figure to subclause 4.2.3.4
- Subclause 4.3.2.5.2 - concur but Dale will redraw figure he provided
    - Possibly add subclause on new scheme to protect for turn-to-turn faults - Dale Finney will write/add (Normann Fischer promoted)
    - Negative sequence directional for turn-to-turn faults (Mike Thompson)
- Subclause 4.3.3 - editorial - accept
- Subclause 4.3.3.1.1 - concur on rewriting per J12 output; editorial accept; add consequences of ungrounded neutral; pass remaining comments to J16/C37.101
- Subclause 4.4 - some discussion over section title, changed to Field circuit ground protection; otherwise accept
- Subclause 4.4.1.4 Normann Fischer mentioned a scheme where a signal is injected directly into the rotor, suggested adding
- Subclause 4.1.1.2 - Murty Yalla mentioned adding a statement about exclusion 6 in PRC-025 (using similar language)
    - Suggestion to show the entire excitation system, which parts are stationary, which parts are rotating
    - Question about brushless machines, protecting exciter

The Chair discussed possibly conducting a WebEx prior to the May meeting.

For the May meeting, request a double session for 40, computer projector.

***

Subclause Review Assignment Instructions:

- The latest C37.102 word draft from this meeting will be available in iMeetCentral folder C37.102/Drafts/Drafts in Progress by 1/19/2018.
- All new comments must be made in that copy using "tracking on" and include your proposed new verbiage. In general, comments without a suggested verbiage will not be considered.
- Address comments in the below 2 files available in folder "C37.102/Comments from previous revisions":
  - C37.102 -2012 Reaffirmation – ALL comments.xlsx
  - C37.102_Comments_Alla Deronja_20110509.docx
- Coordinate with the Figures group if your subclause figures need to be updated.
- 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 a single commented word copy with input from all group members. Identify the clause/subclause # in the filename.
- All new uploads after the Jan 2018 meeting and prior to May 2018 meeting must be made into the folder "C37.102/Assignments/2018-03-23".

***

Latest Subclause Assignments

(Any pending assignments are due March 23, 2018)

Subclause	**Description**	**Assignees**
Figures	Consistency of Figures throughout C37.102	Mircea Rusicior, Don Burkhart, Jason Espinosa, Dale Finney, Meyer Kao
3.0	Description of generators, excitation systems, and generating station arrangements	Onur Usmen, Normann Fischer
4.2	Field Thermal Protection	Onur Usmen, Normann Fischer
4.4	Generator Rotor Field Protection	Onur Usmen, Normann Fischer
4.8	Excitation System Protection	Onur Usmen, Normann Fischer
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, Beckwith, Hartman, Klingerman, Finney, Nader
4.5.1	Loss of Field	Gary Kobet
4.5.2.	Unbalanced Currents	Russ Patterson, Bob Pettigrew, Sudhir Thakur
4.5.3	Loss of Synchronism	Jason Espinoza, Dennis Tierney
4.5.4	Overexcitation w/ concurrent review of C37.106	Will English, Jason Espinoza, Murty Yalla
4.5.5	Motoring	Kelvin Barner, Jason Espinosa
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
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, Jun Verzosa
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:
(Any pending review comments are due March 23, 2018).

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 Automatic 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

NERC PRC standards:
http://www.nerc.com/pa/stand/Pages/ReliabilityStandardsUnitedStates.aspx?jurisdiction=United%20States

J Publications Input Assignments:
(Initial input from all completed publications highlighted below are due March 23, 2018).

J Publication	Status	Assignees (WG Chair/Vice Chair)
J2 Protection Considerations for Combustion Gas Turbine Static Starting (2011)	complete (2011)	Mike Reichard, Zeeky Bukhala
J3 Power Plant and Transmission System Protection Coordination (2012)	complete (2012)	Phil Waudby, Sungsoo Kim
J5 Coordination of Generator Protection with Generator Excitation Control and Generator Capability (2007)	complete (2007)	Mike Reichard
J5 Application of Out-of-Step Protection Schemes for Generators (ongoing)	Ongoing, est. completion 2018	Sudhir Thakur, Manish Das
J6 Protection Issues Related to Pumped Storage Generation (ongoing)	Ongoing, est. completion 2018	Joe Uchiyama, Dale Finney
J7 Avoiding Unwanted Reclosing on Rotating Apparatus (2017)	complete (2017)	Mike Reichard, Steve Conrad
J8 Tutorial on the Protection of Synchronous Generators (2011)	complete (2011)	Mike Thompson
J12 Improved Generator Ground Fault Protection Schemes (ongoing)	Ongoing, est. completion 2018	Dale Finney, Manish Das
J13 Modeling of Generator Controls for Coordinating Generator Relays (ongoing)	Ongoing, est. completion 2018	Juan Gers, Phil Tatro
J14 Plant Protection Issues Associated with Black Starting of Generators (ongoing)	Ongoing, est. completion 2018	Chris Ruckman, Zeeky Bukhala

All PSRC published publications: http://www.pes-psrc.org/Reports/Apublications_new_format.htm

J18 Impact of Inverter Based Sources on Rotating Machines

Chair: Normann Fischer
Vice Chair: Mike Jensen
Output: Report
Established: September 2017
Status: WG

ATTENDANCE:
Total 27 ; Guests 16; Members 11

OVERVIEW:
This was J18 first meeting as a working group. Jim Schetter made a presentation on the impact of renewables on power plant cycling. Jim will continue as a corresponding member. In his presentation, he presented the results of a California study. He showed that 50% of plant cycling was due to system load and13% was due to renewables in 2011. This grew to 21% by 2013; of this 2% was due to wind and 6 % was due to solar. Some others

renewable sources were negative or negligible. Solar grew much faster than wind. However, a 1% increase in wind penetration resulted in a 1% increase in causality but, a 1% increase in solar penetration resulted in a 3% increase in causality. Afterwards there was a spirited round of questions and discussion.

REQUIREMENTS FOR NEXT MEETING:
For the next meeting, J18 will need a room for 30 and an overhead projector.

Liaison Reports:

Electric Machinery Committee - M Yalla
Dr Yalla reported that there are PARs open on both C50.12 and C50.13. There was some consideration about merging them into a single document but that was rejected. Instead plans are to revise C50.12 to cover only Hydro machines, both salient and cylindrical pole rotors, while C50.13 will handle non-hydro machines, both cylindrical and salient pole rotors, as well as synchronous condensers. The main considerations are machine testing.

The J SC is considering a Task Force to monitor and coordinate with the Electric Machinery Committee on their work, but no action was taken.

Industry Applications Society (IAS) / Industiral & Commercial Power Systems (I&CPS)
No report. The J SC is looking for a member to be a liaison with this group. Anyone interested should contact the Chair/Vice-Chair.

Nuclear 1E WG - Prem Kumar
Prem reported that IEEE Std 741 Criteria for the Protection of Class1E Power Systems and Equipment in Nuclear Power Generating Stations has been approved by IEEE SA in June 2017. The revision included updating normative references revisions as necessary, moving definitions from Annexes to main body, and updating Annex A to include one method found acceptable for the determination of the proper settings for loss of voltage and degraded voltage protection systems and their associated time delays.

NERC - Mike Thompson
Mike reported that PRC-025 and PRC-024-2 failed to gain approval. Some of the comments included statements that the standards were supposed to include examples but did not. There are several changes to the documents that will be required before these standards will be ready for the next ballot.

Old Business:
The Chair reported that PSRC officers have stated we are to begin using the PES Technical Committee Report Template (links below) and associated checklist. This is required for any reports that are to be considered for PES awards, including any previously completed reports.
PES Technical Committee Report Template[ieee-pes.org]
IEEE PES Resource Center Technical Report Submission Checklist[ieee-pes.org]

The Chair requested meeting agendas be sent at least two weeks prior to PSRC meetings.

In addition, WG/TF chairs should begin including draft number with their reports, which is to be including on the MRR spreadsheet.

New Business:

The Chair recognized the contributions of Bob Pettigrew, who is being made an honorary PSRC members. The J SC appreciates his leadership and many contributions and mentoring throughout the years, and looks forward to his continued involvement.
Yanfeng Gong of AEP proposed a new WG/TF on sub-synchronous oscillation protection guide. Yanfeng presented a couple events that resulted in SSO involving wind farms (Type III wind turbines) connected to series compensated lines. Following his presentation and the ensuing discussion, the J SC decided to form a task force to address this topic with Normann Fischer as the TF chair.

K: SUBSTATION PROTECTION SUBCOMMITTEE

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

The K-Subcommittee met on January 10, 2018 in Jacksonville, FL with 18 of 31 members and 33 guests in attendance. A quorum was achieved. Don Lukach requested a motion to approve the May 2017 subcommittee meeting minutes. Roger Hedding made the motion, Randy Crellin 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 had some recent changes.

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
Expected Completion Date: Dec.2018
Current draft of the document is 7.3e

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. 8 members and 5 guests were present. After the introduction, a call for quorum was made, quorum was achieved.

A motion was made by M. Thompson and seconded by A. Bapary to approve the minutes of the last meeting in Phoenix, and the motion was approved.

A motion was made by C. Henville and seconded by S. Conrad to approve the minutes of the October WebEx meeting, and the motion was approved.

A motion was made by A. Bapary and seconded by M. Thompson to approve the minutes of the December WebEx meeting, and the motion was approved.

Current draft of the document is 7.3e.

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 working Group Ballot was completed with 14 out of 15 members voting. Of that 14, 9 Approved without comments and 5 Approved with comments.
- Updates based on WG Ballot comments reviewed as group.
- Comments to figures not addressed. These will be addressed when the figures are replaced with the final Visio versions.
- Motion was made by Mike Thompson and seconded by Abu Bapary to vote approve the guide as final and submit to SA for editorial review and Sponsor Ballot. The motion was unanimously approved.

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

Avoid conflict with K16 working group

K10: SCC21 Distributed Resources Standard Coordination

Chair: R. Ben Kazimier
Vice Chair: Mark Siira
Established, 1999
Output: Standard through the SCC 21
Assignment: To interface with SCC21/P1547 in order to reduce unnecessary delays by getting PSRC input into the process without having to wait for after-the-fact coordination.

K10 met on Tuesday at 8am in City Terrace 8. There were 4 members and 23 guests.

First the working group was made aware of two PV/Battery standards, (IEEE 1013 and 1562) which are open for balloting. A pictorial set of instructions for signing up is given below the end of the text for the meeting minutes.

Next an update of IEEE 1547 and 1547.1 was given, the final version was expected to be sent to RevCom ahead of their meeting this month. IEEE Smart Grid will be giving a four-part online tutorial this month, beginning Jan 18th, on the proposed changes within 1547. The link to sign up is here: https://smartgrid.ieee.org/ieee-smart-grid-tutorial-as-in-depth-review-of-the-revised-ieee-1547-standard

1547.1 is working diligently to have a draft ready prior to the next meeting which will be Mar 6th-8th in Richmond, VA

Next we discussed the 1547 application guide 1547.2 which is up for revision and on a fast track to completion. If you have interest in participating, please advise Ben Kazimier or Wayne Stec.

During the open discussion period it was suggested that there is a great need to develop consistent terminology related to DER not just within the PSRC although there appears to be a need for that today as well, but in general for IEEE and the industry. After the meeting Wayne Stec and I agreed to discuss this need with SCC21 leadership to get their opinion on the subject.

K11: Open Phase Detection for Nuclear Generating Stations

Chair: Charlie Sufana
Vice Chair: M. Urbina
Output: Report
Draft 6.7
Assignment*:* Write a report to the K Subcommittee entitled Methods for Analyzing and Detecting an Open Phase Condition of a Power Circuit to a Nuclear Plant Station Service or Startup Transformer.

K11 did not meet in January.

K12 P1032 Guide for Protecting Transmission Static Var Compensators.

Chair: Satish Samineni
Vice Chair: Martin Best
Established: May 2013
Output: Guide for Protecting Transmission Static Var Compensators
Expected Completion Date: December 2018
Draft 17
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 had a joint meeting with Substations WG I9 on Monday, January 8th, 2018. K12 had 2 members present and no guests. Quorum was not met.

The K12 meeting minutes from September 2017 meeting will be approved after the meeting through email.

Section 10 – Coolant System Protection of draft 16.1 was extensively reviewed and updated.

WG plans to go for ballot end of this year and will have a series of web meetings before the May 2018 meeting to meet that goal.

The next in person K12 meeting will be May, 2018 in Pittsburgh, PA. The requirements are a single session, a meeting room for 20 people, and a computer projector. The current draft number is 17.

K13 PC37.116 IEEE Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks

Chair: Ilia Voloh
Vice Chari: Luis Polanco
Established: September 2013
Draft 1.10
Assignment: Revise IEEE C37.116 "Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks**"**

K13 is in the process of balloting and did not meet in January.

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: 10
Assignment: To revise and update C37.91, IEEE Guide for Protecting Power Transformers to correct errors and address additional protection related topics.

The working group met with 18 members and 17 Guests on January 10, 2018 at the Hyatt Regency Riverfront in Jacksonville, Fl.

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 September minutes from the Phoenix meeting were approved at this meeting motion by Pat Carrol and 2nd by Brian Boysen.

A comment to remove the hyphen from short-circuit as used in the document was made by the chair, which was agreed to by the WG.

Clause 7.2.3.1.1 was discussed, decided to leave as is.

Clause 7.2.3.4 removed lines 23-27

Clause 7.2.6 removed text from lines 27-28

Clause 7.3.2 removed lines 14-16

Clause 7.6.5.1 removed “dropout” replaced with “operate”

Clause 9 Thermal Detection of abnormalities was rearranged

Clause 13.1.3 Discussion centered around the figure 39 and an alternate method to utilize CTs on the zigzag transformer to be included in the differential zone. A new figure and write-up to be provided by M. Thompson.

New material in clauses 7.5.1 and 7.5.2, is to be reviewed by Rene Midence.

Having no more business a motion to adjourn was made by Pat Carroll, second by Mark Schroeder

Next meeting requirements: Single meeting, room for 50 and computer projector.

Avoid WG conflict with K22

K17 Geomagnetic Disturbances (GMD)

Chair: Qun Qiu
Vice-Chair: Luis Polanco
Draft: 5.1
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 January 9th 2018 with 23 participants (8 guests and 15 signed members).
2. Meeting minutes of the K17 September 2017 meeting was previously approved via email.
3. Since last September meeting, six members reviewed the draft report and provided their comments.
4. The WG did not complete the review of all received comments at the meeting. Discussions are mostly related to:
   - GMD introduction
   - Impact on communication
   - Transformer saturation, harmonics

- Editorial corrections and clarifications on tables 1 references with respect to definition of “Major”, which was recommended to be replaced with “Notable”
- Chair will contact the author of Section 1.3 to provide additional info for the typical transformer info referred in Figure 1-2

5. Chair/vice-chair will follow up with team members and provide an updated draft document. A WebEx meeting is to be scheduled for March.
6. The next step is to have May meeting for reviewing most up to date document.
7. K17 report is expected to be ready for submitting to K Subcommittee by Sept. 2018 meeting.
8. For next meeting chair requests a double-session (in case extra time is required for the review) and a meeting room for 25 persons, with AV capabilities.
9. The WG report draft # is 5.1

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: 2.5
Assignment: To revise and update C37.108-2002 –Guide for the Protection of Secondary Network Systems

1. Introductions/ Signup sheet/Patent slides/ 50% Quorum? Not Met, 7 needed

   Present patent slides, and ask, “Is there any patent issues?” Record answer in meeting minutes : “No”.

   _18_ attendees

   _5_ out of _14_ members attended

   _1_ new members added (Rafael Garcia)

2. Approve last meeting minutes from September 2017

   1st Member name __ _____ - motioned

   2nd Member name __ - seconded

   (not done due to lack of Quorum)

3. Status on PAR process/submittal/schedule

   PAR Submitted for Approval : October 7th 2015

   PAR Approved by RevCom : December 5th 2015

   Expected Date of submission of draft to IEEE-SA for Initial sponsor Ballot : January 2018.

   Projected Completion Date for submittal to RevCom : 08/2018

   PAR will expire December 31st 2019

   PDF of PC37.108 describing the accepted PAR form has been uploaded to our working folder.

4. Title, Scope and Purpose restatement from accepted PAR

Title : Guide for the Protection of Secondary Network Systems

Scope : Devices and protection schemes that are being used in secondary network system protections are discussed in this guide. These devices should act to sense the

fault and initiate fault interruption locally or remotely, thereby minimizing damage and restoration time.

Purpose : This guide covers devices that are being used in secondary network systems protections schemes. These devices should act to sense the fault and initiate fault interruption locally or remotely, thereby minimizing damage and restoration time.

5. Update on assignments

- Any update on review of section 6 from Kevin. D, or Mike Thompson and Bruce Pickett. (last review waiting completion)
- No Progress/Update on C57.12.44 protection section.
- Ben Kazimer confirmed that the IEEE 1547 WG has no issues with us removing section 9 from our guide. Email has been archived in the project folder.
- Whole document complete editorial review by Bruce Mackie, Raluca Lascu and Thomas An. Draft 2.5 is available to download from the link below.
- Figure 1 and Figure B1 have been converted to Visio. The rests of the figures are charts, and it will be scanned in high resolution by Adi into .tif and .jpeg for final use.
- Who can help converting the draft to final IEEE format document?

6. Discuss schedule for final editorial review and submittal to SA. Can we submit before spring?

No. We discussed the schedule and agreed that we will give additional time for section 6 review and will use web-ex to go over detail final line by line review of entire document. The chair expects that this will get done before Spring and we will review the schedule again in Spring or Fall to decide if we are ready for editorial review from SA before submitting to RevCom in January 2019.

PLEASE DOWNLOAD LATEST DRAFT FROM THIS LINK BELOW

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

Brief discussion points:

Figure 1 updated to clarify the different between spot vs grid network. Draft 2.6 has been updated with the new figure.

Section 9 removed per agreement of the WG member.

Adi will schedule several web meeting to go over line by line review before Spring meeting.

Rafael Garcia from Oncor has been included as member of WG. He will provide us a review of usage of differential relay for protection of network transformer.

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

The K19 Chair and Vice Chair briefly met. The IEC group is not ready this time for any additional comments but expect a document that can be reviewed by the May PSRC meeting.

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: 2.0
Expected Completion Date: TBD based on PAR
Assignment: To pursue the renewal of C37.112

The working group did not meet in January. The original document was converted into the latest standard format by IEEE SA prior to this s PSRC meeting. Multiple formatting issues occurred and the Chair is resolving the issues with IEEE SA.

For the next meeting, keep the request for 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: 2a
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, January 9th with 28 of 43 members and 8 guests. Two attendees agreed to join the working group bringing the roster to 43 members.

Introductions were made.

The status of assignments was updated. The assignment tracking spreadsheet will be updated accordingly and placed on imeetcentral soon after the meeting.

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

The minutes of the September meeting were discussed. D. Lukach motioned to approve the minutes of the September meeting. A. Deronja seconded the motion. The minutes to the September meeting were approved by a quorum of the working group.

The minutes of the October web meeting were discussed. A. Deronja made some corrections to the minutes. J. Barsch motioned to approve the minutes of the October Web meeting. L. Sevov seconded the motion. The minutes to the October web meeting were approved by a quorum of the working group.

The working group discussed the normative references section. It was decided that we would wait until near the end of the drafting process to assess which documents should be normative references and which should be bibliographical references.

The working group discussed the visio figures. The previous chair provided visio drawings that had the polarity marks removed. The figures in the current document have polarity marks. A motion was proposed to change all of the figures to the ones without polarity marks. This motion was not carried forward. An alternative motion was proposed by Jeff

Barsch to form a team consisting of J. Barsch, S. Elling, A. Mezco, and L. Sevov to look at the figures and recommend if any should retain polarity marks. The motion was seconded by Scott Elling. The motion was approved by a quorum of the working group.

Existing and new assignments are requested by April 1st, 2018.

One web meeting will be scheduled between meetings. The chair will send out a proposed schedule to check availability.

We request a single meeting with room for 50 and a computer projector for May 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.

1. Introductions/ Signup sheet/roster

   3 of 15 members, total 15 attendees.

2. Approve Phoenix minutes,
   first___Adi_Mulawarman_____second_Phil_Tatro_____

Quorum not requied. Not a PAR based WG.

3. Summary Paper is approved by K Subcommittee. 4 comments received. Incorporate and or discuss these.

4. Present draft powerpoint presentation slides

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

6. Discuss Texas A and M tutorial, March 26-29, 2018. Volunteer to present?

7. Breaker failure events? ……..Adjorn

Check for status on abstract submittals for the following conferences :

Dates are estimated from 2017 conferences, the presenter will need to verify the actual deadlines for 2018 and 2019 conferences.

WPRC abstract submittal deadline April 2018 for October 2018 conference.

Georgia Tech abstract submittal deadline Sep 30th 2017 for May 2018 conference will be done by Bruce Mackie. (Bruce submitted and abstract has been accepted)

Mipsycon due date February 2018 for Nov 2018 conference due date will be done by Adi Mulawarman. (Adi submitted but will not know until June 2018)

Discussion notes on item 6:

Texas A&M call for paper (<-tutorial) due date August 2018 for March 2019 conference.

Instead of a paper presentation the conference would like to have this as a tutorial so we are looking for volunteers other than Mike Thompson to do the tutorial. We will probably be looking at least a couple volunteers.