POWER SYSTEM RELAYING AND CONTROL COMMITTEE
OF THE IEEE POWER AND ENERGY SOCIETY
MINUTES OF THE MEETING
September 10-13, 2018 Minneapolis, MN

A. Call to order/ Introductions Pratap Mysore

Chairman Pratap Mysore called the meeting to order at 8:00 am on Thursday, September 13, 2018.

All attendees introduced themselves. A quorum check was conducted and it was verified that the quorum was not met with 59 members in attendance out of a total membership of 127. Main Committee Attendance sheet was routed.

B. Approval of Minutes & Financial Report Murty Yalla

1. As there was no quorum during the main committee meeting, a call to approve the minutes of the May 2018 PSRC meeting could not be made.
   The minutes will be sent in an email to all main committee member for approval.

2. The financial status of PSRC is in good standing.

C. Chairman's Report Pratap Mysore

September 2018 meeting in Minneapolis, MN set a record for the largest attendance for the September with over 260 participants. Joint meeting with Power Systems Communications and Cyber Security (PSCC) technical committee has contributed to better coordination and participation of attendees. We had two local sponsors for this meeting -Xcel Energy and Ulteig Engineers. I Sincerely thank the sponsors for their support. I also take this time to acknowledge Power Grid for their continued sponsorship over many years. The Minneapolis weather also was a great factor in making attendees stay more enjoyable. With NERC committee also meeting at the same venue, we had a very fruitful meeting with NERC discussing the future action of the impact of inverter-based resources on protection.

As my term ends in December 2018, PSRC officers change and I pass on my baton to the new chair, Russ Patterson. We all know that PSRC will be led well by Russ. I welcome Michael Thompson who is taking over as the new secretary. Murty Yalla will be assuming the role of Vice-chair. Adi Mulawarman, Standards Coordinator is moving to the new role as the vice-chair of K Subcommittee in January 2019. Russ, Murty and I acknowledge Adi's contributions as standards coordinator in assisting officers and Working group chairs in IEEE standards process coordinating PAR submission and standards renewal process.

Don Lukach, who completed his term as the chair of K Subcommittee will be taking over as the Standards Coordinator of PSRC committee. I thank Don for his services as the chair of a subcommittee and welcome him in the new role. I thank Brian Mugalian on completing his role as the Chair of I Subcommittee and for his leadership. I also acknowledge Bruce Pickett for his services as the Vice-Chair of K Subcommittee and his contributions to PSRC over many years.

All our meeting arrangements are the responsibility the Secretary of the committee and the two wonderful women behind the scenes make these happen without any hitch. I acknowledge Elizabeth Schimpf and Jana Shellabarger from Beckwith Electric. I sincerely thank them on behalf of officers and members of PSRC for taking care of all the issues in the background and make our Monday night reception enjoyable and meeting arrangements successful.

I thank PSRC and fellow members for supporting me during the past twelve years serving as subcommittee officer and then as PSRC officer. I am looking forward to being back on working groups and be an active participant and contributor.

I wish the new officers the very best and looking forward to meeting in January 2019 in Orange County in California.

Sincerely
Pratap Mysore

Reports of Interest

A. Report from the Vice- Chair – Russ Patterson

a. Technical Paper Coordinator's Report.

- 2019 PES general meeting (August 4-8, 2019 in Atlanta, GA): Call for papers is in progress. Must be submitted by November 7, 2018. See link: http://pes-gm.org/2019/images/pdfs/GM2019-CallforPapers.pdf

b. Future Meetings

- January 2019 meeting will be held from January 13-17 at the Hyatt Regency in Garden Grove, CA.
- May 2019 meeting will be held from May 6-9 at the Westin Cincinnati in Cincinnati, OH.
- September 2019 meeting will be from September 16-19 at the Hilton Denver City Center in Denver, CO
- 2020 venues are presently being worked out.
- Details are posted on the PSRC website.

B. CIGRE B5 Activities Report – Rich Hunt

CIGRE Report
Rich Hunt
September 13th, 2018

GOTF Conference: The CIGRE U.S. National Committee Grid of the Future Conference will be held October 28-31 in Reston, VA. The Grid of the Future™ symposium is sponsored by the CIGRE US National Committee (USNC) and the

Electric Power Research Institute (EPRI), and this year's symposium is hosted by Dominion Energy in Reston, Virginia. The GOTF symposium provides participants with the opportunity to network with their peers in the generation, transmission, distribution, markets, and smart grid technologies industries, and provides a variety of seminars and workshops in addition to educational speakers and tutorial sessions.

9 B5 (protection and control) papers will be presented this year at the Conference.

For details, visit the website: https://cigre-usnc.org/grid-of-the-future/

CIGRE 2019 B5 Colloquium, Tromso, Norway
The B5 Colloquium will be held June 23 through June 29, 2019 in Tromso Norway. Inside the Arctic Circle, and the best place in the world to watch the Northern Lights. (Though the meeting is in June, during the period of the midnight sun).

The Call for Papers is out. Synopses are due by October 31st, 2018. Synopses are submitted through your country B5 representative. (Presently Rich Hunt for the U.S., and Bogdan Kasztenny for Canada). The Preferential Subjects for the papers are:
PS 1: Leveraging PMU data for better Protection, Automation and Control Systems
PS 2: Time in Protection Applications – Time sources and distribution Methods
PS 3: Future technologies for inter-substation communication, Migrating Digital Teleprotection Channels to Packet-Based Networks

So submit your papers, and head for the far north in June, 2019. Details on the Colloquium and the Call for Papers can be found on the website:
https://www.cigreb5tromsoe2019.com/
https://www.cigreb5tromsoe2019.com/call-for-papers

CIGRE 2018 General Session
The 47th CIGRE General Session just concluded in Paris, France on August 31st, 2018. The Preferential Subjects were:
PS1 - Protection under System Emergency Conditions
PS2 - User Experience and Current Practice with IEC 61850 Process Bus.

There were 4 papers accepted for the technical sessions from U.S. and Canadian authors. During the B5 Study Committee meeting, the Preferential Subjects for the 2020 General Session were determined to be:

- Communications Networks in PACS, Experience and Challenges
- Human Aspects of Protection and Automation

Look for the Call for Papers to come out in 2019. The CIGRE General Session requires submission of a full paper (not just a synopsis), through your country B5 members. So start planning your papers now.

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 Convenors. Dr. Murty Yalla of PSRC is Chair of TC 95 (internationally).

The Technical Advisory Group (TAG) to the US National Committee (USNC) of IEC for TC 95 meets as a part of PSRCC WG I4, *International Standards Development*, 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. Our TAG Administrator is Pacific Northwest National Laboratory (PNNL), under the US Department of Energy. The TAG Administrator is Jeff Dagle of PNNL.

Standards projects of interest:

- IEC 60255-118-1, ***Synchrophasor standard*** – US submitted vote in favor of the recently circulated final draft international standard (FDIS). IEC reports that standard has been approved in international voting. A comment from China points out challenges with high-precision total vector error (TVE) requirements, which will need to be addressed in a future revision but has little impact on most practical applications in the meanwhile. With IEEE acceptance, this will be a dual logo standard and the one synchrophasor standard for the world.
- IEC 60255-27 Ed. 3 ***Product safety requirements*** – the new Edition 3 CD requires review and comments. The US TAG will comment on a major legal issue in the overall requirement that a relay should never cause a hazardous condition. Other review is in process; those who would like to review should ask Eric Udren for a review copy right now (by 9/14).
- IEC 60255-26 Ed. 4 ***Electromagnetic compatibility requirements***. A new CDV requires comments and voting by 9/21. The WG has reviewed earlier versions and is reviewing for comments and vote now. Those who would like to review should ask Eric Udren for a review copy right now.
- 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 had circulated an opening draft, presenting the existing standards with proposed changes described. We received no US comments; international comments have been circulated and are available. Contact Eric Udren to obtain review copies of the draft and the comments.
- TC 95 AHWG3 has issued a brief report on the study topic of relay response to sampled values from 61869-9 merging units. Analog properties like filter response to input transients or phase shifts are already addressed in 61869-9, but the report raises the concern regarding the lack of standardization of response of relays to data transmission errors, configuration problems, and failures.
- IEC 60255-187-1: ***Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers*** – CDV was successfully voted and the FDIS will be issued shortly.

- 60255-187-2: ***Functional requirements for busbar differential protection*** – The draft is expected in 2019 – when first CD comes out, set up a PSRC WG to review it.
- 60255-187-3: ***Functional requirements for biased (percentage) differential relays for transmission lines*** - first draft of the standard will be available in 2019 – we already have WG D34 to deal with this when CD arrives.

The next TC 95 Plenary Meeting, and maintenance teams MT1-4 meetings, will take place in Frankfurt, Germany during November 5-9, 2018. Plenary meetings occur every two years.

E. Standard Coordinators Report – Adi Mulawarman

PSR Standards Coordinator's Report September, 2018

The status of standards activities that have taken place since the May 2018 meeting of the PSRCC are as follows:

RevCom = Revision of existing standard
NesCom = New Standard

IEEE SA presented a new roster format to be used by PSRCC WG with/without PAR related work. Work continues in iMeetCentral system to incorporate new GDPR policy. Hard copies of new roster format available for download from IEEE SA (contact Erin Spiewak/Adi Mulawarman)

This is also Adi Mulawarman's last meeting as standard coordinator. In January 2019, Don Lukach will replace Adi as standard coordinator.

Main Committee PAR Submission approved at September meeting:

- H46 C37.1.3
- J19 C37.106 (require slight modification to the scope)
- C39 C37.xxx (chair, scope require reword)
- I31 P1613

(due to lack of quorum at the September meeting, these 3 PARS submission to NesCom/RevCom will be hold off until the main committee received quorum via email; detail of modification mentioned will be in the secretary report)

Main Committee Submission of standards to SA ballot approved at September meeting:

- none

Revision to Existing Standards Completed

- none

PAR for revising existing standard or creation of new standard Approved/or accepted to RevCom or NesCom agenda

PAR Nu	Project	Committee	PAR Expira	Invitation	Ballot Cl	Status
P2030.12	New	PE/PSRCC/Microgrid Protection Systems				NesCom Agenda 06-Sep-2018
P60255-11	Revision	PE/PSRCC/C37.118.1_WG	12/31/2018			RevCom Agenda 06-Sep-2018
PC37.106	Revision	PE/PSRCC/C37.106_WG				NesCom Agenda 06-Sep-2018
PC37.116	Revision	PE/PSRCC/PE/PSR/C37.116	12/31/2019			RevCom Agenda 06-Sep-2018
PC37.237	New	PE/PSRCC/C37.237_WG-H3	12/31/2018	2/20/2016	9/8/2018	RevCom Agenda 15-Oct-2018
PC37.245	New	PE/PSRCC/C37.245_WG	12/31/2018			RevCom Agenda 15-Oct-2018

We are not expecting problem with the approval of all the above PARs.

PAR for C37.94, C37.104 were approved between the May and September meeting.

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 Nu	Project	Committee	PAR Expira	Invitation	Ballot Cl	Status
PC37.92	Revision	PE/PSRCC/I-38	12/31/2022	9/27/2018		Sponsor Ballot: Invitation
PC37.112	Revision	PE/PSRCC/C37.112_WG	12/31/2021	5/11/2017	8/17/2018	Sponsor Ballot: Comment Resolution
PC37.230	Revision	PE/PSRCC/C37.230_WG-D28	12/31/2018	6/29/2018	8/19/2018	Sponsor Ballot: Comment Resolution

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

PAR Nu	Project	Committee	PAR Expira	Invitation	Ballot Cl	Status
P60255-11	Revision	PE/PSRCC/C37.118.1_WG	12/31/2018			RevCom Agenda 06-Sep-2018
PC37.91	Revision	PE/PSRCC/C37.91_WG-K16	12/31/2018			WG Draft Development
PC37.230	Revision	PE/PSRCC/C37.230_WG-D28	12/31/2018	6/29/2018	8/19/2018	Sponsor Ballot: Comment Resolution
PC37.237	New	PE/PSRCC/C37.237_WG-H3	12/31/2018	2/20/2016	9/8/2018	RevCom Agenda 15-Oct-2018
PC37.245	New	PE/PSRCC/C37.245_WG	12/31/2018			RevCom Agenda 15-Oct-2018
PC37.249	New	PE/PSRCC/WGH22	12/31/2018			WG Draft Development

PARS expiring at the end of 2019-2021 (all already have PARs and in various stages of work.)

PAR Nu	Project	Committee	PAR Expira	Invitation	Ballot Cl	Status
P1646	Revision	PE/PSRCC/H/WGP1646	12/31/2021			WG Draft Development
PC37.90.2	Revision	PE/PSRCC/C37.90.2_WG-I18	12/31/2021			WG Draft Development
PC37.101	Revision	PE/PSRCC/J16 - Revision to C37.101	12/31/2021			WG Draft Development
PC37.102	Revision	PE/PSRCC/C37.102_WG-J17	12/31/2021			WG Draft Development
PC37.108	Revision	PE/PSRCC/C37.108_WG	12/31/2019			WG Draft Development
PC37.110	Revision	PE/PSRCC/C37.110_WG-I15	12/31/2019			WG Draft Development
PC37.112	Revision	PE/PSRCC/C37.112_WG	12/31/2021	5/11/2017	8/17/2018	Sponsor Ballot: Comment Resolution
PC37.116	Revision	PE/PSRCC/PE/PSR/C37.116	12/31/2019			RevCom Agenda 06-Sep-2018
PC37.120	New	PE/PSRCC/C31	12/31/2021			WG Draft Development
PC37.233	Revision	PE/PSRCC/C37.233_WG	12/31/2019			WG Draft Development
PC37.234	Revision	PE/PSRCC/PC37.234	12/31/2021			WG Draft Development
PC37.235	Revision	PE/PSRCC/C37.235_WG-I7	12/31/2019			WG Draft Development
PC37.242	Revision	PE/PSRCC/C37.242_WG	12/31/2019			WG Draft Development
PC37.251	New	PE/PSRCC/WG-H27_	12/31/2020			WG Draft Development

PARS expiring 2022 and beyond

PAR Nu	Project	Committee	PAR Expira	Invitation	Ballot Cl	Status
P2030.100	New	PE/PSRCC/P2030.100.1_WGH-44	12/31/2022			WG Draft Development
PC37.92	Revision	PE/PSRCC/I-38	12/31/2022	9/27/2018		Sponsor Ballot: Invitation
PC37.104	Revision	PE/PSRCC/C37.104_WG	12/31/2022			WG Draft Development
PC37.300	New	PE/PSRCC/H45WG	12/31/2022			WG Draft Development

Additional notes:

PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:

Deadlines for submittal to RevCom or NesCom

NesCom/RevCom Submittal Deadlines:	
20 December 2017	27 July 2018
26 January 2018	06 September 2018
16 March 2018	15 October 2018
04 May 2018	

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

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

We would like to report that the PSCCC Main Committee membership has been established with 35 members across 5 active subcommittees. Those members along with subcommittee members and working group members are busy working on approximately 45 standards and reports. The Fiber Optic Subcommittee is working on the following:

1. IEEE 524 Guide for the Installation of Overhead Transmission Line Conductors, standard published by T&D Committee, reviewing definition of OPGW
2. IEEE 525 Cable Systems in Substations, reviewing the draft being created in the Substations Committee in collaboration with the PSCCC's Wireline Subcommittee
3. IEEE 1138 Standard for Testing and Performance for Optical Ground Wire (OPGW) for Use on Electric Utility Power Lines, working on a draft that may be published in 2020
4. IEEE 1595 Standard for Testing and Performance for Optical Phase Conductor (OPPC) for Use on Electrical Utility Power Lines, working on a draft
5. IEEE 1594 Standard for Helically Applied Fiber Optic Cable Systems (Wrap Cable) for Use on Overhead Utility Lines, final draft approved, going to ballot soon
6. IEEE 1591.1 IEEE Standard for Testing and Performance of Hardware for Optical Ground Wire (OPGW), working on submitting a PAR to revise that last published version
7. IEEE 1591.3 WRAP Hardware, final draft approved, going to ballot soon

G. NERC Report - Bob Cummings
NERC Report to IEEE PSRC - Bob Cummings
13 September 2018

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

- Level 2 Alert – Industry Recommendation issued 20 June 2017
    - Loss of Solar Resources during Transmission Disturbances due to Inverter Settings
- Alert survey results – filed with FERC on 29 September 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
- 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 published in February 2018
- Another Level 2 Alert – Industry Recommendation issued 1 May 2018
    - Mitigating actions:
        i. Dynamic model improvements
        ii. Mitigation of momentary cessation
        iii. Plant control loop coordination
        iv. Mitigation of voltage-related tripping
        v. Information sharing among operating entities
        vi. Planning and operations studies to ensure no potential stability risks
    - Response by Reliability Coordinators of study findings is due to Regional Entities by December 7, 2018

Multi-Pronged Approach:

- Disturbance analyses and reports
    - Blue Cut Fire, Canyon 2 Fire, (and upcoming Angeles Forest) Disturbances
- Level 2 NERC Alerts
    - Identifying extent of condition, and recommending mitigating

actions

- IRPTF Reliability Guideline
    - Recommends BPS-connected inverter-based resource performance
    - Posted for comments
- Modeling and simulations
    - Modeling Notifications
    - Leading interconnection-wide stability studies to identify potential risks
- Industry education – webinars and workshops
- Outreach to BPS-connected non-BES resources (e.g., < 75 MVA)
- Reliance on SGIA, LGIA, and Facility Connection Requirements

Relevant Links:

- **Blue Cut Fire Disturbance Report:**
- **http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-Solar-Photovoltaic-Resource-Interruption-Disturbance-Report.aspx**
- **Canyon 2 Fire Disturbance Report:**
- **http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-Solar-Photovoltaic-Resource-Interruption-Disturbance-Report.aspx**
- **Webinar on Both Disturbances:**
- **http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-Solar-Photovoltaic-Resource-Interruption-Disturbance-Report.aspx**
- **NERC Events Analysis:**

  http://www.nerc.com/pa/rrm/ea/Pages/default.aspx

- **NERC Alerts:**

  http://www.nerc.com/pa/rrm/bpsa/Pages/Alerts.aspx

- **NERC IRPTF Page:**

  http://www.nerc.com/comm/PC/Pages/Inverter-Based-Resource-Performance-Task-Force.aspx

2. **Single Point of Failure (FERC Order 754) (3rd ballot ends Friday, 14 Sept. 2018)**
    - Modifications to be made to Standard TPL-001-4 to address two FERC directives
    - Focusing on planning requirements for assessing single point of failure in TPL-001 and further clarifications in the standard

3. **System Protection Coordination (Phases 1 & 2) (Approved – Both PER-006-1 and PRC-027-1 go into effect October 1, 2020. Note that Requirements R2, R5, and R6 of PRC-001-1.1(ii) retired effective March 30, 2017, yes 2017)**
    - PRC-027-1 – Coordination of Protection Systems for Performance During Faults
        - Replaces R3 and R4 from PRC-001-1.1(ii)
    - PER-006-1 – Specific Training for Personnel
        - Moves R1 from PRC-001-1.1(ii)
    - FERC-approval of PRC-027 and PER-006 completely retires PRC-001-1.1(ii)
    - 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)
4. **Protection Systems Phase 3: Remedial Action Schemes (RAS)**
    - Replacing existing RAS-related standards - PRC-012, PRC-013, PRC-014, PRC-015, PRC-016 and revises SPS definition
    - FERC issued Order No. 837 on September 20, 2017 approving PRC-012-2 Effective date January 1, 2021.
    - Requirement R4: Evaluation of each RAS every 5 years (by 01/01/2026)
    - 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 – complete by 01/01/2027
        - For each RAS designated as limited impact – complete by 01/01/2033
    - Requirement R9: Each Reliability Coordinator shall update a RAS database at least once every twelve full calendar months.
        - Reliability Coordinator must establish and populate a RAS database by 01/01/2022
5. **Project 2016-04 Modification of PRC-025-1 Generator Relay Loadability**
    -
    - Approved by FERC Letter Order.
    - Addresses issued revealed during implementation:

- 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

- Post approval pre-recorded webinar available on the project page
- Implementation Plan for version 2 supersedes version 1; however, relays covered in version 1 still have the same implementation. New relays get the full 60 or 84 months depending on what has to be done to become compliant.

6. **Standards Applicability for Dispersed Energy Resources**
   - IEEE Standard 1547-2018 Distributed Generation (resources) – connected at distribution level voltages published on April 6, 2018
     - Dispersed Power Producing Resources – aggregated small-scale resource technologies such as: wind, solar, fuel cells, flywheels, geothermal, energy storage, & micro-turbines
     - Launched a Distributed Energy Resources Task Force (DERTF) in association with the activity of the NERC Essential Reliability Services Working Group
     - Coordinating with IEEE on inverter-based resources connected to sub-transmission and LV transmission (BPS)
   - NERC is collaborating with IEEE on an International Task Force dedicated to transmission-distribution interactions.

H B: ADVISORY COMMITTEE REPORTS

Chair: Pratap Mysore
Vice Chair: Russ Patterson

B1: WG Awards and Technical Paper Recognition Working Group

Chair: Hugo Monterrubio
Vice Chair: Mal Swanson

September 2018 Meeting Minutes:
The B1 Working Group met on Monday September 10, 2018 in Minneapolis, MN with 7 members and one substitute member (H SC). The May 2018 meeting minutes were discussed and approved.

The following items were discussed during this meeting:
1. Improvement to the selection and internal nomination process for PSRC members for IEEE & IEEE-PES Individual Awards.

2. The WG discussed and identified nominees for the following awards:
   a. IEEE Nikola Tesla Award
   b. IEEE PES Douglas M Staszesky Distribution Automation Award
   c. IEEE PES Award for Excellence in Power Distribution Engineering
   d. IEEE PES Leadership in Power Award
   e. IEEE SA Standards Medallion
   f. IEEE Charles Proteus Steinmetz Award

The WG members took assignments and will continue working to complete and submitting these nominations prior to the deadline in January 2019.

3. The WG discussed, nominated and selected the 2018 PSRC Working Groups of the Year; these WG's will be announced in our January 2019 meeting. The categories are:
   a. PSRC Outstanding Standard or Guide
   b. PSRC Outstanding Technical Report
   c. PSRC Prize Paper Award
   d. PES nomination for Prize Paper Award

4. The following awards were announced or issued on Thursday September 13, 2018 during the PSRC Main Committee Meeting
   a. PSRC Bronze Service Awards for 15 years of service to the PSRC
      - **Fred A. Friend**
      - **Juergen Holbach**
      - **Don G. Lukach**
      - **Mark S. Schroeder**
   b. PSRC Silver Service Awards for 25 years of service to the PSRC
      - **Alex Apostolov**
      - **Wayne Hartmann**
      - **Chris Huntley**
      - **Kenneth Martin**
      - **Daniel Reckerdred**
   c. PSRC Certificates of Appreciation
      - **Elizabeth Schimpf**
      - **Jana Shellabarger**

In recognition for their services and support to this Committee
d. 2018 PES Awards (Announcement Only)

The 2018 PES Outstanding Standard or Guide Award was awarded this August to the PSRC K5 WG.
- **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

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 Minneapolis meeting was 266, which exceeds our previous attendance track record.

226 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:

Three gentlemen Mentors attended the Newcomers meeting and offered assistance to one attendee.

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.

8 Service Awards were presented.

Regards,

Malcolm J. Swanson
Membership Chairman

B4: <u>O & P Manual and WG Training</u>
Chair: Phil Winston: O&P Manual:

It was reported that the PSRCC WG P&P was submitted for approval.

If not approved at the September Standards Board meeting, it will be approved in December.

Plans are for there to be some form of training on the P&P during the January PSRC meeting.

Chair: R Hunt: WG Training:
Nothing to Report

B5: Publicity
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.

B5: Publicity Activity Report

- IEEE PES PSRC committee flyer was distributed at the annual PES General meeting in July 20918.

- PACWorld Updates have been provided regularly to Alex Apostolov. Cathy Dalton requested subcommittee input after each committee meeting in January, May and September, so as to provide this input to the magazine. She also requested that each subcommittee chairperson provide her with key accomplishments from each of their subcommittees—after each meeting--so this information can be shared in the magazine's IEEE PSRC Update.

- A "Spotlight" article which focuses on PSRC will be developed and included in the IEEE newsletter in the December 2018 issue.

- Webcasts will be scheduled as each subcommittee chair advises Cathy regarding the topic and timing. We will work with IEEE to schedule these webcasts for the broader IEEE audience.

- PSRC has a new APP, in addition to its updated website. The B5 committee (Cathy Dalton and Malcolm Swanson) would like to thank Russ Patterson and Rick Gamble for all the time and effort they have each put into improving our website and creating this amazing APP for our meetings.

Thank you,
Cathy Dalton
Publicity Chairman
IEEE PES PSRC

B8: Long Range Planning

Chair: Mike McDonald
None from Long Range Planning

B9: PSRC Web Site

Chair: Rick Gamble

The website is in a stable state with a few more tweaks to be made. Upcoming changes will incorporate:

1. Working Group download links
2. Email Subscription link (listserv)
3. Photos
4. General clean-up

Subcommittee web correspondents should submit an excel spreadsheet or word doc with a table of subcommittee updates (WG, Name, Chair, Vice Chair, Scope). This should be based on the latest subcommittee minutes - so it updates sometime after each meeting.

Easy123 integration is in the works.

- 3 Phase rollout (committees using nothing 1st, committees using 123 already 2nd)
- We're 3rd phase since we use RegOnline - do nothing for now, but expect a rollout next year
- Goal is for 1 membership database and 1 location for event management

H. ITEMS OF INTEREST FROM THE MAIN COMMITTEE

The following motions were made by SC chairs to the Main Committee:

1. The following motion was moved by Gene Henneberg (C –SC Chair) : "Mr. Chair, the System Protection Subcommittee, C, requests the submission of a PAR to the IEEE SA with the following details:

   PAR Title: Testing Guide for Automatic Voltage Control Systems in Regional Power Grids
   Output: IEEE Guide (Project Number unassigned)
   Scope: This guide provides the basic functional requirements and testing methods for the automatic voltage control (AVC) system of the regional power grid. The guide applies to the testing for reactive-power-control-based AVC systems in the regional grid.

   After the motion was made, there was discussion and as a result the following changes will be made to the PAR.

   <u>The Scope will be modified as follows</u>:

   This guide ~~provides the basic functional requirements~~ describes the application philosophy, limitations and testing methods for the automatic voltage control (AVC) system of the regional power grid. The guide applies to the testing for reactive-power-control-based AVC systems in the regional grid.

   PAR Purpose: The purpose of this work is to recommend the methods of testing the functions and technical performance of the regional grid AVC systems, with a view of finding the potential defects of AVC systems and improving the operation performance of AVC systems.
   Proposed Chair: TBD

   <u>The PAR Purpose will be modified as follows</u>:

   The purpose of this ~~work is to recommend~~ guide is to describe the methods of testing the functions and technical performance of the regional grid AVC systems, with a view of finding the potential defects of AVC systems and improving the operation performance of AVC systems.
   Proposed Chair: TBD

   The motion was seconded by Mal Swanson. The motion will be circulated through e-mail for voting as there was no quorum during the meeting.

2. The following motion was moved by Eric Allen (for H –SC Chair Galina Antonova) : “Mr. Chair, the Relaying Communications Subcommittee, H, requests the submission of a PAR to the IEEE SA with the following details:

   Proposed Title: Recommended Practice for Human Machine Interfaces (HMIs) used with Electric Utility Automation Systems
   Output: Recommended practice
   WG Assignment: To create a recommended practice for Human Machine Interfaces (HMIs) used with electric utility automation systems
   Proposed Scope: This recommended practice 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 with electric utility automation systems. The visualization elements covered are screen philosophies, data presentation format, HMI organization and structure, menus and their hierarchies, screen navigation, graphics and color conventions, pan and zoom functions, clutter/declutter, dynamic elements, popup conventions, help screens, and methods used to work with alarms. The recommended practice will be technology-agnostic or independent of various software and hardware platforms. Application to HMIs with small screen sizes or to vendor-provided IED configuration software including HMI-like functionality may have limited visualization elements. In the future, this recommended practice could address object model and/or configuration language, HMI communications, roles and access control, alarm philosophy, and alarm management. Proposed Purpose: The purpose of the proposed work is to define industry-specific HMI screen requirements for HMIs used with electric utility automation systems.
   Proposed Chair: Matthew Black

   The motion was seconded by Gene Henneberg The motion will be circulated through e-mail for voting as there was no quorum during the meeting.

3. The following motion was moved by Dale Finney (J –SC Chair) : “Mr. Chair, the Rotating Machinery Subcommittee, J, requests the submission of a PAR to the IEEE SA with the following details:

   Proposed Title: Guide for Abnormal Frequency Protection for Power Generating Plants
   Proposed Chair: Ritwik Chowdhury
   Type of Project: Revision to IEEE Standard C37.106-2003
   Proposed Scope:
   This application guide assists the protection engineer in applying relays for the protection of generating plant equipment from damage caused by operation at abnormal frequencies including overexcitation. Consideration is given to the effect of abnormal frequency operation on those associated station auxiliaries whose response can affect plant output. The guide also presents background information regarding the hazards caused by operating generation equipment at abnormal frequencies. It documents typical equipment capabilities and describes acceptable protective schemes. Underfrequency protection can be provided by load shedding and/or a discrete underfrequency protective function. If both load shedding and a discrete protective function are used, then they must be coordinated. Guidance is provided to help meet requirements from regional entities and regulatory bodies. The recommendations made pertain to typical synchronous generator installations but does not displace manufacturer guidance. The protective functions

discussed in this guide may be implemented with a multifunction microprocessor based protection system. Proposed Purpose: This guide summarizes the use of relays and devices such that the reader may select the necessary equipment to provide adequate protection for AC generators from abnormal frequency conditions.

The motioned was seconded by Jim Hackett. The motion will be circulated through e-mail for voting as there was no quorum during the meeting.

SUBCOMMITTEE REPORTS

C: SYSTEM PROTECTION SUBCOMMITTEE

Chair: Gene Henneberg ghenneberg@nvenergy.com
Vice Chair: Fred Friend fafriend@aep.com

System Protection Subcommittee Scope

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

Meeting Minutes
The System Protection Subcommittee of the PSRC met on September 12, 2018 in Minneapolis, MN. Six new members were recognized: S.S. (Mani) Venkata, Abu Bapary, Michael Bloder, David Morrissey, Robin Byun, and Jim van de Ligt. The participants introduced themselves, a quorum was achieved (31 of 60 members and 29 guests), and the May 2018 minutes were unanimously approved

Advisory Committee Items of Interest
- WG meeting minutes due to Fred and Gene by this Friday, September 13, 2018.
- The new IEEE privacy policy to comply with the European Union requirements were implemented on May 25. Attendance sheets can only be pre-printed with names and affiliations, no email addresses.
- Standards WG Awards - The IEEE Standards Association Working Group Awards has a new Procedure to request certificates of appreciation for completed (Approved Standard) work. These certificates have to be requested by the Chair or VC of the WG directly from the IEEE SA. These awards can be shipped to our next PSRC meeting for announcement and distribution. The request for the SA certificate must be made at:
  http://standards.ieee.org/develop/awards/wgchair/wgawards.html
- Reports/Paper Final Output – To be considered for PES level award the output of all Working Groups with a Technical Output including Technical Reports, Transactions/Journal and conference papers must be completed in PES Format and submitted and posted in the PES Resource Center. In future, WG reports should be initially developed using this format.
- Other relevant PES links will be provided separately to WG chairs and vice chairs.

Working Group Reports
The minutes of the Working Groups follow.

PC37.246 IEEE Guide for Protection Systems of Transmission to Generation Interconnections produced by WG C-18 was published on May 17. The Working Group has now been disbanded.

WG C-19, C37.247, IEEE Standard for Phasor Data Concentrators (PDC) for Power Systems, is planning on issuing the recirculation ballot the week of September 17.

The **P2004 / CTF-33:** Recommended Practice for Hardware-in-the-Loop (HIL) Simulation Based Testing of Electric Power Apparatus and Controls has been upgraded by the C subcommittee to a Working Group (C-33) and will continue in support of the PELS, IAS, and IES on this subject. Dean Ouellette is the chair and Sakis Meliopoulos is vice chair.

Task Force CTF-37 decided not to convert the C-20 report, Impact of Voltage Source Converter (VSC) Based HVDC Transmission on AC System Protection into a conference or transactions paper. The task force has been disbanded.

A new task force CTF-39 met to discuss the possibility of PSRC Subcommittee C sponsoring development of a new Testing Guide for Automatic Voltage Control Systems in Regional Power Grids. If approved, this guide will be developed in entity mode, meaning that the participants must be IEEE entity members. IEEE individual members can contribute to the guide as specialists but neither will they have voting rights nor will the name of their company appear in the front page.

Old Business

A brief review of the recent joint work with NERC work of CTF-34 and the ongoing work for which C24, C25, C32, D29, and D38 are expected to make significant contributions regarding Inverter Based Generation.

New Business

IEEE is starting two fast-track standards on Inverter-Based Resources (IBR):

- P2800 Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems (PSRC sponsored)
- P2800.1 Guide for Test and Verification Procedures for Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems (PSRC supported)

General Discussion

There was no general discussion.

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: September 2018
Assignment: Develop a standard for Phasor Data Concentrators for power systems.

6 Attendees: 4 members, 1 corresponding member, 1 guest attended. The meeting roaster is attached.

- Patent/IP related IEEE slides were shown
- Previous meeting minutes had been approved electronically.
- WG C19 PAR, Assignment, Purpose, and Scope were presented

- The WG's task status was presented.
  - This included the ballot result summary
  - 133 comments had been received during the ballot
  - All have been addressed
  - Two reviewers had major comments. The response to their comments was sent to them, and further discussions held, resulting in several other changes based on these discussions.
- The final document is in process for formatting per IEEE guidelines.
- WG expects to do a recirculation ballot soon, possibly before the end of this month. If we do not receive significant technical comments, we expect to submit for approval for the 10/15 RevCom meeting.
- The PAR expires at the end of this year. If we do not submit for approval by the 10/15 RevCom meeting, an extension will be required.

C-21: <u>Guide for Engineering, Implementation and Management of System Integrity Protection Schemes (PC37.250)</u>
Chair: Yi Hu
Vice Chair: Gene Henneberg
Output: IEEE Guide C37.250
Draft: 0. 72
Established: September 2013
Completion: December 2018
Assignment: Develop an IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

Working group C21 met on Wednesday, September 12, 2018 in Minneapolis, MN in single session chaired by Yi Hu and Gene Henneberg with 12 members and 1 guest attending. Each attendee introduced themselves and described their affiliation.

Yi Hu presented the IEEE patent slides. No attendee indicated any knowledge of any patents critical to implementation of the proposed PC37.250 Guide. The proposed agenda was approved. A quorum was achieved and the May 2018 minutes were approved.

The WG is not going to complete this Guide development before the present PAR expires. We will file for an extension. This has been delayed due to a mis-assignment of the PAR to another Committee.

The WG has been holding regular web meetings resulting in the present version 0.72 draft, which was distributed to the working group members prior to today's meeting.

After a discussion regarding the Annex B, which provides additional redundancy design examples for SIPS, the followings have been concluded:
- Review Annex B to assess if any of the examples should be moved to the main body of this guide
- WG Chair to reach out to WG C31, which is working on an "IEEE Guide for Protection System Redundancy for Power System Reliability" that included a discussion of SIPS redundancy, to see if their guide would be an appropriate place for some of the examples in Annex B

The rest of the meeting discussion centered primarily on the wording for the definition of System Integrity Protection Schemes (SIPS). The agreed wording is as follows:

> System Integrity Protection Scheme (SIPS): A scheme that serves to enhance security and prevent propagation of disturbances for severe system emergencies caused by unacceptable operating conditions and is used to

stabilize the power system by taking control action to mitigate those system conditions. This definition encompasses Special Protection Systems (SPS) and Remedial Action Schemes (RAS) as well as underfrequency (UF), undervoltage (UV), and out-of-step (OOS) schemes.

This definition was further reviewed at the I2 Working Group and approved.

The major editing that still needs to be accomplished includes:

- Revisions related to the *voltage instability* discussion suggested by Eric Allen
- Various minor revisions and open questions throughout the document
- Review of all Figures which were not originally produced in Visio (Dean Miller volunteered)
- Confirmation to substitute "verification" for "fail safe" in text and figures beginning at 5.2.8.2.2
- Correlate the references within the text to the bibliography at Annex A.
- Finalize where the material in Annex B on detailed redundancy design examples should be placed.

Yi will continue to schedule web meetings with WG members to complete editing the document. Wednesday at 10:30 am eastern time. Notice will be provided to WG members for specific dates.

Requirements for next meeting: Room for 20, single session and projector with HDMI connector. Try to avoid conflicts with C31.

Meeting minutes by Gene Henneberg and Yi Hu 09/12/2018.

C-23: Coordination of Synchrophasor Related Activities

Chair: Mahendra Patel
Vice Chair: Allen Goldstein
Output: Ongoing Liaison
Draft: N/A
Completion: Ongoing Liaison
Assignment:

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.

https://www.naspi.org/node/699
Working on a repository of publically available data (details?)
Working on an update on Distribution PMU installations and applications (developing a survey).

They are specifically NOT working on recommendations for standards for Distribution PMUs until they better understand the baseline performance, applications and needs of the applications of distribution PMUs.

Attendees
Mahendra Patel (EPRI), Allen Goldstein (NIST), Ken Martin (EPG), Shane Haveron (AMETEK), Felipe Wilches-Becral (Sandia National Lab.), Yi Hu (Quanta Technology), Jim Hackett (Mehta Tech), Jim O'Brien (Duke Energy), Harold Kirkham (PNNL), Bill Dickerson (Arbiter Systems), Kamal Garg (SEL)

Requirements for next meeting: Single Session, Meeting room for 25 people. To the extent possible, avoid conflicts with P 8-9-10, H 3-11-40, C 19, 28 and ICAP. Also, since C23 is a coordinating WG for all synchrophasor activities, we liked C23 being on Wednesday after all the other Synchrophasor related WGs were done meeting.

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: 2.0
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.

In the absence of the chair (Sukumar Brahma), vice-chair (Evangelos Farantatos) ran the meeting. The meeting started with introductions, and then the May 2018 minutes were approved.

First, the status of the report was described to the attendees, as follows.

Since the May 2018 meeting Sukumar and Evangelos have done a first round of review of the report and made editorial changes. One pending item is the availability of manufacturer-data for Type III WTG. On June 27 Sukumar, Evangelos and Dean Miller (WG member) had a webcast call with Vestas. The content of the discussion during the call was summarized to the WG attendees. In summary, the data (simulated fault response for balanced and unbalanced faults) that Vestas has provided to the WG for their Type IV WTG were discussed. For the unbalanced data, Vestas will re-run the simulations and update the data. Also a request was made for Type III WTG data. Vestas agreed to provide those, and once they become available the corresponding section will be updated in the report. Also during the meeting, it was suggested for the WG to approach Siemens-Gamesa and request Type III WTG data.

The other pending item in the report that was discussed was the section of the CAPE model implementation by Electrocon. Electrocon provided a few days prior to the meeting a revised write-up for the corresponding section. The CAPE model and

corresponding results presented are not final, since some convergence issues with the model have been identified based on testing by Electrocon and Southern Company. The plan is for EPRI to work with Electrocon to resolve the convergence issues, so that the corresponding section in the report is finalized by the January meeting.

Two more attendees volunteered to review the final report. A draft report is expected to be sent to the reviewers by end of October. Once the report is reviewed (by end of November), it will be sent to the WG members and guests for final review before the January 2019 meeting, during which all comments will be discussed.

Then Evangelos presented updated results on the model benchmarking of two wind plants with Type III WTGs. The updated results included the application of the relay filter equations that were provided to Evangelos by Mohammad Zadeh (WG member). The updated results show good match between the model and the measured data and the attendees agreed to include those in the WG report.

Finally, a suggestion was made to change the title of the report and include “solar PV” since this model is also covered in the report.

There were total 26 attendees in the meeting, 5 members and 21 guests.

For the next meeting in January 2019, we need a room with capacity of 30. Please avoid conflict with WG C30, C32, CTF34 and C25, in that order.

C-25: Protection of Wind Electric Plants

Chair: Martin Best
Vice Chair: Keith Houser
Output: PSRC Report
Draft: 4.3
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 Minneapolis, MN in a single session on Tuesday, September 11, 2018 at 1:30 pm with 12 members and 16 guests. After introductions, the agenda, the May 8, 2018 meeting minutes, and revisions to Draft 4.3 of the Report were reviewed.

Martin will check on sources of Figures to make sure they are either original or used with permission from other sources.

The group reviewed recent changes.

Section 3.1.1. Martin Best will review the TCC plot in Figure 12 to ensure the negative sequence TCC has been adjusted to be correctly shifted with respect to the fuse TCC in order to show them on a common plot.

Section 3.1.2 There was considerable discussion about the phasor and RX diagrams of Figures 15, 16, 17, 18, and 19. Martin Best agreed to try to put the phasor and RX diagrams for the same condition (WTG importing or exporting reactive power) side by side on the same figure to aid in understanding the concepts presented.

Section 3.1.4. The words “and Static VAR Devices” in the title of this section will be removed. Jim Van Der Ligt will prepare a draft of this section for the next draft. The mechanism by which the WTGs would be removed from a faulted feeder was discussed. It was agreed that this section could just refer to non-specific “WTG protection and control functions” that would shut down the WTGs when the feeder is disconnected from the integrated system.

Section 3.5 Juan Gers will present different types of harmonics which could be generated by WTGs from various manufacturers.

All working group members are encouraged to have their assignments completed by October 31.

The group requests a single session, meeting room for 25-30 at the January 2019 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 9-11-2018,
Charles Henville

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

Chair: Don Ware
Vice Chair: Matt Black
Output: IEEE Guide, C37.233
Draft: 2.19
Established: January 2016
Completion: November 2019
Assignment: Revise C37.233 Power System Protection Testing Guide.

The C26 working group met on Tuesday, Sept. 11, 2018 with 12 members, 8 Guests, 1 new member, and 1 new corresponding member.

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

Don discussed status of current draft 2.19 and how we want to accelerate our efforts in order to be ready for a January ballot done internally to members.

We discussed the comments made on Steve Turner’s feedback on reviewing suggested changes by Nina Selak and read the changes to section 4.6.4 by Angelo Tempone and choose to approve his changes.

Action items:

1. Angelo Tempone will assess all hyperlinks contained within document to make sure they still are current and active, i.e. have life.

2. Tony Seegers agreed to make necessary changes to document on Nina's suggestions.
3. Mike Bloder to share a "lessons learned" story on improper commissioning activities and Don Ware will also share some lessons learned from a recent event. This adds importance to quality assurance in testing and commissioning activities.
4. Don to write at the end of commissioning section a paragraph on taking "in-service" load readings, and emphasize why this task is so important to do.
5. Mark Siira will assess Annex for any clean up and Mark has a list of definitions to include.
6. Tony will need to review those new definitions presented by Mark.
7. Comment presented to include as reference the work recently done by I25 on commissioning.

The version of the Guide C37.233 is v2.19 as of Sept. 8, 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: <u>C37.242 Guide to the Synchronization, Calibration, Installation and Testing of PMUs for Power System Protection and Control</u>

Chair: Allen Goldstein
Vice Chair: Harold Kirkham
Output: IEEE Guide, C37.242
Draft: 20180508
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 main body of the guide has been revised and all revisions accepted by the working group. Volunteers to draft revisions to the annexes have turned in their assignments and the working group is beginning to review and accept the changes. A new annex on data quality has been proposed and is under review.

The chair believes that a working group vote to go to ballot may be held before January and we may request to form a ballot group before the January JTCM.

Working group C28 met on Tuesday, September 11, 2018 in single-session chaired by Allen Goldstein with 6 of 18 members and 4 guests attending. After introductions and the call for patents (with no responses), the chair updated the working group on the status of the assignment as shown in the Chair's Remarks.

The WG then continued to work on revisions to the guide, focusing mainly on a new Annex B on data quality.

Next step actions:
- Bi-weekly conference calls to work on revisions to the Annexes will resume beginning on Monday, 24 September.

Next meeting requirements: Single session, a room for 30 people and a PC projector with HDMI connector. Do not conflict with other synchrophasor related activities C19, C23, and C28.

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: 0.6
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.

WG C29 met in single session on September 12, 2018 in Minneapolis, MN with 7 members and 10 guests. Mike Kockott participated as WG Chair due to Heather Malson not being able to attend. Kevin Jones participated as Vice Chair.

After introductions, Mike led a discussion on the latest outline from May, 2018. The WG decided that section II (Test Equipment and Environment) should be swapped with section III (Types of Tests) to flow more logically. Additional volunteers were added to these sections with Mohit Sharma taking the lead on the Test Equipment and Environment section and Rob Fowler taking the lead on the Types of Tests section. The volunteers committed to completing the writing assignments for these sections by mid-December. These updates will be distributed to WG membership before the January, 2019 meeting. The complete list of volunteers for these two sections is as follows:

- Old II (new III) Test Equipment and Environment: Rob Fowler, Benton Vandiver, Eugenio Carvalheira, Mohit Sharma (Lead), Jun Verzosa.
- Old III (new II) Types of Tests: Rob Fowler (Lead), Jun Verzosa, Jim van de Ligt, Mohit Sharma, Benton Vandiver.
- Ratan Das committed to completing the Transient portion of section V (c) (Test Data Formats and Creation) by the May 2019 meeting.
-

Current copies of the J5 and D29 reports need to be sent to the C29 membership to allow completion of writing assignments. Heather will get with the Chairs of these WG's to get current copies and distribute to C29 members at her earliest convenience.

For the next meeting, C29 will need a single session room for 30 and an overhead projector.

C-30: Microgrid Protection Systems

Chair: Michael Higginson
Vice Chair: Fred Friend
Output: PSRC Report

Draft: 6.2
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, September 11 at 3:00 PM with 40 attendees, including 18 members and 22 guests.

The Chair opened the meeting with introductions. The minutes for the May meeting were reviewed and no corrections were noted.

The chair discussed some of the over 200 comments received from WG ballot (over 75% approval):

1 Some reviewers requested an executive summary. The working group decided that it was not needed or required, and we would not create one.
2 The working group agreed that references to other microgrid standards should be added where referenced in section 2. Suggested references were:
    a. 2030.7, 2030.8, 2030.11 (in development), 2030.12 (to be developed)
    b. Equipment standards: Distribution Line, Transformer, Generator, and Bus Protection Guides will be referenced
3 The working group discussed the section on Centralized Fault Detection.
    a. The working group voted on whether more description on FLISR should be added. The votes were: 1 For, 8 Against, 2 Abstained
    b. The working group voted on whether more description on Fault Detection should be added to the existing section. The votes were: 1 For, 7 Against, 5 Abstained
    c. There was consensus among the group that if Centralized Fault Detection is discussed, Distributed Fault Detection should also be discussed.
    d. After much discussion, a resolution team (Matt Reno, James Niemira, Amin Zamani, Mani Venkata, the original author) was formed to revise 4.3.5 to address distributed verses centralized for fault protection/ detection.
4 There was some confusion on the relationship between the communication-based and custom protection logic sections. The working group decided that these sections should be reorganized. The sections will be reviewed and revised by the comment resolution team to differentiate between conventional communication-based protection schemes, and custom protection logic which does not require communications, and customer protection logic which leverages communications.
5 Several reviewers requested that additional case studies and examples should be added as Appendices. The working group agreed, and Ratan Das and James Niemira volunteered to each provide an example.

Next steps: The chair proposed keeping the same editorial team to address the remaining comments. All agreed. (Michael Higginson, Fred Friend, Ben Kazimier, Wayne Hartmann, Manish Patel, Kamal Garg, Amin Zamani, Jim Niemira, and Matthew Reno)

A revised draft will be sent to the working group for re-balloting prior to the January meeting. We are targeting finalizing the report and submitting to C subcommittee leadership at or shortly after the January 2019 PSRCC meeting.

Mani Venkata requested all of the C30 members to become a C38 working group member, where this work can be developed into the Guide for the Design of Microgrid Protection Systems.

There was no new business and the meeting was adjourned.

Next meeting: Computer projector and room for 50 attendees. Please avoid conflict with I2, I29, C32, and C38 (conduct C30 prior to C38).

C-31: IEEE Guide for Protection System Redundancy for Power System Reliability C37.120

Chair: Solveig Ward
Vice Chair: Alla Deronja
Output: IEEE Guide
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, September 12, 2018 at 11:00 AM in a single session with 13 members and 10 guests attending. 2 guests became new voting members and another 3 – non-voting members. The quorum was not met so the May 2018 meeting minutes will be approved via email.

The meeting was chaired by the vice chair in absence of the chair.

The vice 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 vice chair mentioned the new IEEE Privacy policy that email addresses cannot be made public so the roster will no longer include the participants' email addresses.

The vice chair reviewed the guide outline and status of all assignments made at the previous WG meetings.

Review and writing assignments:

a. Clause 4, General Considerations review. Status: the review was reassigned to Gary Stoedter and Derrick Haas.
b. Clause 5.7 – 5.9 – assigned to review to George Moskos, Jay Anderson, and Dave Morrissey).
c. Clause 6, Redundancy Applications Considerations review. Status: the review was reassigned to Angelo Tempone and Paul Thompson.
d. C16 PSRC Report Relay Scheme Design Using Microprocessor Relays, 2014: Robert Frye. Status: pending.
e. Allen Goldstein will provide new material on redundant synchronization time. Status: reach out to Alan.
f. Section 5. Reassigned to Tony Bell to investigate the available power line carrier technical documentation and correct Figure 12 Two PLC channels, coupled together via phase to phase. Status: reassigned.
g. Figure managers: Alexis Mezco, Jeff Brown. Status: pending.

h. Clause 6: Adding control application section – Roy Moxley, Solveig Ward – out of scope? If affecting protection – in scope. Status: pending.
i. Clause 4: Add human factor (simplicity in scheme design) – Robert. Status: pending.
j. Sub-clause 6.6: Capacitor bank protection (Nathan Gulszynski). Status: pending.
   Sub-clause 6.9 SIPS redundancy consideration – review/write by Robin Byun. Status: new.
k. Sub-clause 6.10: Crossover/mixed use SIPS/primary protection/automation (Aaron Martin). Status: reach out to Aaron.

The vice-chair will work with the contributors on comment submission format, preferably, via iMeet central.

The WG has much discussion on contingency definition involving N (normal system), N-1, N-2, and N-1-1 vs. N+1 and N+2. A consensus was that this is planning criteria rather than protection although protection does use it in the design of protection systems. The WG was not in favor of discussing it in the guide and no further action will be taken in this regard.

There was also a discussion about including NERC regulatory requirements in the guide since they affect and guide the degree of protection system redundancy and adding the NERC documents as normative references to the guide. At the same time, this guide is being developed for protection engineers practicing in various regions of the world. To limit the guide application to the North American market only would not be the best approach and in the best interest to its future users.

The WG decided to start webex meetings after the January 2019 meeting to start reviewing and editing the guide.

All the outstanding and new assignments are due to the Chair by **November 1, 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. Please avoid conflicts with I2, K22, and C35.

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

Chair: Mukesh Nagpal
Vice Chair:
Output: PSRC Report
Draft: 1.03
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 28 members and 19 guests present.

The following items were discussed:

1. Minutes from the 2018 May meeting were reviewed and approved.

2. The following presentations were made to the group.

a. Mukesh Nagpal provided a presentation on Type IV WTG fault current contributions illustrating the fact WTG's primarily provide positive sequence current. Zero sequence current is provided by the interconnected wye-gnd/delta transformers. This further clarifies the need to ensure that protection is configured to operate with the unique fault current characteristics of WTG's and IBR generation.

b. Manish Patel provided a presentation of the high voltage issues related to the IBR characteristic of a lack of negative sequence current injection for various faults. This also included a discussion on the German "grid code" which specifies that IBR's provide negative sequence current injection to mitigate the adverse effects of high voltage and protection deficiencies related to positive sequence only IBR's.

c. Yanfeng Gong provided a presentation on SSR occurrences in areas with WTG during three fault events. The presentation included a description of the events, the harmonic characteristic of this particular SSR, along with possible detection and mitigation.

3. The Chair discussed that few subsections in Section 4.0 and Section 5.0 were not applicable to the working group report and would be dropped in the next draft.

4. There was brief discussion on new line protection working group which would likely have some overlap with C32. Subsequently, the Chair attended joint the NERC/PSRC meeting where it was recognized need to coordinate outcomes of various IBR WG groups.

5. A meeting room with capacity of 50 with a projector is requested for the January 2019 meeting.

C33 IEEE P2004 Working Group and IEEE PSRC CTF-33 Task Force Joint Meeting

Web Teleconference and in-person (Pittsburgh, PA, USA)
11 September 2018, 9:30-10:45 EST

Chair: Michael "Mischa" Steurer
Vice Chair: George Lauss
PSRC Chair: Dean Ouellette
PSRC Vice-Chair: Sakis Meliopoulos

P2004 Scope: 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).
PSRC Scope: Support the development of this IEEE recommended practice in cooperation with PELS, IAS, and IES efforts.

Roll call—7 members, 2 guests from PSRC and 5 members from P2004 via a web conference.

Patent slides were shown and all participants were 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.
Privacy Policy was reviewed.

IEEE PSRC CTF-33

- Dean Ouellette reviewed the membership and who wants to be member, corresponding member, or guest
- Tony Johnson asked how this structure will liaison with P2004 and whether we will have access to the P2004 membership and material. The chair has forwarded all membership and will forward new members to the P2004 secretary for inclusion to the P2004 mailing list
- Chair to get more information about the P2004 imeet online file sharing website and pass along to the TF members.
- Introduced Sakis Meliopoulos from Georgia Tech as the Vice-Chair
- General discussion about the scope of the task force and whether or not we want to narrow the scope. We decided to leave the scope as is because the present scope provides the avenue to provide as much support to P2004 as necessary.
- Presentation on the outcome of the P2004 survey. The survey was held to elect chapter leads for the P2004 document. Each chapter lead was introduced along with a short background of their relevant experience to lead the chapter. This presentation will be made available to the TF members so members can determine which chapter they can contribute to.
    - Chapter 3 – "Definitions, Acronyms, and Abbreviations"
    - Chapter 4 – "Overview of HIL Simulation"
    - Chapter 5 – "Real-time Simulation"
    - Chapter 6 – "Establishing a HIL Simulation"
    - Chapter 7 – "Executing a HIL Simulation"
- A vote was taken to determine whether or not CTF-33 should request the sub-committee for approval to become a working group. The vote was positive and we will ask for approval to become a WG.

The next joint PSRC CTF-33/WG-2004 meeting is scheduled in Orange County, CA in January 2019. We will need a room for 20 and web access. Revision of P2004 is 1

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

Chair: Kevin W. Jones
Vice Chair: Gary Kobet
Output: PSRC Report
Draft: 4.0
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.

CTF34 met in single session on September 12, 2018 in Minneapolis, MN with 12 members and 25 guests.

After Introductions, the minutes from the May 9, 2018 meeting in Pittsburgh were approved, as well as the minutes from two web conferences held May 14, 2018 and May 18, 2018. The Chair briefly noted the Joint NERC/PSRC document has been posted, with a corrected version to be posted this week that fixed figure numbers and includes CTF34 as contributing members (inadvertently left out of the first draft).

The Chair reviewed action items for other PSRC working groups as noted in the document.

- C24 Modification of Commercial Fault Calculation Programs with Wind Turbine Generators
  Evangelos Farantatos stated work continues on fixing issues with convergence of the models, and he is working with vendors to resolve these issues by end of this year. The C24 final report will be produced following resolution of those issues.
- C25 Protection of Wind Electric Plants - no member present for update
- C32 Protection Practices for Interconnecting Solar or Other Inverter Based Generation to Utility Transmission Systems
  Mike Jensen gave an update stating that the document first draft is essentially complete and under review.
- CTF34 will remain a task force
- D29 Tutorial on Setting Impedance-Based Power Swing Blocking and Out-of-Step Tripping Functions on Transmission Lines
  Kevin Jones gave an updated. Jason Espinosa asked about the effects of IBR on generator out-of-step. Some discussion ensued over which working group would handle this. It was decided that J18 (Effects of DER on Synchronous Generators) will address this, making use of D29 work as appropriate.
- D38 Impact of High SIR on Distance Relaying
  Pratap Mysore gave an update and mentioned that work is ongoing.
- NERC Reliability Standard updates
  Bob Cummings reported on the coordination meeting with NERC/PSRC. Bob will join CTF34 and is also the Vice-Chair of IEEE P2800. At least four NERC members are involved in PSRC working groups including Bob Cummings, Rich Bauer, Jessica Harris and Ryan Quint. IBR Guideline is nearly complete and will be provided to P2800. IEEE 1547 will be used as a basis document and worked into a transmission document (P2800).

Russ Patterson mentioned an overall PSRC working group made up of chairs/vice-chairs of all involved working groups to keep all these activities coordinated.

Manish Patel made a presentation on IBR and negative sequence current, which stimulated many questions & much discussion.

Bob Cummings discussed IEEE P2800 and P2800.1. P2800.1 is an “entity” standard proposed by China (only corporate entities who have paid the required fee may participate in development and approval). P2800 is a Standard. PSRC is a co-sponsor; the sponsoring society is IEEE/PES/Energy Development & Power Generation (PE/ED&PG). First Solar & GE are participating. IBRTF at NERC is participating as well. Jason Espinosa asked about participating in P2800, Bob Cummings will provide info as requested.

For the next meeting, CTF34 will need a single session room for 40 and an overhead projector.

CTF35: 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:1
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.

WG C35 met on Wednesday, September 12, 2018 in a single session with 6 members and 9 guests attending. 3 guests volunteered for assignments and joined the WG as members.

The Chair explained the WG assignment and distributed the final draft of the paper. It is complete, reviewed, and approved by WG so the chair proposed a next step of submitting the paper to Subcommittee C for approval.

The WG then moved on developing the outline of the power point presentation. The assignments for the presentation were made as follows.

- Background need for industry-wide document – **Alla Deronja**
- Scope/purpose of new IEEE guide – **Alla Deronja**
- Guide contents
    - Establishing interconnection (information exchange between T and G engineers) – **Mike Jensen**
    - Interconnection configurations – **Steve Klecker**
    - System studies – **Yuan Liao**
    - Protection system settings for interconnections
        - General considerations – **Mike Jensen**
        - Protection functions
            - Synch check, degraded grid voltage, reverse power – **Dean Miller**
            - Breaker failure, power transformer ground overcurrent – **Abu Zahid**
            - Over/underfrequency – **Yuan Liao**
            - Bus differential and tie line differential – **Steve Klecker**
        - Redundancy – **Abu Bapary**
        - Autoreclosing – **Abu Bapary**
        - Tapped connections – **Mike Jensen**
- Summary – **Alla Deronja**

The action plan for the upcoming work is as follows:

1. WG Chair submitted the paper abstract to 2019 relay Texas A&M relay conference (was due August 31, 2018) and will submit it to Georgia Tech (due is September 30, 2018), WPRC (mid-April of 2019), and MIPSYCOM (end of February of 2019).
2. The paper will be sent to the C-subcommittee for review and approval between the September 2018 and January 2019 meetings.
3. A Power Point presentation will be developed between September 2018 and January 2019 meetings. Assignments have been made as shown above. For an approximately 30-minute presentation, about 25 slides with many figures from the guide need to be developed. The text should be minimally presented as short phrases in bullets; the rest should be included in the speaker notes.
4. Power Point presentation slides will be put together by the end of November and distributed to the WG members for review in early December.
5. The PP presentation will be dry run with the WG at the January 2019 meeting. All WG members are strongly encouraged to attend.
6. The paper should be ready to be presented at the PSRCC Main Committee meeting in May of 2019 in Cincinnati, OH.

7. The paper would be presented at the 2019 relay conferences. The following WG members from C18 and C35 have volunteered to make presentations at the relay conferences (Thank You, all!):
   Texas A&M – **Abu Bapary or Jim O'Brien** (not committed). Call for another volunteer!
   Georgia Tech – **Manish Patel** (committed)
   Western Protective – **Mike Jensen** (committed)
   MIPSYCOM – **Alla Deronja** (not committed). Call for another volunteer!
8. The conference paper will be converted into an IEEE transaction paper at that time. This is questionable and TBD.

Action items:

1. **Alla Deronja** is to distribute the Power Point presentation empty slides and the final draft of the paper to the PP presentation developers.
2. **Alla Deronja** is to submit the paper for Subcommittee C approval.
3. Power point presentation slides to be developed by **Mike Jensen, Steve Klecker, Yuan Liao, Dean Miller, Abu Zahid, and Abu Bapary** are due by November 1, 2018. Please submit them to the chair, Alla Deronja (aderonja@atcllc.com) and vice chair, Keith Houser (keith.houser@dom.com**).**
4. **Alla Deronja** is to submit the paper abstract to the three remaining protective relay conferences.

For next meeting the WG needs a room for 20 people, single session. Please avoid conflicts with C31 and K22.

C36: Paper Development from C2 report: Role of Protective Relaying in the Smart Grid

Chair: Alex Apostolov
Vice Chair: R.Benjamin Kazimier
Output: IEEE transactions paper
Draft:0
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.

For the next meeting we request a single session with room for 20 people. Draft 0.00
We request that if possible please avoid scheduling conflicts with K10, C38.

CTF-37: IEEE Transaction Summary Paper for Impact of VSC HVDC Transmission on AC Protective Relaying

Chair: Ian Tualla
Vice Chair: TBD
Output: IEEE transactions paper
Draft:
Established: May 2018
Expected Completion Date: December 2019

Assignment: Develop a IEEE Transaction Paper, reduced size conference paper from the PSRC report C20 "Impact of Voltage Source Converter (VSC) HVDC Transmission Systems and the impact on local AC system protection."

The Task Force met Tuesday with 10 attendees; 5 members and 5 guests.

After significant discussion, the Task Force decided to not develop the C20 report into a conference or transactions paper and recommended disbanding.

Next meeting Requirements [January 2019]: No meeting scheduled

C38: Guide for the Design of Microgrid Protection System P2030.12

Chair: S.S. Mani Venkata
Vice Chair: Michael Higginson
Output: IEEE transactions paper
Draft: 0
Established: May 2018
Expected Completion Date: December 2022

Assignment: To create the Guide for the "Design of Microgrid Protection Systems"

Scope
This guide provides for the design and selection of protective devices and coordination between them for various modes of operation of the microgrid. These include grid connected and islanded modes as transitions between modes.

Purpose
To facilitate the deployment of protection systems, given the challenge of protecting equipment and assets in the different modes of operation of the microgrid, including grid connected or islanded modes and during transitions between modes. The guide proposes different approaches, centralized and decentralized, passive and active, to detect and take proper actions to dependably and securely protect the microgrid and its equipment.

This is the first meeting of C38 as a working group. We met once previously (in May, 2018) as a Task Force.

C38 met on Tuesday, September 11th, 2018 with 52 attendees, with 33 requesting membership.

Mani kicked off the meeting by reviewing the minutes from the previous meeting. He also provided some history on why the working group has been started, and how our work has progressed thus far. This working group will be fast-tracked, and we will have web meetings in the interim to produce the report quickly.

Mani reported on the status of the PAR. On September 6th, 2018, NESCOM recommended approval of the PAR. IEEE SA has to vote to approve the PAR on September 27th, 2018. He requested that all attendees become members of the standards working group.

The working group discussed the relationship with C30. Mani explained that it will inform the guide we are producing.

The topics that we intend to discuss were introduced by Mani, and the group discussed.

The working group discussed ideas and comments for the guide. Some of those ideas were:

- Not limiting scope to specific sizes of system

- Including microgrid protection testing in the guide
    - Multi-terminal testing, including contributions of multiple sources
- Cybersecurity concerns - should we address?
- Fast load shedding and dispatch of generation

In our first online meeting (after PAR is approved), we will work on an outline for the guide.

Next meeting: Computer projector and room for 60 attendees. Please avoid conflict with I2, I29, C32, and C30 (conduct C30 prior to C38).

C39 Guide for Testing Automatic Voltage Control Systems in Regional Power Grids

Chair: TBD
Output: TBD (Guide preferred)

Assignment: To discuss the technical feasibility and necessity of a testing guide for AVC systems

The meeting was held between 4:30-5:45 p.m. on September 12, and hosted by C-Subcommittee Chair Gene Henneberg.

6 people were in attendance (see the attendance sheet as attached).

Shuqi Li from SGCC made a presentation and introduced the need to develop an IEEE-SA Guide for Automatic Voltage Control Systems in Regional Power Grids.

The following comments were received from the attendees:

- AVC systems were suspended by EDF due to operation constraints. The slide "Applications of AVC systems should be revised accordingly.
- AVC systems, only applied in PJM in the U.S., are exotic to PSRC members. Thus, there may be a lack of interest.

Mahendra Patel from EPRI commented that the AVC system was suspended by EDF and is not so widely applied now due to safety constraints. PJM does use the AVC system for a couple of years.

Daniel LeBeau from BBA stated that there may be possible interest from within the company, and he will later ask his colleagues about it.

Gene Henneberg suggested passing on related material to the subcommittee and seek for more interest. Votes will be balloted in the main committee meeting on Thursday morning to determine whether this PAR gets approved.

If approved, this guide will be developed in entity mode, meaning that the participants must be IEEE entity members. IEEE individual members can contribute to the guide as specialists but neither will they have voting rights nor will the name of their company appear in the front page.

Next meeting request room for 20.

Attending:

Gene Henneberg	Li Shuqi	Fred Friend
Daniel LeBeau	Mahendra Patel	Scott Cooper

The following summarizes the discussion at the C Subcommittee and the Main committee meetings.

The need for this guide was discussed at the subcommittee meeting on Wednesday afternoon.

Members expressed the following concerns at the subcommittee meeting.

- Is this testing guide within the scope of the C committee?
- Why develop this guide under entity mode and what are the procedures of developing entity-mode standards?

The PAR was reviewed at the main committee meeting on Thursday morning. SGCC representative responded to previous concerns and hoped to seek support and understanding from PSRC members.

The following comments were received.

- The scope of this guide needs to be revised. The guide should provide background material for AVC systems rather than "provide functional requirements" which seems mandatory.
- The background of AVC systems is recommended to be presented in the annex.

Murty Yalla as secretary of PSRC main committee requested the PAR be revised accordingly and sent to main committee members with the slides through the E-mail system for a vote.

The approval of this PAR needs support from over half of the main committee members.

D: LINE PROTECTION SUBCOMMITTEE

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

The Subcommittee meeting was called to order on Wednesday, September 12, 2018 with 28 members and 40 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (28 out of 43 members present).

Minutes from the May 2018 meeting in Pittsburgh were approved after motion made by Don Lukach and seconded by Fred Friend.

The Chair reviewed items of interest from the Advisory Committee.

- WG Chairs – please send minutes to Chair and VC
- Please send agendas one month prior to meeting
- Template for Technical Report (including Tutorials)
    - PES Technical Paper Templates https://www.ieee-pes.org/templates-and-sample-of-pes-technical-papers
    - Template for IEEE/PES Technical Reports https://www.ieee-pes.org/images/files/doc/tech-council/PES-Technical-Report-Template_Jan_2016.docx

    - PES Resource Center Submission Checklist http://ieee-pes.org/images/files/doc/tech-council/Submission_Checklist_PES_Resource_Center.docx
- IEEE SA has new Procedure for requesting certificates of appreciation for completed Standards work. WG Chair or VC directly request from IEEE SA http://standards.ieee.org/develop/awards/wgchair/wgawards.html
- Rick Gamble is webmaster for D Subcommittee
- IEEE SA has agreed to review PAR documents prior to balloting
- New Policies and Procedures have been drafted and should be approved soon
- Privacy Clause – due to privacy concerns, the roster shall not be distributed, except to the IEEE-SA staff, IEEE-SA Board of Governors and IEEE-SA Standards Board, unless everybody on the roster has submitted their written approval for such distribution

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 : 2.2
Expected Completion Date: 2019
Assignment: To review and revise C37.230-2007, "Guide for Protective Relay Applications to Distribution Lines" to correct errors and address additional distribution line protection related topics**.**

The working group met on Tuesday, September 11, 2018, 9:30 am CDT.

There were 14 members and 8 guests. A working group quorum was achieved. The attendance will be posted to I-Meet Central.

The patent slides were presented. No concerns were voiced.

May 2018 meeting minutes were presented. Don Lukach motioned to approve the minutes. Randy Crellin seconded the motion. The minutes were approved.

The D28 Working Group reviewed and discussed the following balloting comments:

- Clause 2: There were some comments that Clause 2 should be removed since there were no normative references cited in the guide. The working group agreed that the statement in this clause "that the existing statement that there are no normative reference" is acceptable and this comment should be rejected. Brian Boysen confirmed this with the IEEE SA editors as well.
- Clause 9: A balloter had concerns that this clause on DA/Smart Grid is not in the Scope of this standard and should either be added to the

scope or this Clause removed. The working group discussed this concern and concluded that this clause is only meant to provide a brief discussion on these topics since they do impact distribution line protection. This Clause is not intended to provide guidance on Smart Grid or DA. A statement will be added to in this clause to state that this clause is only meant to provide general description and that the user should refer to other documentation for guidance on these topics. Fred Friend volunteered to review Clause 9 against P1854, "IEEE Guide for Smart Distribution" to ensue this Clause is consistent and properly referenced in this guide.

- There were several comments by a ballotter regarding Clauses where Communication, DA, and SCADA are discussed in the guide but not in enough detail to be useful and since these topics are not in the Scope of the guide, they should not be discussed. The working group decided that the intent where these topics are discussed is not meant to provide guidance on these topics, rather they are just meant to discuss how they are used in Distribution Protection. The Working Group agreed to reject these comments.
- Reference to IEEE Color Books: A comment noted that the IEEE Color Books are being replaced with IEEE 3000 series standards. Brian Boysen will review where these references are used to make sure that these standards are still valid and if not, change the reference.
- Pulse Closing: There were several comments regarding the use of "pulse closing". Although this not a patented trademark, its use could imply endorsement of a specific manufacturer's device since that manufacturer is the only one using this term. The working group decided that "pulse closing" should be replaced with a more generic term such as "fault testing" or "enhance fault testing". Brian Boysen will replace pulse closing with a more generic term. Additionally the working group agreed to delete Clause 8.2.1 since this clause implied that pulse closing is the only method to restore loop schemes (i.e. endorsing this scheme) and this Clause does not add value to the guide.
- 5.1.3.2 – There were balloting comments on Figures 21a and 21b regarding how they depict detecting zero sequence currents. Craig Holt and Joe Xavier agreed to review this section and adjust language and figures as necessary.
- 5.4.2 – This section defines "reclosers" which may not be consistent with C37.60 or definitions in other IEEE. Ratan Das agreed to review this section to ensure the description of reclosers is consistent with other IEEE Standards.
- References: It appears some reference numbers may have been incorrectly re-numbered. Brian Boysen will review reference numbers.
- A comment noted that many B references are not cited in the document. The working group confirmed that this is acceptable. Brian Boysen also discussed this with IEEE SA editors who also agree that all B references do not need to be cited in the guide text. Therefore this comment will be rejected.
- 5.6.4 – A comment was provided that this section on CT saturation should include discussion on how CT taps impact saturation. The working group agreed that a sentence should be added to this clause noting to refer to C37.110 for guidance on CT saturation. Brian Boysen will add this statement.

Assignments:

- Fred Friend to review Clause 9 against P1854, IEEE Guide for Smart Distribution" to ensue this Clause is consistent and properly references this guide.
- Brian Boysen will review where the IEEE Color Book references are used to make sure that these standards are still valid and if not, change the reference.
- Brian Boysen will replace pulse closing with a more generic term throughout the document.
- Craig Holt and Joe Xavier will review this section 5.1.3.2 on Zero Sequence Current Transformers to ensure it properly describes this topic.
- Ratan Das will review this section 5.4.2 to ensure the description of reclosers is consistent with IEEE C37.60 or definitions in other IEEE standards.
- Brian Boysen will add a statement in Clause 5.6.4 noting to refer to C37.110 for guidance on CT saturation.

Next Steps:

Brian Boysen will complete the initial review / resolution of balloting comments to resolve remaining editorial or minor technical comments. The next draft (2.3) will be downloaded, along with all balloting comments and their initial resolution, on I-Meet Central. A Web-Ex meeting will be schedule to continue the Working Group review of unresolved technical comments.

D29: Tutorial on Setting Impedance-Based Power Swing Blocking and Out-Of-Step Tripping Functions on Transmission Lines

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

WG D29 met in single session on September 11 in Minneapolis, MN with 5 members and 23 guests.

Chair Kevin Jones began the meeting with introductions. Vice-Chair Normann Fischer was unable to attend. Minutes from the May meeting in Pittsburg were reviewed and approved. Kevin gave a follow-up on the IEEE D29 test system based on questions about the machine angle deviation and slip rate calculations. Next, Kevin mentioned that he and Normann were going to give the document a high-level review to better organize it and they will complete a few other incomplete sections. Once it is reorganized and more complete, it will be presented to membership for review, hopefully before the January, 2019 meeting.

A new section titled Determination of the Need for Power Swing Relaying was added that Kevin will complete. Ilia Voloh volunteered to send Kevin a paper on the topic for guidance. A new section was added to the System Modeling section to break it into

two topics addressing stability studies with and without high penetrations of IBR as requested in the recently published IEEE-PES Technical Report titled “Impact of Inverter Based Generation on Bulk Power System Dynamics and Short-Circuit Performance”.

Several new volunteers agreed to model the test system with data provided by Kevin:

- Ratan Das in PSCAD
- Laura Agudelo in DIgSilent PowerFactory
- Ashok Gopalakrishnan in PSS-Sincal

Kevin reiterated that it is desired to have a final draft ready by the January, 2020 PSRC meeting to coincide with the NERC PRC-026-1 Standard effective date for Generator Owners and Transmission Owners.

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 4.0
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 Minneapolis on September 11, 2018, with 8 members and 21 guests.

After introductions, the WG Chair reviewed the assignment and thanked Josh Lamb, Ted Warren and Alla Deronja for meeting on a Webex on September 5 as part of an editing team for the Tutorial.

Ted Warren discussed some proposed changes in Sections 2 and 3 to align the writing style and flow with the rest of the document.

Karl Zimmerman discussed a proposed addition to the section on Comparison of Mho and Quad. The addition would be to add a short description and figure to show a comparison of fault resistance coverage (sensitivity) for Mho versus Quad, but also include overcurrent and line current differential sensitivity, since many users apply line current differential and ground directional overcurrent along with distance.

Ted Warren added a section on coordination of protection when applying distance and overcurrent together and Craig Holt commented that this section should be expanded to discuss coordination issues with ground mho, ground quad and ground overcurrent. Ted and Craig agreed to revise the work on that section to include the new comments. Craig joined the working group.

The WG Chair volunteered to incorporate all up to date contributions and send an updated version for an “IEEE SA” type of ballot and verify the document matches the latest PES style format.

The next meeting is planned in January 2019 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 Minneapolis and has no minutes to report.

For the next meeting, WG D34 will need a room for 20 and a computer projector.

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: September 2019
Draft: 5

Working Group D35 met on Wednesday, September 12, 2018 at 8:00am in a single session with 22 members and 20 guests.

After introductions, the chair discussed the opportunity to provide input to the D40 working group for the Line Guide.

The working group then reviewed 2 writing assignments: Typical Transmission Lines and Inline Transformer Transmission Lines. There was good discussion and several suggestions that will be folded into the report.

Three assignments are still outstanding but several volunteers stepped up to complete these assignments.

Draft 5 will be distributed to working group members for review.

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

Action Items:

1. ~~Typical Line - Mike Benitez / Zach Zaitz / Addis Kifle~~
2. ~~Typical Line with Tapped Distribution Transformers - Jeff Barsch~~

3. ~~Double Circuit Overhead Transmission Line with Mutual Effects - Rick Gamble~~
4. Single Circuit Transmission Line with Weak Infeed - Qiao Yin Yang / Jun Verzosa / Nuwan Perera / Daniel Lebeau
5. ~~Series Compensated Overhead Transmission Line - Nuwan Perera / Vijay Sundaram~~
6. ~~Hybrid Line (Overhead Line and Underground Cable) - Alla Deronja~~
7. ~~Overhead Line with Inline Transformer - Vinod Sekhar / Wani Hakim~~
8. ~~Transmission Line with Grounded Bank Tapped on Line - Brandon Armstrong~~
9. ~~High SIR Electrically Short Line - Bruce Mackie~~
10. ~~Very Long Line - Adi~~
11. ~~Three Terminal Line with Outfeed - Josh Lamb / Adi~~
12. ~~Three Terminal Line with Weak Infeed - Don Fontana / Adi / Phillip Richardson~~
13. Transmission Line with Single Pole Tripping - Aaron Martin / Qun Qiu / Alla Deronja
14. Underground Cable Line - Demetrios / Mat Garver / Joerg Blumschein

D37: <u>Impact of Series Compensation on Transmission Lines</u>

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

D37 met on September 11, 2018 with 12 participants (7 guests and 5 signed members).

Meeting minutes of the D37 May 2018 meeting in Pittsburg, PA was reviewed and approved.

D37 Chair/Vice-chair provided updates on the existing report outline and structure based on input comments received from the WG members and guests on the past WG meeting.

WG members discussions related mostly to ensure outline items included covers all topics related to the WG assignment.

D37 chair/vice-chair will work on converting the existing document into the new PES format and will perform a check/correction on the figure format using as reference recently completed reports to ensure consistency thought the expansion and development of the report content.

D37 WG existing and new sign-in members committed to provide new assignments and/or review to existing section for the next January 2019 meeting:

Roy Moxley
- Provide draft on section 3.4.4. (Delayed Current Zero Impact)
- Provide review comments on the Fault Levels Section 3.3

Tapan Manna
- Research section 3.2.5 on current harmonic distortion on series capacitor.

Charles Henville

Provide references of reported events on BC Hydro for the section 5.2.1

Peter McLaren

Research a Manitoba Hydro directional line protection trip during series compensation bank switching operation for section 5.2.1

Luis Polanco

Research on three (3) Gas-Turbine Generator failures that occurred on south-america few years back to incorporate section 5.2.1

Provide review comments for section 5.2 (a&b) on motivation of upfront real-time dynamic simulator studies, and benefits.

Provide review for section 4 on planning for addition of series capacitors.

Nuwan Perera

Provide draft for the Section 7.2 on Faulted phase selection.

Provide draft for the Section 7.5 on Staged fault testing.

Normann Fischer

Provide draft for section 7.4.1 on New Technologies (Travelling Waves applications) and for section 3.2.3 on Low Frequency Oscillations.

Kamal Garg

Provide review comments for section 3.1 on Understanding series capacitors

Aaron Findley

Provide review comments on the 3.2.2 voltage and current inversion section.

Provide review comments on the 5.1.2 on Impact of the capacitor protection and bypassing mechanism on the line protection.

Mike Kockott

Provide draft for section 3.2.1 on Instrument Transformers placements

Provide review comments on the 3.4.2 Sub-synchronous resonance section.

Provide draft for section 7.1.1 on Impact of series compensation on the Permissive over-reaching Transfer Trip (POTT) scheme.

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

The WG report outline draft # is ongoing (1b)

D38: <u>Impact of High SIR on Distance Relaying</u>

Chair: Chris Walker
Vice Chair: Greg Ryan
Working Group Assignment: Prepare a technical report to the line protection subcommittee to evaluate the impact of high SIR on line protection.

D38 met on September 12, 2018. The meeting started with introductions.

Minutes Adi Mulawarman motioned. Craig Holt seconded

Craig Holt presented "Impact of Signal Error on Relaying"

We discussed the title and scope of the working group. We discussed High SIR or Signal Error and Distance Relaying or all relaying. The assignment already does not limit to distance relaying. We discussed changing the working group title to match the assignment and agreed to make that change.

Chris presented the outline and we began to discuss the paper and expanded on the outline.

Ted Warren will start on Inst OC section and will present at the next meeting.

42 Attendees: 16 members and 26 guests

For the next meeting we request a room for 50 attendees and a projector.

D39: Revise C37.104 IEEE Guide for Automatic Reclosing on AC Distribution and Transmission Lines

Chair: Manish Patel
Vice Chair: Brandon Armstrong
Established: 2018
Output: C37.104 – Guide for Automatic Reclosing on AC Distribution and Transmission Lines
Draft: 0.1
Expected Completion Date: 2022
Working Group Assignment: Revise C37.104 IEEE Guide for Automation Reclosing of Circuit Breakers for AC Distribution and Transmission Lines

Working group D39 met on Wednesday, September 12, 2018 at 9:30am EST in a single session with 27 members and 21 guests.

The meeting started with introductions. The patent slides were reviewed. No one knew of any patent issues at this time. The working group did not approve meeting minutes for the May 2018 meeting. Electronic vote will be conducted to approve May 2018 meeting minutes.

Ritwik Chowdhury gave a presentation on application of travelling waves for autoreclosing. The presentation was well received. WG members decided to add this application to the emerging technologies section of the guide. Ritwik Chowdhury to provide a brief write-up.

Additional items discussed are as follows:

1. Schedule – WG vote by May 2021 with initial ballot in 4th quarter of 2021.
2. Use of term “breaker” and “other interrupting devices” – WG decided to continue to use a term freely as appropriate in the guide.
    a. Matt Graver to expand section 4.7.3 to include “other interrupting devices”.
3. Reclosing following a bus fault – WG decided to remove most content and a provide a reference to the guide C37.234.
4. Considerations for autoreclosing near Wind and Solar generators
    a. Distribution connections – Jezzel Martinez to review related content in IEEE 1547.
    b. Transmission connections – Adi Mulawarman, Philip Richardson and Scott Elling volunteered to contribute to this topic.

Contributions are requested by November 30, 2018.

For the next meeting, D39 will need a room for 60 and a computer projector.

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D40: Manage the Development of Line Protection Topics

Chair: Jeff Barsch
Vice Chair: Don Lukach
Assignment: Manage the development of line protection topics and harmonize efforts with IEEE Std C37.113-2015, IEEE Guide for Protective Relay Applications to Transmission Lines.

The D40 working group met for the first time. There were 34 people in attendance, 17 of whom would like to be members and 17 guests.

The group discussed zone 2 protection. More information and possibly examples can be added to the guide related to coordination time intervals, margins for reach, relation to breaker failure timer settings, and multi-terminal and transformer-tapped line applications. A 2009 D4 WG report entitled "Applications of Overreaching Distance Relays" may be a good reference for some of this information.

The output of existing working groups D35 (Evaluation of Transmission Line Pilot Protection Schemes) and D38 (Impact of High SIR on Distance Relaying) may be applicable to the next revision of the guide. In addition, the output of task force DTF41 (Impact of Inverter Based Resources) may be something that could be added to the guide.

The following topics were also mentioned in discussion and may be useful additions to the guide. As an alternative, it was suggested that possibly a working group could create a report on 'special cases' of transmission line protection.

- Expansion on the subject of load encroachment and loadability as it relates to zone 3 reach
- Use of torque control for phase overcurrent relays
- Use of an overcurrent element which is supervised by a loss-of-potential condition
- Setting of the resistive reach for ground quadrilateral distance elements

The January 2019 meeting for the D40 WG will require a single session, computer projector, and a room for 40 attendees.

DTF41: <u>Coordination of activities related to line protection inverter-based sources</u>

Chair: Karl Zimmerman
Vice Chair:
Task Force Assignment: Investigate the need to form a working group to coordinate with the CIGRE activities and to provide guidance on the impact of inverter based sources on line protection

The DTF41 task force met for the first time. There were 18 people in attendance.

Karl Zimmerman handed out a copy of a proposed WG in CIGRE, as part of CIGRE Study Committee B5. The proposed CIGRE WG proposed a scope of activities to identify, review and explain protection issues related to IBRs, and to make recommendations on how IBR manufacturers should design the control systems to better accommodate relaying practices.

Russ Patterson and Evangelico Farantatos, members of CIGRE committee were in attendance, and both spoke of the intent and approach of the CIGRE WG, which also

led to broader discussion on other industry activities, including in PSRC C Subcommittee working groups on modeling and protection issues when connected to IBRs. There was broad agreement and interest amongst the TF members that we can contribute in several ways:

1) Collect and retain a repository of line protection events, when connected to IBRs.
2) Provide coordination for D Subcommittee to monitor and report on other activities within and outside PSRC.
3) Develop and make recommendations to IBR manufacturers for improved IBR models and characteristics more favorable for protection.

Thus, the TF proposes that the following WG be created:

D41 Coordination of Activities that Impact Line Protection Due to Increasing Penetration of Inverter-Based Sources

Proposed assignment : Monitor and collect line protection events, coordinate with other industry activities, and provide recommendations to improve protection response when connected to inverter-based sources.

The WG Chair will be Ilia Voloh.

Proposed WG will have a single session with 30 participants at January 2019 meeting.

During the subcommittee meeting, the title and assignment were modified. The new title of D41 is **Coordination of activities that impact line protection due to increasing penetration of inverter-based sources**

The assignment is to monitor and collect line protection events, coordinate with other industry activities, and provide guidance to line protection subcommittee to improve line protection response when connected to inverter-based sources.

The subcommittee approved the formation of the working group after a motion was made by Russ Patterson and seconded by Phil Winston. There was one dissenting vote. He thought the assignment was unclear.

Coordination Reports

T&D Committee / Distribution Subcommittee

The next T&D Committee / Distribution Subcommittee meeting will occur during the IEEE PES JTCM in Garden Grove, CA, 14-17 January 2019.

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 recirculated, 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
Mike Simms, Chair Suresh Gautam, Vice-Chair John Sell, Secretary

Work is resuming on P1885 'Guide for Assessing, Measuring and Verifying Volt-Var Control Optimization (VVO) on Distribution Systems'. Balloting is expected next year.

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

Continued working on the "Guide for Reliability Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment", P1806 with the plan to go to ballot in early 2019. A PAR extension will be requested.

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
None

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 September 12, 2018, 2018. The Chair announced changes in the Subcommittee membership. Three new members were welcomed: Hugo Monterrubio, Mario Capuozzo, and Dennis Holstein. Three members have indicated to the Chair that they will be departing: Rick Cornelison, Sam Sciacca, and Ray Young. The meeting continued with 24 members of 42 total and 44 guests, comprising a quorum.

Minutes of the May 2018 meeting were approved without objection (Motion: M. Benou; second: C. Preuss).

The Chair presented new several announcements

1. Announcements from AdCom
    a. New items from May 2018 Adcom Meeting
        i. WG Chairs with active PAR are required to attend Standards Coordination meeting on Tuesdays at 8am. If not able to attend, provide a report to PSRC Standards Coordinator
        ii. There will be an iMeet Training at January 2019 JTC
    b. New items from Awards and Recognition Meeting
        i. Standards WG Awards – a new procedure to request certificates of appreciation for completed (Approved Standard) work. These certificates have to be requested by the Chair or VC of the WG directly from the IEEE SA. The request for the SA certificates must be made at: http://standards.ieee.org/develop/awards/wgchair/wgawards.html

    c. New items from Standards Coordination Meeting
        i. New Roster Format is required for all meetings attendance to comply with GDPR
    d. 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. Please announce meeting's cancellations in advance
        iv. Standard format for SC H vote mailings (Subject line):
        PSRC VOTE REQUIRED SC H *[WG HXX]* (2014-1) by May 31, 2014

<u>WG business:</u>

WG H23 has completed its assignment with the publication of standard C37.248 (COMDEV)and the virtual completion of a summary paper. The Subcommittee voted to disband the WGwithout objection (Motion: E. Allen; second: B. Dickerson).

WG H41 invited members of the H3 WG to join.

HTF46 requested approval of the Subcommittee to form a new WG H46, subject to PARapproval by the Main Committee (Motion: C. Preuss; second:

B. Vandiver). The new WG H46 would be titled "Recommended Practice for Human Machine Interfaces (HMIs) used with Electric Utility Automation Systems" with an assignment to "create a recommended practice for Human Machine Interfaces (HMIs) used with electric utility automation systems."

Formation of a new task force HTF49 chaired by Solveig Ward to consider development of a "Tutorial on the Use of Packet-Switched Communication Channels for Protection and Control"was requested (Motion: D. Marigal; second: C. Preuss). The motion was approved without objection. It is noted that a subsequent WG recommended by this task force would most likely be a joint WG between the PSRC and PSCC Committees.

Formation of a new task force HTF50 chaired by Jim Bougie to consider "Requirements for Time Sources in Protection and Control Systems" was requested (Motion: R. Das; second: C.Preuss). The motion was approved without objection.

Standards Nearing Expiration:
The process of revising C37.232 (COMNAME) needs to start in 2019. A volunteer to chair aWG for reapproving the standard is requested. (A previous Task Force [HTF43] alreadyconcluded in September 2017 that the standard should be re-approved as is without changes.)

Old business:
None

New business:
Deepak Marigal asked the Subcommittee to gauge interest in a standard for optical relays.

Reports from the WG Chairs

H3: Time Tagging for Intelligent Electronic Devices (COMTAG)

Chair: W. Dickerson
Vice Chair: J. Hackett
Output: IEEE Standard, PC37.237
Completion Date: 2018 December 31
Current Revision: D1.01
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 full WG did not meet since the work of the group is mostly completed, we are in comment resolution phase and expect to submit to RevCom in October.
A small group of four members met to work on development of a conference paper.

H6: IEC 61850 Application Testing

Chair: C. Sufana
Vice Chair: B. Vandiver
Output: Report
Established: 1999

Expected completion date: January 2019
Assignment: Write a report to the H Subcommittee on application testing of IEC-61850 based protection and control systems. Emphasis will be on the GOOSE functions.

Introductions were done after a welcome by Chair Charlie Sufana. There were 13 members, 2 guests, and 1 officer present for the Sept 11, 2018 meeting.

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

The Chair began with a review of the report's status, it had to be converted to the new SA technical report format and this was an involved process. The chair reviewed the report with the WG and various edits were made and comments noted on other corrections required due to the reformatting. A few new references will be added to clarify issues of network PRP/HSR and timing concerns. A revised copy will be circulated to the WG attendees for another final review and vote in the coming month.

Once completed, it will be resent to the SC for final approval and posting. Once the Report is re-approved, the SC will be requested to approve disbanding the H6 WG.

H11: IEC/IEEE 60255-118-1, Synchrophasor for Power Systems – Measurements

Chair: K. Martin
Vice Chair: A. Goldstein
Output: Standard
Established: 2006
Par Expiration Date: 31-December-2018
Draft: 9
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 Tuesday Sept 11, 8:00 – 9:15 am.

The attendance was 10 members, and 9 guests. Attendees introduced themselves, and a sign-in was circulated. The chair made the patent announcement and reviewed the current status:

The IEC FDIS completed circulation with unanimous approval and a few editorial comments. The final approval was on Sept 10, and the draft was sent to the IEC editors for publication. The FDIS draft was submitted to IEEE by the July 27 deadline, and subsequently recommended for approval by RevCom at their Sept 6 meeting. Final approval from the standards board is expected from their September 27 meeting. Publication should occur within 2 months after that. A new paper outline was circulated after the May meeting. A few comments and 1 offer to write a section was received.

Aspects of the new standard were reviewed. The performance requirements are the essentially same as C37.118.1, mostly simplified and clarified. The reasons for producing the new standard are to meet IEC desire for a joint standard, clarify ambiguities, and simplify compliance testing without degrading the requirements. The IEC and IEEE versions are the same standard. The IEEE-SA still offers the old standards for sale. A vendor can claim compliance with any of the standards they

choose to as long as they do comply; an old standard may be deemed obsolete or superseded, but that does not prevent someone from using it.

In the meeting, the WG discussed the planned summary paper and different ways to present the material to make the standard known. After considering audiences and restrictions on presenting at more than one places, the WG decided to focus on regional relay conferences rather than the IEEE GM. The IEEE venues require original material for each conference and copyright which prevents using material at more than one place. Some regional conferences do not require original papers, so we can use the paper or variations of it to reach more prospective users of the standard. I. Voloh will provide the submission information for the 3 major relay conferences in North America. Gert Rietveld will submit an abstract to the CIRED 2019 conference (in Madrid, Espana). We will continue to explore other venues.

The WG discussed the prospective outline and decided to create a draft following the proposed outline. The following volunteers will lead the drafting of the major sections as follows:

I. Introduction – H. Kirkham

II. Synchrophasor, frequency, and ROCOF defs & derivations – K. Martin & K. Narendra

III. Evaluation of performance – D. Ouellette

IV. Summary of the performance tests – A. Goldstein

V. Extended performance options – B. Dickerson

VI. Future developments – B. Dickerson

There is no page minimum or limit. Section authors are encouraged to add figures. Assignments are due October 15.

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

H17: <u>Establishing Links between COMTRADE, IEC 61850 and CIM</u>

Chair: C. Brunner
Vice Chair: A. Apostolov
Output: Report
Established: 2010
Expected completion date: December 2013
Assignment: Develop a standards approach to link IEC 61850, CIM and COMTRADE so that the COMTRADE channels can be associated to a node in the power network.

No meeting and no report.

H22/C19: <u>Guide for Categorizing Security Needs for Protection Related Data Files</u>

Chair: Amir Makki
Vice Chair: Cesar Calix
Secretary: Hugo Monterrubio
Ballot Administrator: Rick Cornelison
Output: Guide - PC37.249
Established: January 2014
Expected Completion Date: December 2018
Draft: 10.0

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 10 members and 5 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 meetings from the last meeting were approved.

The Draft Guide has been assembled and was reviewed by the group.

The Group discussed filing for a PAR extension by October 15th. The need to modify the PAR was also discussed, to change the name of the Chair and Vice-Chair and also to modify the title to remove reference to joint effort with Substation Committee C19 as it no longer exist. Amir Makki was assigned action item to retrieve the latest PAR and submit for an extension to allow for completion of the project.

The document sharing requirements for I Meet Central were also reviewed. The Group agreed to avoid editing documents with the site editor, as it is not an optimal tool to track changes to the document.

The Chair requested that all members review the assigned assessments for each category in the Draft Guide and comment on reasonability.

H27: PC37.251 Standard for Common Protection and Control Settings or Configuration Data Format (COMSET)

Chair: Mario Capuozzo
Vice Chair: Benton Vandiver
Output: Standard
Established: January 2013
Estimated Completion Date:
Draft: 0.3

Assignment: Develop a standard file format for exchange of protection and control configuration data between engineering tools and asset management tools.
The working group met with 15 members and 6 guests in attendance.

The working group met with 12 members and 8 guests in attendance.

Meeting was called to order by the chair and introductions made. The patent slides were presented and reviewed. The chair recapped the last two meetings and then began review of a short presentation on 5 typical use cases for the proposed standard. The chair also reviewed all scope proposals and based on the complexities recommended to keep the scope focused on the key value pairs for the initial work and later expand the standard as required by the future industry use cases.

A brisk discussion of the range of this information by the WG resulted. Herb reviewed the CIM approach to handling vendor semantics and how to manage multiple identifiers of the same value pair for example. The goal is to have a definition that will work with any relay technology and not just focused on IEC 61850. The data

exchange via COMSET would rely on the application to properly interpret what each piece of data means to each vendor device.

In general, the WG agrees that the key value pairs are the core of the standard requirement but that logic, semantics, and other vendor data is also required to be addressed. The chair solicited writing assignments to the WG for contributions – Theo Laughner volunteered for providing DFR / PQ Meter data, James Formea wants to include relay logic and Mario suggests to use RDF (resource description framework) to accomplish it. Depak suggests IEC 61113-3 is an alternative since many vendors would use all or part of it for their logic design, but not all do. Advantages/ disadvantages were discussed till end of session.

Zach Makki was made Secretary of the working group.

Mario will schedule additional conference calls to continue the WG discussion to work on the outline of the draft and bring it to a general completion. Writing assignments are due in six weeks from those who volunteered.

Theo Laughner volunteered for providing DFR / PQ Meter data.

Craig Preuss agreed to assist with the Introduction section of the standard.

H30: IEC 61850 User Feedback

Chair: D. Maragal
Vice Chair: A. Martin
Output: Recommendation on formation of a Working Group
Established: September, 2014
Estimated Completion Date: N/A
Draft: 0.7

Assignment: Collect user feedback from utilities and consultants for designing and implementing IEC-61850 based substation automation system. Prepare a report outlining the experienced issues and suggest enhancements to IEC-61850 standard and manufacturer implementations.

The group met on Sep 12th with 8 members and 16 Guests.

Scope of H30 was mentioned to new attendees.

Interactions and feedback from PSRC's H30 to IEC Working Group 10 were discussed. These items were related to link layer reliability concerns and the mitigation options. The group discussed specific used cases to produced to highlight the need beyong HSR & PRP techniques. Further, group decided to further investigate in future the applicability of SDN and IEEE TSN technologies to achieve better reliability.

New York Power Authority's digital substation undertaking and testing plans were discussed. The need for extensive performance testing to quantitatively identify the group delays, latencies, frequency response, and sensitivity to protection functions. Some attendees questioned the need of testing as some of these requirements are mentioned in 61969-9 10 and 13. Chair replied: since much of this work is in progress, the merging unit products with new standard requirements are not ready

yet. Further, there is no official certification for 61869 standard. It became difficult the operational behavior with just referring to standard.

Due to the need of the hour, chair promised to include the detailed requirements of IEC 61850 test tools in next meeting..

H31: Common Protection & Control Parameters for COMSET

Chair: D. Maragal
Vice Chair: A. Apostolov
Output: Report
Established: September, 2015
Estimated Completion Date: September, 2020
Draft:3
Assignment: Develop generic models and parameters of protection functions.

The group discussed about the logic modeling aspects compared to the scope of H27 (COMSET).

Presentation was made by chair on IEC 61850 Modeling fundamentals. The general concept of logical node groups, logical nodes, CDCs, attributes were highlighted. Parameters of various commonly used CDCs were reviewed including SPS, SPC, DPS, DPC, CSD, INS etc.

The general relay model concept with input, output and settings was presented. Mapping of commonly used CDCs to the general relay model with input, output setting was highlighted.

The draft report (rev.3) spreadsheet containing all protection and protection related functions was reviewed. Members raised concerns in utilizing IEC 61850 nomenclatures as many are not aware. In this regard, references were made to supplemental explanation contained in the spreadsheet and the CDC characteristics.

For next meeting, group discussed to review overcurrent, undercurrent, overvoltage and undervoltage functions. Volunteers are expected to read relay manuals and identify all parameters both new and matching IEC 61860 models in input, output & setting categories. Following assignments were committed by members:

- Harsh Vardhan to read manuals from various GE relays and validate the models.
- Todd Martin to validate model parameters from SEL
- Ashok to validate models from Siemens
- Eugenio from Omicron to assist in model validation from any manufacturer of interest.
- Greg Rzepka to be contacted for SEL relays
- Peter Reitman from ABB and Antonio from National Grid to be contacted for ABB relays.
- New contact to be established from Schneider electric
- Eric Allen volunteered to review and provide comments for the initial version prior further investigation by others. A conference call will be setup in a month to review and assist in understanding of IEC 61850 models and parameters.

H32: Performance Requirements for Ethernet Circuits Applied to Teleprotection

Chair: K. Fodero
Vice Chair: W. McCannon
Output: Report
Established: September, 2014
Estimated Completion Date: 2019
Draft:8
Assignment: Develop a report on the use of Ethernet transport for teleprotection services and line current differential protection. This report will define the channel performance requirements for Ethernet transport systems / circuits that carry pilot protection communications.

No meeting. No Report

H35: <u>XML Translation for COMTRADE</u>

Chair: M. Adamiak
Vice Chair:
Output: Report
Established: May, 2015
Estimated Completion Date: December 2019
Draft: 10
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.

Discussion about getting a PAR and how we might interface with TC95 regarding the dual-logo COMTRADE standard. How will we go about creating the next version since this is a joint standard? Dr. Murty Yalla has volunteered to present our report at the forthcoming TC95 meeting.

Discussion on additions to the COMTRADE 2020: It was observed that many of the proposed changes and additions are centered on conforming to IEC 61850 and making COMTRADE an appropriate home for data for a wide range of time-sequenced data.

The rest of the discussion centered around Mark's presentation of the proposed requirements. Discussion topics included:

- Channel Definitions (Theo)
- Extensions to Channel ID (Mark)
- Backwards compatibility - including a Binary representation for today's tools.
- Support of rectangular and polar representations of Synchrophasors
- Unicode (UTF-8 or beyond?)
- Virtual Channels - mechanism for describing a channel derivation, need a flag to identify that a channel is derived.
- Theo: Header should include information about file origination (where it came from).
- Filenames: What is the advantage? - Amir The information allows you to track its lineage. Some editing recommended in the final version – Theo
    - Chairman addition: Source of the COMTRADE file should be included – specifically, inclusion of the Logical Device name. It is to be noted that COMNAME should be referenced for this purpose
- Suggestion: find a way to have configuration management so that the COMTRADE file identifies from whence it came. Leave the details to the PAR.

Amir - Date/Time should be included in the "path". See Chairman's addition above

- HTML should be used for the HHeader and images should be in SVG format
- Paul Myrda: Formalism for generating graphs from scratch.
- Big discussion on Combining Data (interleaving) in the same channel. The main agreement is that we should create channels with unique sampling rates and sizes.
- Mark: The emission rate is not an integer multiple of the sampling frequency.
- Amir: Record leap second pending as a digital channel.

General: make adjustments to the document based on the comments from the meeting

Mario - Flesh out how to track active settings with the fault report. Chairman's note: a field should be added to capture such in the CFG

Get final draft to Murty Yalla

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

Chair: J. Bougie
Vice Chair:
Output: Guide
Established: 2017
Expected completion date: 2018
Current Revision: D11.6
Assignment: This guide practice covers the design, installation and monitoring of time synchronization systems in power utility substations. This includes time sources such as Global Positioning Satellite (GPS) and time distribution systems such as Inter-Range Instrumentation Group -B (IRIG-B), Network Time Protocol /Simple Network Time Protocol SNTP (NTP/SNTP), and Standard Profile for Use of IEEE Std. 1588 Precision Time Protocol in Power System Applications - IEEE STD.

The WG met on Monday, with 4 members and 8 guests in attendance.

CHAIR'S REMARKS The Guide has been published.

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

AGENDA APPROVAL Agenda approved.
Future of WG: The WG will continue to meet for probably one more meeting with a goal of developing a summary paper and presentation for a presentation at the May PSRCC and various conferences.

Next "step": Held a discussion on the what would be the next item to be worked on. A significant discussion was held on writing a standard on clocks and specifically on GPS clocks. We also had a discussion on cyber security issues on the clock system. Also had a brief discussion on clocks in slave devices

The chair will provide an outline so that the working group can start on a paper for a presentation at the main PSRCC meeting in May 2019 and for presentation at various conferences. We will be looking for help with presentations at these conferences.

ACTION ITEMS: Jim B will be asking for a formation of a task force with a goal of starting a working work for writing a standard for time synchronization clocks used in utility power systems

Jim B will also be in contact with PSCC in relation to security related to time systems.

H40: Databases used in SAS

Chair: J. Bougie
Vice Chair:
Output: Guide
Established: January 2017
Expected completion date: December 2020
Draft: 1.3
Assignment: This recommended practice presents general requirements, design, and lifecycle costs versus performance for databases associated with substation automation systems. Also included are specifications for database elements that should be standardized to ensure interoperability. Example designs are included for reference purposes, which are not intended to prescribe a definitive database design. Applications utilizing databases can be very different and may have vastly different requirements.

The WG met on Wednesday, with 3 members and 7 guests in attendance. After introductions, IEEE IP Policy slides were presented. No IP related issues were raised. Quorum was not achieved. Minutes of the previous meeting will be approved electronically.

Discussion on the document scope followed. Galina Antonova (ABB) commented that at the previous meeting in May 2018 it was suggested to review and potentially narrow down the scope.

Anthony Johnson (SCE) explained the history of the document creation, and how initial contributions were made by Synchropasor community and NASPI group (North American Synchrophasor Initiative).

Jeff Shiles (SCE) explained the plethora of databases used for various purposes by utilities companies, and the need to clarify what specifically this document is focuses on. Jeff agreed to support his effort and encourage his engineers to get involved.

Jim Bougie, the WG Chair, explained that this document is intended to help protection engineers to discuss and negotiate their needs with IT department, similarly to H32 effort which is intended to help protection engineers to discuss communication needs with communication department.

Rebekah Goldman (BPA) agreed to reach out to BPA automation, IT and cyber security engineers and invite them to join this effort.

H41: Revision of IEEE 1646 Communication Delivery Time Performance Requirements

TF Chair: D. Holstein
Vice Chair: T.W. Cease
Output: Standard
Established Date: 2017 January
Completion Date: 2021
Assignment: Revise IEEE standard 1646-2004 – IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation"

The meeting cancellation was not announced by the WG Chair. Chair was not in attendance. As 6 people were present, the SC H Chair held the meeting. The Vice-Chair kept the attendance list.

There were 3 members and 3 quests in attendance. Quorum was not reached. Minutes of the previous meeting will be approved electronically.
Definition of delivery time was discussed. Mel Swanson is a terminology liaison for this group. He confirmed that a definition can have figures, if desired. One can also have a concise definition (2-3 sentences) and a more elaborate description in later sessions. Mal agreed to provide definitions and style guideline.

Discussion on Craig Preuss' s comments followed. Because of relation to COMTAG standard (on time tag location), it was suggested to invite WG H3 members to WG H41 meeting next time. Galina agreed to reach out to Bill Dickerson and Marc LaCroix.

Following standards maybe related to this WG effort and need to be reviewed: IEEE 1615 (PSCC P5), P1854 (currently in ballot in T&D), ITU-T Y.1564 (Ethernet performance) and RFC 2544 (Ethernet performance). Craig clarified that IEEE 1646 covers performance requirements but not how to perform the tests. IEEE C37.115 covers the testing part.

WG Members are to review the above documents to determine their relevance to the this standard.

H44: <u>Monitoring and Diagnostics of IEC 61850 GOOSE and Sampled Values Based Systems</u>

Chair: A. Martin
Vice Chair: Q. Yang
Expected Output: Guide
Established: May 2018
Expected completion date: January 2021
Draft:
Assignment: Determine if a working group should be formed to assess enhancing GOOSE I/O monitoring

Introduction – 18 Members, 3 Guests

New Working Group with new Par. No previous minutes.

Patent statement read – no comments

Policy statement read – No comments

Primary purpose of today's meeting is present how the LSVS (Sampled Value Supervision Logical Node) and LGOS (GOOSE Supervision Logical Node).

Herb presented LGOS

Herb presented a written description of LOGS. Members reviewed and made suggestions for updates.

Need a room for Garden Grove, CA with LCD projector and 25 people.

H45: Guide for Centralized Protection and Control (CPC) Systems within a Substation

Chair: R. Das
Vice Chair: Kanabar
Expected Output: Guide
Established: January 2018
Expected completion date: January 2022
Assignment: Explore the possibility of a Working Group to develop a "Guide for Centralized Protection and Control (CPC) Systems within a Substation".

The WG met on Sep 12, 2018 with 40 participants (33 in person and 7 remotely, with 11 members and 29 guests). Fourteen (14) guests expressed interest to join the working group.

Chair started the meeting by discussing the IEEE patent policy and other guidelines for WG meetings. Chair then presented the project plan discussed and approved during the May meeting.

WG then went over a draft outline based on comments received from members and guests after the May meeting. Members and guests will have till October 15 to provide their comments. WG will have a web meeting (tentatively planned on Nov 1) to discuss the outline and have an updated version to be finalized during the January 2019 Meeting.

We could not have the presentation planned and we will plan to have a presentation during the January 2019 meeting.

H46: Recommended Practice for HMIs used in Utility Automation Systems

Chair: C. Preuss
Vice Chair: M. Black
Output: Report to H subcommittee regarding expanding the HMI section of C37.1 into PC37.1.3
Draft:
Established: September 2017
Completion Date:September 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

HTF46 met on Monday 9/10/18 at 13:30 EDT with 28 total attendees: 7 members, 21 Guests. There were 6 attendees via Skype. The goal for this meeting was to review the working group vote and path forward.

The chair announced that the following approval votes were regarding the electronic ballot to approve draft 2.0 of the HTF46 report, we have approvals from the following members:

1. Matt Black
2. Craig Preuss
3. Mike Dood
4. Khalid Rahman
5. Mark Ziegler
6. Xiangyu Ding
7. Jasper Silknetter
8. Christopher Nowakowski
9. James Formea
10. Tim Farrar
11. Jay Anderson
12. Benton Vandiver
13. Chris Mazur
14. Ryan Newell
15. Bridget Fitzpatrick

The following have not voted:
1. Hamid Sharifnia
2. Luke Witek
3. Marc Lacroix
4. Raymond Arnold

With 15 of 19 members voting to approve, the report is approved via electronic ballot. The comments received with the approval votes will be passed along to the working group when it forms for consideration at that time.

The chair will put together the slide contents for PAR approval by the Main Committee. If approved, the working group will meet for the first time in January and accept new membership at that time, including voting members and corresponding members, where corresponding members do not have voting rights.

HTF47: <u>Impact of Digital Communications on Protection & Control Applications</u>

Chair: M. Kanabar
Vice Chair:
Output: Recommendation for WG
Completion Date: January 2019
Current Revision:
Assignment: to determine if working group should be formed on Impact of Digital Communications on Protection & Control Applications.

The TF Chair announced meeting cancellation in advanced, however, it remained in the large printed PSRC agenda and 12 colleagues attended. SC H Chair moderated the discussion and provided a summary to the TF Chair.

A brainstorming discussion tool place on what would be most useful for protection and control engineers. Various aspects of process bus and station bus technology were discussed. Various challenges, such as time synchronization, experienced in deployed projects were raised. The initial document provided by the TF Chair was updated with group's suggestions during the meeting. A number of topics were

suggested for inclusion. A number of standards and IEEE PSRC reports were suggested as references.

Participants suggested that an introduction to digital communications for protection and control, would be a useful scope to consider.

The group suggested to have a teleconference meeting before January 2019 meeting.

HTF48: Education/Outreach for Synchronized Measurements

Chair: W. Dickerson
Vice Chair: R. Midence
Output: TBD
Completion TBD
Current Revision: N/A
Assignment: Investigate the needs and opportunities for outreach and education regarding synchronized measurements, especially Phasor Measurement Units (PMU).

The Task Force met for the first time in Minneapolis. We had an excellent group of seasoned synchrophasor experts and newcomers. There ensued a lively discussion of how to approach the problem, and a number of important points were made.

The general consensus of the group was that this assignment might be addressed by a series of webinars, available either ad-hoc or on a scheduled basis, with the following emphases:

1. One for decision makers, explaining the benefits of synchronized measurements
2. One regarding the standards and conformity certifications available
3. One (or more) directed at practitioners, explaining the measurements and their usefulness and limitations

The group also thought that a forum attended/moderated by some of the IEEE Synchronized Measurement experts would be a welcome addition.

Note that right now, phasor measurement units are the primary target of this discussion; but that many other devices including DFRs, Merging Units, relays with event recording capability etc. also provide synchronized measurements with potential utility in numerous applications.

IEEE-ICAP representatives indicated that IEEE HQ could probably provide support in the way of helping with webinar production, and web hosting for the webinar(s) and perhaps forum. (With the appropriate caveats that opinions expressed are those of the authors and not of IEEE nor the authors' affiliated organizations...)

Liaison Reports

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

Power System Communications and Cybersecurity Committee
C. Preuss
No report.

HTF49: Tutorial on the Use of Packet-Switched Communication Channels for Protection and Control

Chair: S. Ward
Vice ChairTBD
Output: TBD
Completion TBD
Assignment:

HTF50: Requirements for Time Sources in Protection and Control Systems

Chair: J. Bougie
Vice ChairTBD
Output: TBD
Completion TBD
Assignment:

I: RELAYING PRACTICES SUBCOMMITTEE

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

I SC – Scope: "Develop, recommend and establish standards on protective relaying practices which are compatible with the electrical environment, including but not limited to; relay withstand capabilities to electromagnetic interference, characteristics and performance of instrument transformers, testing procedures, applications performance criteria, and definitions of relay and relay systems. Evaluate and report on pertinent aspects of protective relaying not addressed by other PSRCC Subcommittees. Maintain applicable protective relaying standards."

1. Welcome and Introductions – a new signup sheet was passed to the attendees
2. New members of the Subcommittee welcomed: Angelo Tempone and Marilyn Ramirez
3. Determine a Quorum (41 members total in I SC); 23 members and 8 guests, quorum was met
4. Minutes of the May 2018 meeting were approved
5. Coordination & Advisory Committee Meetings Items of Interest
    a. Attendee record! 266 including 26 newcomers
    b. Future Meetings:
        i. January 2019 – Orange County (Garden Grove) CA
        ii. May 2019 – Cincinnati OH
        iii. September 2019 – being finalized
    c. ***NEW*** Policies and Procedures for: Power System Relaying and Control Committee Working Group to be approved this year for use in 2019; draft will be sent to Subcommittee members by email for review
    d. Working Group sign-in sheets – new policy
        i. The following disclaimer is to be used on all sign-in sheets for our working groups; only Chair and Vice-Chair may maintain email addresses. Email addresses are no longer permitted to be placed on your sign-in sheet. Attendees must add their email address.

By choosing to attend and sign in to this meeting, you acknowledge and agree that your personal data will be documented for IEEE standards development purposes to comply with policies and procedures, legal and accreditation requirements, and evaluation of patent claims by patent offices. IEEE must capture your personal data for these purposes, and will provide information about activities related to standards development groups in which you participate. IEEE standards development participation is documented through various methods, e.g., rosters, submission documents, email reflectors, records of meeting attendance, responses to ballots, publicly available participation lists, and declaration of affiliations. See the IEEE Privacy Policy at https://www.ieee.org/security-privacy.html

e. 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.
f. ***Join.me*** is available for conference calls/screen sharing – Contact Erin Spiewak and an account can be set up for the WG/TF Chair
g. 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.
h. Looking for presentations for the Main Committee meetings – please contact Andre Uribe or Brian Mugalian. Many of our working groups have concluded their work and could be considered for January and May 2019.
i. For September 2018, I Subcommittee will have a total of 16 WGs and TFs
j. 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.

6. Administrative Items
    a. **IEEE Privacy Policy – any questions?**
    b. Working Group/Task Force roster template provided by IEEE
    c. 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. See examples provided of how to request at the Main Committee
        iii. Includes creation of a new PAR
        iv. Includes approval to proceed to IEEE-SA for creation of a balloting body or to proceed to sponsor ballot
        v. Includes changes to a PAR scope and/or purpose
        vi. 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.
        vii. The Subcommittee reviews it, and then the SC Chair **submits the PAR/name/ID number and reason for**

approval to the Main Committee Secretary to put in the slide deck. The slide is displayed while the SC Chair reads the request to the Main Committee members. A vote is then taken.

viii. Motion to approve the new or modified PAR is done at the Main Committee meeting
ix. PSRCC is the Sponsor
x. myProject™ Volunteer User Guide – good stuff https://mentor.ieee.org/etools_documentation/dcn/11/etools_documentation-11-0014-MYPR-myproject-user-guide.pdf

d. **Technical Report template for working group reports – please use for new reports**
e. From IEEE-SA: WG/TF Agendas and Minutes: "***The 14-calendar-day rule" – the Standards Association requirement in O&P***
f. Review Draft 1 of the PSRCC 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.
g. Make sure that on the Meeting Room Request (MRR) form for the ***January 2019*** meeting that you include "do not conflict with I50, D87, …"
h. As Chair or Vice-Chair of WG or TF, please contact Brian Mugalian and Andre Uribe ***if you cannot attend your session***. Do this when the PSRCC meeting agenda is sent, or during the update phone calls we have.
i. 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.
j. 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.
k. 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!
l. Email WG or TF Minutes *including membership list* to Brian Mugalian and Andre Uribe at: bmugalian@sandc.com and to auribe@powergridmail.com
m. PSRC Website – Email items to post on the I web pages to Brian Mugalian and Andre Uribe. Review your working group's officers and assignment. We will review and forward to: webmaster@pes-psrc.org
n. 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.
o. ***iMeet Central*** (formerly Central Desktop) is to be used for IEEE Guide/Recommended Practice/Standard documents with a PAR
p. Subcommittee Chair/Vice-Chair will hold progress report conference calls with each WG and TF Chair/Vice-Chair in ***December 2018***. Andre Uribe will set up the conference bridge for these calls.

q. 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
r. Standards WG Awards - The IEEE Standards Association Working Group Awards has a new Procedure to request certificates of appreciation for completed (Approved Standard) work. These certificates have to be requested by the Chair or VC of the WG directly from the IEEE SA. These awards can be shipped to our next PSRC meeting for announcement and distribution. The request for the SA certificates must be made at: http://standards.ieee.org/develop/awards/wgchair/wgawards.html
s. Reports/Paper Final Output – To be considered for PES level award the output of all Working Groups with a Technical Output including Technical Reports, Transactions/Journal and conference papers must be completed in PES Format and submitted and posted in the PES Resource Center.

t. Links to PES:

- PES Technical Resource Center: http://resourcecenter.ieee-pes.org/
- PES - Technical Report Template: https://www.ieee-pes.org/images/files/doc/tech-council/PES-Technical-Report-Template_Jan_2016.docx
- PES - Technical Paper Template: https://www.ieee-pes.org/templates-and-sample-of-pes-technical-papers

- PES Resource Center Submission Checklist with instructions on how to get your report or Paper submitted please use this link: http://ieee-pes.org/images/files/doc/tech-council/Submission_Checklist_PES_Resource_Center.docx

7. Working Group Reports

Reports from the Working Group Chairs

I2: Terminology Review Working Group
Chair: M. Swanson
Vice Chair: F. Friend
Output: On Going
Established Date: N/A
Expected Completion Date: N/A
Draft: N/A
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, September 12, 2018 with 8 members.

Quorum was achieved and minutes from the May meeting in Pittsburgh, PA 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.

A change in our process was discussed. The working group chair will send the working group approved draft to Erin Spiewak e.spiewak@ieee.org, IEEE SA, to begin the editorial review process in order to expedite the review process.

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

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

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

I4: <u>IEC Advisory Working Group</u>

Chair: E.A. Udren
Vice Chair: Jay Gosalia
Output: On going
Established: 1990
Expected completion date: Meetings are continuing
Draft: N/A
Assignment: Develop comments and votes for USNC of IEC on TC 95 (Measuring Relays and Protection Systems) standards projects and drafts. Report to PSRC on IEC Standards development.

The WG met on September 11, 2018 with 8 members and 2 guests to review TC 95 standards activities. There were no comments on the May 2018 minutes. Main discussion points are as follows:

- IEC 60255-118-1, Synchrophasor standard – US submitted vote in favor of circulated FDIS. IEC reports that standard has been approved.
- IEC 60255-27 Ed. 3 Product safety requirements – the new Edition 3 CD requires review and comments. The Chair noted a major legal issue with the overall requirement that a relay should never cause a hazardous condition, and we will submit this comment. Reviewers agreed to provide other comments on the draft.
- IEC 60255-26 Ed. 4 Electromagnetic compatibility requirements. A new CDV requires comments and voting by 9/21. The WG has reviewed earlier versions. Reviewers agreed to comment on the new draft. The WG held an extensive discussion on an issue raised by Chris Huntley – whether bit errors in protection signals like teleprotection data streams comprise failures of EMC tests. The attendees concluded that bit errors are allowed and that the functional behavior of the protection had to meet the Section 8 assessment table requirements. Bit error issues of other communications equipment, such

as Ethernet switches, is a separate issue addressed in other standards like IEC 61850-3 and IEEE 1613. Some application guidance may be needed in Part 26 or elsewhere. We also learned that IEC 60834-1, not previously known or accessible to most attendees, defines allowed bit error rates that result in a low (10e-6?) probability of false operation of protection.

- 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 had circulated an opening draft, presenting the existing state with proposed changes described. The Chair received no US comments; international comments have been circulated and made available. Contact Eric Udren to obtain review copies of the draft and the comments.
- TC 95 AHWG3 has issued a brief report on the study topic of relay response to sampled values from 61869-9 merging units. Analog properties like filter response to input transients or phase shifts are already addressed in 61869-9, but the report raises the concern regarding the lack of standardization of response of relays to data transmission errors, configuration problems, and failures.

The next TC 95 Plenary Meeting, and maintenance teams MT1-4 meetings, will take place in Frankfurt, Germany during November 5-9, 2018.

I26: Mathematical Models of Instrument Transformers
Chair: Mike Meisinger (S&C)
Vice Chair: Steve Turner (Electrical Consultants, Inc.)
Output: Report
Established Date: 2013
Expected Completion Date: N/A
Draft: 1.0
Assignment: Recommendation to update and expand mathematical models of instrument transformers and transducers, including interface electronics such as merging units, for use in both off-line and real time transient simulation. There are now new transducer types such as optical, Hall Effect and Rogowski coils in addition to improved models for conventional CTs, VTs and CVTs.

Dr. Sakis Meliopoulos gave a detailed technical presentation on modeling CT saturation using dynamic state estimation and can accurately estimate the primary current. This model covers from the source to the relay input and will be included in the working group paper.

The draft document is to be sent to all working members (**ACTION** – Amir Makki).

Alejandro Avendaño has been invited to attend the next meeting in California this coming January.

Vishal Patil of SEL is available to perform transient simulation.

14 in total attended the meeting and 10 members were present.

I27: Investigation of Protective Relay Self-Monitoring Capabilities

Chair: Roy Moxley
Vice Chair: Cathy Dalton
Established: 2014
Output : Standard through the SCC 21

Expected Completion Date: Jan 2019
Assignment:

I-27 Working Group met on September 11, 2018 PSRC meeting, 9:30am-10:45am Harriett.

I-27 met on Tuesday Sept. 11th at 9:30am. Attendance was not taken as only a few final editorial comments were reviewed. Notably NERC PRC-005-2 was referenced multiple places and includes figures in the document. PRC-005-2 has been superseded. All references in the paper were changed to reflect the updated standard of PRC-005-6.

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

Chair: Joseph Valenzuela
Vice Chair: Michael Higginson
Output: GuideEstablished: Sept, 2014
Expected Completion Date: October, 2018
Draft: 1.1
Assignment: N/A
The working group convened with 15 attendees, including 5 members and 10 guests.

The working group did not achieve a quorum.

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

The working group could not approve past meeting minutes because of the lack of quorum.

The working group discussed updates to the report since our last meeting. The figures have been updated, with help from IEEE SA. Jackie Wilson also prepared updates to the time-to-saturate section. Working group members requested the time-to-saturated plot replace the figures with dotted, solid, and/or dashed lines instead of symbols, and changes the Y-axis labels to read e.g. 3000 instead of $3x10^3$.

Mal Swanson let the working group know of a new procedure for expediting review and IEEE editorials. We are to submit the draft to Erin as soon as possible to allow SA to make edits in parallel with our internal and IEEE SA balloting.

The working group discussed our path to completion. We will have an internal ballot. After passing the internal ballot and addressing the comments, we will ballot through IEEE SA. We hope to have this complete to submit to Revcom by the October 2018 meeting to avoid the standard lapsing.

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: 6.0
Output: Revised version of C37.235
Assignment: Revise C37.235

I-30 met on Tuesday, September 11, 2018 with four members and five guests. A quorum was obtained.

The Patent Slides were reviewed and no patent concerns were brought forward. The previous concern by ABB that we need to soften the document language has been resolved through email and the document has been revised to reflect the desired language.

Brian Mugalian asked that he be dropped from member status due to schedule conflicts. Peter McLauren was moved to member status due to his consistent attendance and participation.

Ratan motioned and Peter McLaren seconded to approve the May 2018 meeting minutes. The motion was carried unanimously.

The group reviewed the document revisions suggested by ABB to soften the patent language, and no concerns were brought forward.

We had another large discussion on whether the integration of the output of Rogowski Coils was in scope of our document or out of scope, and the consensus was "out of scope."

We began reviewing comments received from LEM, and the Vice Chair expressed a concerns as to whether those portions of LEM's comments regarding shielding of field cables could possibly belong in Working Group I-38 (C37.92) rather than in I-30 . It was decided the leadership of I-30 and I-38 will discuss and decide before the January meeting.

The LEM attendee provided an overview of their product offering to the working group.

We are on Draft 06 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: Craig Preuss
Secretary: Jerry Ramie
Output: Standard
Draft: 0. 34Established Date: 05-Feb-2016 (PAR approval date)
Completion Date: 31-Dec-2020

I31 met with 21 local and 3 remote attendees (shown below).

The chair called the meeting to order at 8:03 am and reviewed the agenda. There were no objections to the agenda.

The copyright policy was reviewed.

The chair announced quorum was achieved with 10 members present.

The May meeting minutes were reviewed. Mike Meisinger made a motion to approve, which was seconded by Jerry Ramie. The chair announced unanimous approval.

After showing of the patent slides, no patent claims were made.

Under new business, the chair opened the topic of reviewing the output of the subgroup.

The proposed title, scope and purpose proposed by the subgroup were modified by those present at the meeting:

- Title: IEEE Standard for Environmental and Testing Requirements for Devices with Communications Functions in Electric Transmission and Distribution Facilities
- Scope: This standard specifies ratings and service conditions, environmental performance and testing requirements for devices with communications functions installed in electric transmission and distribution facilities. Environmental and electromagnetic compatibility (EMC) immunity levels and type-tests simulating electric transmission and distribution facilities are described. Acceptance criteria for evaluating device functionality are provided. Devices performing strictly protective relaying functions covered by the IEEE C37.90 family of standards are not covered by this standard. Where a device includes communication functions that support both protective relaying and non-protection functions, the most rigorous standard shall apply.
- Purpose: The purpose of this standard is to define the environmental and EMC conditions present in electric power transmission or distribution facilities and to establish a common reproducible basis for designing and evaluating devices to be installed in those locations.

Jerry Ramie made a motion to approve the revised title, scope and purpose, which was seconded by Mike Meisinger. During discussion, the three items were read for Claire who was participating via phone. The chair asked for a roll call vote of the members. The following members approved: Chris Goodney, Mark Simon, Claire Patti, Craig Preuss, Jerry Ramie, Brian Mugalian, Solveig Ward, Mario Ranieri, Mike Dood, Fred Friend, and Jay Anderson. The chair announced unanimous consent of the members present.

The chair requested two slides be made for presentation to the subcommittee and main committee meeting. The next steps are to determine whether Zone B should be removed or be at the same levels (so that all T&D equipment have the same levels). As an action item, Fred Friend can help liaison with the T&D committee to ensure the T&D committee agrees with any changes. Another action item is that Jerry indicated some further edits are still required. An action item is for Brian to review members and ensure all have access to iMeet site. The final action item is Jay requested use case information from Jerry and Ed.

Jerry Ramie made a motion to adjourn, which was seconded by Jay Anderson and passed without opposition. The chair adjourned the meeting at 9:07 am.

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

Chair: Andre Uribe
Vice Chair: N/A

Output: Report
Established Date: 15
Expected Completion Date: May 2019
Draft: 3.2
Assignment: To review report prepared by working group I11 in 2001 called "Survey of Relaying Test Practices" and update the survey accordingly to today's industry environment.

- The Working Group did not meet on Tuesday, September 11, 2018.
- The working group reviewed the subcommittee member's comments of the survey.
- We have two more comments to review and address.
- Chair will have a virtual meeting with members to complete the comments list.
- We expect to finalize the survey in January.

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

Chair: Amir Makki (Acting)
Vice Chair: Hugo Monterrubio
Output: Report
Established: 1/2017
Expected 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 I33 Working Group met on Wednesday September 12, 2018 in Minneapolis, MN with 3 members and 4 guests. There was not enough quorum to approve the May 2018 meeting minutes therefore a vote will be requested via email.

The following items were discussed during this meeting:

1. The WG has new permanent leadership with Scott Cooper taking over as Chair and Hugo Monterrubio as Vice Chair
2. The WG would like to request to the I SC Officers for guidance and recommendations on how to reset the WG membership. The I33 WG was started in 2015 and has been in influx without permanent leadership during the last year. The PSRC WG Directory lists 18 members however a large number of those members no longer attend this WC and some don't even attend PSRC meetings anymore therefore quorum will be very hard and possibly impossible to achieve.
3. The WG agreed to split the current list of 24 terms among 5 volunteers to do a thorough review and update of their definition and also look for any additional terms that the industry commonly uses during test procedures. The WG will discuss these in January.

Our goal will be to complete the assignment of the WG by the end of 2019.

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

Chair: Mike Dood
Vice Chair: Marc Lacroix
Output: Final version of the document
Established Date: 2017
Expected Completion Date: Dec 2018
Draft: 1.1
Assignment: N/A

I35 met with 5 members and 4 guests. We had a quorum.

The patent slides were shown to the participants.

We discussed an inquiry from C19 on harmonizing the definition of PDC in both of our documents.

We discussed in length how best to use this standard to designate a REF (restricted earth fault). It appears that different vendors designate this function in different ways. We concluded that we cannot change that but we can add REF in our suffixes to give stakeholders the option to document the function in that manner.

We voted to proceed with a PAR extension for 2 years.

We plan to go to ballot by very early 2019.

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

I36 met on Tuesday Sept 11, 2018 with four members and thirteen guests. Jeff Burnworth (vice-chair) chaired the meeting.

A quorum was not reached.

Reviewed SA - Patent Slide set for Standards Development.

Minutes of May 2018 meeting were not approved due to the lack of quorum. An email approval request of the working group will be performed.

A request from the EMC Society to be a joint sponsor has been received. Erin Spiewak discussed the actions required that include a working group approval vote and PAR revision. Since a working group quorum was not present, a proposal will be made at the I subcommittee meeting to approve pending a working group email approval vote.

Questions submitted by Craig Palmer of RFL were discussed and answered. Clarification for the meaning of digital pulse synchronization was discussed and added to the draft.

Draft revisions performed based upon prior ballot comments received were reviewed, discussed and approved.

Jerry Ramie provided a revised draft and gave a presentation of his proposed revisions to the standard. Working group discussions on elements of the proposed changes were had during the presentation.

No additional assignments were made, other than for the working group members to review the proposed changes submitted by Jerry Ramie, located on I-Meet Central, for approval or further discussion.

Assignments for revision of the standard are as follows:

1. Working group members – Review Jerry Ramie's proposed revisions and additions for the draft revision of IEEE C37.90.2.
2. Jeff Pond/Jeff Burnworth – Acquire working group member's approval via email for minutes of May 2018 meeting and acceptance of the EMC Society co-sponsorship.

I37: Revision to IEEE Standard C37.90-2005
Chair: Oscar Bolado
Vice-Chair: Marilyn Ramirez
Output: Standard
Established Date: 18
Expected Completion Date: N/A
Draft: 1.0
Assignment: Review of C37.90 Standard for withdrawn in 2021

Working Group Meeting No. 3
Assignment: Revision of C37.90 Standard for withdrawn in 2021

Working group C37.90 met on Tuesday, September 11 at 4:30 PM with 8 out of 13 members and 5 guests present. The following items were discussed:

1. Meeting agenda was reviewed.
2. Guidelines for IEEE – SA Meetings were reviewed and no comments were made.
3. Minutes of the May meeting were approved
4. PAR application completed in January had items missing. New additions were reviewed and approved.
5. The WG proposed to split the contents in section 5 and 6 between digital and electromechanical/solid state technologies. A new section 3 will be created with a definitions table.
6. Completed the review of discrepancies found between IEEE C37.90 and IEC 60255-1.
7. Jeff Burnworth volunteered to revise section 8.

With no additional business to discuss the meeting was adjourned.

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: StandardEstablished: January 2018
Expected completion date: December 2018
Assingment: Approved IEEE Standard C37.92, *Standard for Analog Inputs to Protective Relays from Electronic Voltage and Current Transducers*
I-38 met on Wednesday, September 12, 2018 with 5 of 7 members and 12 attendees total. The minutes from May 2018 were reviewed and approved.

After introductions, the Chair reviewed IEEE patent slides; attendees reported no patent concerns. The Chair then explained the status of the PAR submission, including Mandatory Editorial Coordination (MEC) and formation of a balloting body.

The IEEE SA MEC process has noted that the concise PAR wording of the Purpose for C37.92 differs from that in the expansive Purpose paragraph of the existing standard document. After discussion of possible response actions, and consultation with IEEE SA process expert Erin Spiewak at the meeting, the WG leadership decided to copy the expansive standard document text into the PAR and to resubmit the modified PAR. This will take place in advance of the October 15 deadline for the December NesCom review meeting. If the modified PAR is accepted as we expect, the balloting process and balloter review will commence in January 2019. Feedback on the existing draft of C37.92 should be available for discussion at the May 2019 WG meeting.

ITF39: Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDS)

Chair: Craig Preuss
Vice Chair: Angelo Tempone
Output: Standard
Established: January 2018
Expected completion date: September 2018
Draft: 3.0

Assignment: Review report that needs to be submitted to the committee to initiate a Work Group based on the need expressed by the members of the Task Force in the subject of Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs).

ITF39 did not meet this session.

ITF40: Rreview of IEEE C37.90.1 – Standard for Surge Withstand Capability (swc) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

Chair: Jeff Burnworth
Vice Chair: Bruce Mackie
Output: Standard
Established Date: Sep 2018
Expected Completion Date: Dec 31, 2022
Draft: N/A

Assignment: To determine if IEEE C37.90.1 – Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus should be revised.

Task Force ITF40 met on Tuesday, September 11, 2018 at 3:00am CDT in a single session with 13 members and 1 guest.

After introductions, the patent slides were reviewed.

The current standard was reviewed. The chair discussed an error in the current standard that had been corrected with an erratum. In addition, the chair stated references will have to be updated included three that were noted. A discussion ensued regarding the different tests required between air insulated substations (AIS) and gas insulated substations (GIS) substations.

The EMC is interested in joining the working group as a co-sponsor.

The chair will draft the scope and PAR and send to the members before the next meeting.

ITF41: <u>Review of IEEE C37.90.3 - IEEE Standard Electrostatic Discharge Tests for Protective Relays</u>
Chair: Steve Turner
Vice Chair: Open
Output: Standard
Established Date: September 2018
Expected Completion Date: N/A
Draft: N/A
Assignment: N/A

Ten members attended the meeting.

There is a lot of interest to form a working group and there are new recommended practices such as how to test communication pins (i.e., ANSI C63.16). The last revision occurred in 2001. Note there is a motion to open the document for revision.

Here is a partial list of items that require revisions to update the standard:

- Section 3.2.3 – Review wave shape
- Section 3.2.4 – Figure 3
- Section 3.2.5 – test points should be the weakest points
- Section 3.2.6
- Section 3.4 - Add a sample
- Bibliography (e.g., IEEE 100 is no longer available)
- Definitions (coordinate with WG I2)
- Annex A
- Annex B
- Annex C should reference IEC 61000-4-2 Electrostatic Discharge Immunity Test Standard
- Annex D (Eric Udren will provide voltage levels for testing from the new draft for IEC 60255-22-2)

We need members from utilities.

8. Liaison Reports

INSTRUMENT TRANSFORMER SUBCOMMITEE

The next Transformers Committee meeting will occur October 14 – 18, 2018 at the Hyatt Regency Jacksonville Riverfront, Jacksonville, FL.

C57.13 “Standard Requirements for Instrument Transformers” published January 2016.

C57.13.2 “Conformance Test Procedure for Instrument Transformers” working on revision.

Section 7.5 was discussed concerning if the section should be removed or not. Zoltan Roman made motion to reference C57.13 Rudy Ogajanov seconded this motion. Unanimous approval was given by those in attendance.

Section 8 was regarding insulation system acceptance was discussed. Igor Ziger is to review wording and perhaps propose next text. Thomas Sizemore is to review the referenced ANSI/UL 1446 document. Once text changes are worked on between Igor and Thomas as survey will be sent out for comment.

Section 9 which covers production monitoring was discussed. Huan Dinh suggested the addition of partial discharge as a required test to this section. Igor Ziger made a motion and Arnaud Martig provided a second to add PD in this section. This was unanimously accepted by the attendees.

Section 9 was also discussed with respect to third party monitoring (by UL, CSA inspectors, etc.) was discussed but no conclusion was reached to make a change to this item. More discussion may take place in the future to clarify this language.

C57.13.5 "Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above” revision in process.

The first item of business was related to the survey made on the temperature rise test methodology for current transformers. The results showed that we did not get consensus on the actual edition methodology. A new proposal has been made by the Chair, this proposal is inspired from IEC 61869-1 and IEC 61869-2 wording but an exception has been made to gas-insulated current transformers rated 550 kV and above. In addition, the minimum duration of the temperature rise test has been decreased from 5 times the thermal time constant to 3 times the thermal time constant.

Dry-type current transformers rated 550 kV and above will be added with the same criteria as oil-filled current transformers.

A motion to approve the revised Chair proposal as amended during the meeting was made by Zoltan Roman and was seconded by Igor Ziger. The Chair revised proposal has been approved unanimously. The agreed wording will be part of next Draft 1.6.

The second item of business was related to the comments received on Draft 1.5. Among the subjects discussed, the following additions of modifications will be made to Draft 1.5:

- A reference to IEEE Std. 4 will be made;

- Maximum system voltages will be aligned with C57.13;
- The wording regarding background noise during partial discharge test will be the same as used in C57.13. Moreover, if IEEE C57.160 is adopted before the publication of the new edition of IEEE C57.13.5, then the reference will be changed from IEC 60270 to IEEE C57.160;
- "Pd intensity" will be change for "Pd level";
- TPS class called in Annex D will be deleted.

D1.6 will be issued before the next meeting, this will be the last round of comments within the WG and SC membership. It is planned to request from the Subcommittee an approval for Sponsor Ballot at the upcoming meeting in Jacksonville, Florida.

As a new business, the internal arc test procedure has been discussed. The description of the fuse wire location may need to be improved. Igor Ziger will make a proposal as soon as possible. In addition, an additional rated current for the arc protection classification will be added. This rated arc protection current may equal to or lower than the rated short-circuit withstand current. This rated value will need to be added to the nameplate.

Zoltan Roman made a motion to add informative wording in Annex D in order to recommend the use of polymeric insulators when an arc proof protection class is specified. His motion was seconded by Igor Ziger. The motion was accepted unanimously.

C57.13.6 “Standard for High Accuracy Instrument Transformers”, published in 2010, no activity.

C57.13.7 “Standard for Instrument Transformer with max output of 250ma” balloting complete, comment resolution.

C57.13.8 “Station Service Voltage Transformers” is working on Draft 3

TF work has begun to revise the CCVT standard, proposed as IEEE C57.13.9 (previously C93.1)

- Clause 4.4.1.1, 8.3.10, 8.4.3, and 8.4.7.6 were accepted as per the changes requested in the returned comments.
- Clause 8.4.5 it was agreed to use NEMA 107-2016 as the reference document replacing NEMA CC-1.
- Clause 8.4.3 It was agreed to use the lightning impulse clause in C57.13.5.
- Clause 8.4.7.6 it was agreed to remove the reference to thermally upgraded paper.
- Clause 8.5.2.1 it was agreed to refer back to Clause 12.2 of C57.13.5
- David will send out a survey on clause 7.3 to determine if the clause will reference

C57.12.90 and what % impedance will require internal inspection, 2% or 7.5%

David will reword the Short Circuit portion of Table 12 to reference C57.12.00

Time expired before all of the comments could be reviewed. If time is permitting during the Instrument Transformer Sub-committee on Wed 3/28, the WG will reconvene to try and address the remaining comments and the result of the survey.

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

An objective is to harmonize with the IEC and CSA as much as possible. There were discussions for and against the offered voltage changes:

- Arnaud Martig explained the Trench opinion that the higher voltages requirements are preferred due to the higher frequency duties of CCVTs.
- Zoltan's opinion is that the BIL requirement insures that capability.
- A user comment supported the higher voltage because of the uncertainties of aging and capacitor characteristics.
- A user comment that existing standards have worked for 345 and 765 units in service in his experience.
- The survey will be transmitted again with additional items.
- Zoltan moved on to the next agenda item and his many proposed edits as Draft 3. As before red text in Draft 3 is material not yet reviewed.
- Added Figure 1 schematic diagram to illustrate the definition of the EMU.
- Added section 6.2 capacitance and dissipation factor of the stack and noted the ambient temperature specification is important.
- Annex F
- Unrestricted Page 6 of 8
- Table 7 now has corrected pd extinction voltage values per C57.13. Further question whether to use 13.5 or IEC values instead, so the proposed values will be Question 2 added to the next survey.
- Table 8 range of C was changed to 100 nF.
- There was a good bit of participation and discussion about Section 6.4 and whether the EMU could be disconnected during test. Considerations were:
- EMU can be tested as a separate physical unit
- 12 to 20 kV rating of EMU does not require pd test
- Manufacturer does not want to have to build the whole unit in order to test EMU
- May push the test capabilities of the manufacturers
- And note that it would be a routine test

The issue of disconnecting the EMU for CCVT pd testing is Question 3 of the next Survey.

Section 6.5 RIV Table 9 was added as no RIV requirements are in 13.5. Some discussion about the need for 72.5 kV and below specification and Igor said not using would harmonize with 13.5 and IEC.

Section 6.6.2 was added with the intent that primary transients are not transmitted to the low voltage side. 6.7.2 is where the review of Draft 2 ended, but needs further review.
Moving on to new items the review of the Draft 3 continued:

Section 7.1.1 is from the line tuner standard for CCVTs as is the new table just above Table 10.

Table 10 has burdens Q and T added. Burdens W through ZZ are the same. There were no comments.

Last topic touched was ferroresonance requirements.

9. Old Business

    a. 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***

10. New Business

    b. New Task Force ITF42 "Scope Revision and Naming of the Subcommittee". Assignment: revise and align with the PSRCC scope. Meeting Room Request submitted for January 2019

        i. Call for members

    c. Subcommittee Officers: ***Effective January 1, 2019, the new Subcommittee Chair will be Andre Uribe, and New Vice-Chair will be Jim Niemira***

J: ROTATING MACHINERY PROTECTION SUBCOMMITTEE

Chair: D. Finney
Vice Chair: G. Kobet

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 16/32 members and 13 guests, reaching quorum.
May 2018 J SC meeting minutes were approved.
10 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: **17th Meeting**

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

The working group did not meet. The report has undergone subcommittee ballot and comments are being reviewed by the working group.

Meeting requirements for January 2019, room for 20 people.

J12: <u>Improved Generator Ground Fault Protection Schemes</u>

Chair: Dale Finney
Vice Chair: Manish Das
Established: Jan 2013
Output: Report to subcommittee
Status: 16th Meeting
Assignment: To review new methods related to generator ground fault protection.

WG Report

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

The WG met on Tuesday Sept 11, 2018 with 10 members and 7 guests.

There were no comments on the minutes from the May meeting

The WG has begun the WG ballot. The latest version and the ballot was sent out on August 20th.

So far 3 ballots have been returned.

The comments associated with the first ballot were reviewed. All of the comments can be easily addressed.

J12 members are urged to review and return their ballots as soon as possible.

The working group will have its 17th meeting in Jan 2019, with the need for a single session, computer projector and seating for 30 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 in a double session with 15 members and 11 guests present. A quorum was achieved.

The minutes from the Pittsburgh meeting in May were approved.

Juan Gers presented an email from PSDPC noting that Bikash Pal stated he would be a guest member of J13 on behalf of PSDPC, noting PSDPC is aware of the J13 report.

As proposed in the May meeting, in the first session, Juan Gers reviewed the example based on actual data for a generator. Sample simulations were performed with and without controls modeled including governor, AVR and PSS, to demonstrate the impact on settings. Cases studied included faults that resulted in both stable and unstable swings, with and without AVR controls, as well as a simulated loss-of-field condition. The results were incorporated into a review of the protective relay settings such as the loss-of-field element and out-of-step element. The differences in results with and without controls were noted and discussed. For the stable cases, rotor angle damping was very similar, voltage recovery with control was quicker and to a higher level with controls, as expected.

For the unstable cases, the impedance trajectory with controls has a tight and consistent circular characteristic, where without control the initial impedance trajectory has a much larger diameter on the first pole slip, with subsequent pole slips having a smaller diameter approaching the diameter of the cases with controls applied. The reason for this is unclear, but the application for the working group is to consider whether the protective element settings would be different with controls and without controls. Conclusions included “For stability simulation, the representation of generator protection is necessary.”

Juan Gers will provide the presentation slides to the working group members.

The chair reviewed the latest version of the report up to the end of section 2. Dale Finney will review the comments on the Simulink example from Bikash Pal. Charlie Henville. proposed to clarify the reference to the LOF schemes 1 and 2 by using the terms positive and negative offset mho. Dale Finney said that coordination of the UEL should be the priority when setting the 40 element. Charlie Henville. proposed a resolution by adding that the UEL should coordinate with the GCC and the 40 element should coordinate with the UEL.

Juan Gers will correct the single blinder figure to remove the reference to the manufacturer. Charlie Henville recommended that the function 81 be included in the list of protection functions to be considered in this report and he will propose some text. Gene Henneberg pointed out that, in his experience, web meetings can expedite the review process.

The consensus of the working group was to have a single session in January but a WebEx session in November.

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

J14: <u>Plant Protection Issues Associated with Black Starting of Generators</u>

Chair: Chris Ruckman
V Chair: Zeeky Bukhala
Established: May 2014
Output: Report to Subcommittee
Expected Completion: January 2017
Status: 12th Meeting

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

WG Report

The working group held its twelfth meeting on Tuesday, September 11th, 2018 with 6 members and 4 guests in attendance.

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

I. Vice Chair kicked off the meeting at 4:40pm with introductions.

II. Minutes from the May 2018 meeting were circulated.

III. Status Update

a. Paper is complete and circulated for balloting.
b. Some comments have been received.
c. Discussion on how to handle balloting for retirees and other inactive members. Suggestion was to email them requesting their vote, and if no responses, they can be moved to non-voting status.

IV. Section Review: None

V. General Discussion: Chair shared another example of a battery-based black start example.

VI. Next Steps:

a. All members to submit their votes (approve, provisional approval, or reject).
b. Chair/Vice Chair will incorporate comments as necessary and forward to J subcommittee.
c. There will be at least one more meeting to wrap up any pending comments.

VII. 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: 11th Meeting (180110)
Assignment:

- **WG Report**
- The working group did not meet, will meet in January 2019, single session, room for 30 people.

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

Chair: Nate Klingerman
Vice Chair: Sudhir Thakur
Established: 2016
Output: Guide
Status: 7h Meeting

The group met on September 12, 2018 in Minneapolis, MN with 20 members, and 9 guests in attendance. Quorum was not achieved.

The chair stressed the important of attendance, and will reach out to members who have missed three or more of the last five meetings to request either renewed commitment or withdrawn membership.

The Chair presented the patent slides, no claims were made.
Reviewers of the previous sections were asked to present their findings for the awareness of the working group. Discussions followed related to reviewed sections (including grounding of multiple machines, legacy or outdated schemes, and improved selectivity with high impedance grounded machines).

The Chair presented 12 new writing assignments and asked for volunteers. The tasks are documented below for the record, and can also be found on iMeet.

Task	Assignment
1	Silvio Roesler
2	Jason Espinosa, Dale Finney
3	Ritwick, Nader, Joe Xavier
4	Ritwick, Derrick Haas
5	Nate, Ryan Carlson, Chris Ruckman
6	Nate, Ryan Carlson, Chris Ruckman
7	Nate, Ryan Carlson, Chris Ruckman
8	Nate using Wayne's write-up
9	Dale Finney
10	Kelvin Barner, Nate
11	Vinod
12	Vinod

The WG requests a single session with space for 35 people with a computer projector for January 2019 session. The WG also requests no conflict with other J meetings, especially J17 (C37.102).

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: 5th WG meeting, Minneapolis, MN
Expected completion date: December 2021 (initial sponsor ballot by January 2021)
Assignment: Revise C37.102 Guide for AC Generator Protection

WG Report

Working Group J17 held its meeting in a double session on Tuesday, September 11, 2018. This was the sixth in-person meeting for this working group.

There were 23 out of 39 members present across both sessions; a quorum was reached. 16 guests attended the meeting. 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.

Minutes from the May 2018 meeting will need to be approved by email.

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

In the absence of the Chair, the Vice Chair then began by initiating a review of comments received for subclauses 4.8, 4.9, 5.1, 5.2, 5.3:

- Subclause 4.8 Excitation system protection
    - Editorial comments by Onur Usmen were accepted.
    - Gary Kobet noted that transformer winding temperature is listed in Table 1 but is not addressed in the following subclauses. Jason Espinosa provided a plot of a 49 element against time overcurrent elements.
    - Mike Thompson commented subclause 4.8.2 seems to address unrelated issues (short circuit protection and unbalance protection). Derrick Haas volunteered to rewrite.
    - Gary Kobet commented the statement in 4.8.2 about 10:1 voltage range needs explanation and a reference.
    - The group agreed subclause 4.8.4 is confusing and needs clarification on which overcurrent is being addressed: DC field overcurrent or AC alternator/transformer/rectifier overcurrent. A figure may need to be added.
    - Jason Espinosa requested assistance from Randy Hamilton on figures related to excitation system protection.
    - Randy Hamilton volunteered to review the entire subclause and provide comments.
- Subclause 4.9 Power transformer protection through mechanical fault detection
    - The group reviewed comments by Zeeky Bukhala and Hasnain Ashrafi. It was noted that the material in the related subclauses 4.9.1, 4.9.2, 4.9.2.1, 4.9.2.2 was addressed in C37.91, and that C37.91 has an excellent treatment of unit-connected differential protection.
    - After much discussion, the group decided to strike subclauses and remove the words “through mechanical fault detection” from the title, leaving a single pointer to C37.91.
- Subclause 5.1 Current transformers
    - The group review comments by Zeeky Bukhala and Hasnain Ashrafi. Again it was pointed out that much of this material is treated in C37.110. Zeeky and Hasnain agreed to review. The result may be similar to subclause 4.9 and C37.91.
    - Chris Ruckman agreed to review the J14 report on blackstart issues and provide recommendation on including material related to current transformers for subclause 5.1 of this document.
- Subclause 5.2 Voltage transformers

- Wesley Gross commented that this section does not address applications that use a single set of VTs to feed all devices including relaying, voltage regulator, etc. Kelvin Barner agreed to added subclause 5.2.2.3 to address.
- The group reviewed comments by Zeeky Bukhala and Hasnain Ashrafi.
- The group agreed to rewrite subclause 5.2.1 to remove statements on common practice and VT connections and focus strictly on what happens when a fuse blows, due to conflicting practices across the industry based on the experience of those in attendance at this meeting.
- Subclause 5.2.1.1 was retitled "…using electromechanical relays". The group agreed to rewrite the second paragraph to acknowledge electromechanical voltage-balance relays do not have adjustable sensitivity settings.
- Subclause 5.2.2.1 was rewritten to acknowledge the use of secondary resistance loading as a separate solution from using line-to-line rated VTs.
- Subclause 5.2.2.1 was also rewritten to acknowledge that not all GCB VTs have ferroresonance suppression.
- Jason Espinosa and Dale Finney will rework figures in subclause 5.2

- Subclause 5.3 Protection during start-up or shutdown
  - Ratan Das reviewed his comments, mostly editorial, but there was extensive discussion over his proposed paragraph below figure 74 that mentions the use of current based frequency tracking. Ratan stated this is an ABB patented method. The group decided to not use the word "preferred' when mentioning this option.
  - Gary Kobet mentioned in section 5.3.1 that some plants use capacitors in the neutral of SFC started machines to block DC to avoid saturation of magnetic elements.

Subclause 5.4 Inadvertent energizing will be reviewed at the next meeting.

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

J18: <u>Impact of Inverter based sources on Rotating Machines</u>

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

The working group did not meet.

Next meeting:

January 2019 meeting requirement, room for 20, single session.

JTF1: IEEE Std C37.106 Guide for Abnormal Frequency Protection for Power Generating Units

Chair: Ritwik Chowdhury
Vice Chair: TBD (likely after TF turns to WG)
Output: PAR
Draft: N/A
Established: May 2018
Status: 2nd TF meeting, Minnepolis, MN
Expected Completion Date: Sep 2018
Assignment: Develop and submit a PAR for C37.106

WG Report
It was the second meeting for our task force with 19 attendees. A quorum was reached. The minutes from the previous (May) meeting was approved.
We communicated the status of the PAR with the working group. NESCOM met on September 6th and Adi is presently checking the status of the PAR.
We went through some parts of the document Draft 1.0 and developed assignments in preparation for revision of the guide.

1. Visio Drawings: Vinod and Dale would help with that. Ritwik would get in touch with Gabriel to check if there are any drawings from the previous version.
2. Two 46 levels: Ritwik will check with Zeeky if the manufacturers provide any guidance to set two 46 levels, one for nominal frequency operation and one during abnormal frequency operation.
3. References: Onur would look through the various references (such as C57) to make sure the information being referenced can be found, make edits and update the references with the latest available information.
4. GSU Voltage Drop Example: Steve, Will and Jason will go through the example to improve clarity (readability) and accuracy (with respect to existing PRC and other available guidance).
5. GSU Overexcitation: Jason, Onur and Chris will suggest some verbiage that can address the use of GSU HV PT's for GSU over-excitation protection.
6. 81ACC: Nate and Kelvin will check with Duke documents what their practice is for the accumulator abnormal frequency bands, and whether it makes sense to update the guide based on latest available information.
7. NERC PRC: Daniel will address the issue raised by the J3 report on clarification desired from C37.106
8. NPCC: Daniel will also go through NPCC (B.1) Criteria
9. WECC: Vinod will go through WECC (B.2) criteria
10. ECAR: Will will address B.3
11. FRCC: Jason will update Section B.4 with the latest guidance available from FRCC
12. ERCOT: Derrick will go through ERCOT criteria

There was good discussion on all the above topics. Any discussion related to SSR is deferred until input from JTF2 and/or J18. The membership list will be updated when the task force converts to a working group.

Next meeting:
Single session, a projector and a room for 20. Request no conflict with J12, J16, J17 and J18. Next time, need an amendment to the name in the schedule, there was some confusion among attendees.

The JTF1 task force made a motion to make JTF1 a working group (J19), contingent on NesCom approval of the PAR, which should be completed September 27, 2018. Motion seconded by Ritwik Chowdhury. Motion carried. Ritwik Chowdhury will be Chair. Candidates for Vice-chair are being evaluated.

JTF2: Protection Issues Related to Subsynchronous System Oscillations
Chair: Normann Fischer
Vice-Chair: TBD
Output: ?
Established: May 2018
Status: TF

JTF2 met for its second meeting with 6 participants.

The WG chair could not attend and the meeting was run by the J SC chair.

In this meeting, the WG went through the review assignments for 8 papers.

Conclusions:

- Several papers covered SSO applications to real systems while others modeled hypothetical systems.
- There are several ways to mitigate SSO. A protection solution is necessarily the best solution but in some cases, could be the least expensive and easiest solution.
- Solutions were proposed using a number of devices including relays, disturbance recorders and PMUs. Other papers did not propose solutions or provided a solution but with very little details.
- Due to the nature of SSO, detection can be a challenge for some devices
- Some papers described severe events that would need to be addressed quickly. Others described SSO events that could evolve over several hours.
- Impact of SSO could include damage to rotating machinery, other power system elements and a loss of system elements (generators, lines, transformers)

For the next meeting, Vinod Yedidi and Ritwik Chowdhury will review two new papers.

Daniel Lebeau will send a new paper.

The working group will have its 3rd meeting in Jan 2019, with the need for a single session, computer projector and seating for 30 people.

Dale Finney noted overlap between J18 and JTF2. J18 covers cycling of thermal plants but this is not a protection issue. The proposal is to combine JTF2 and J18, completing JTF2 and modify the assignment for J18. This proposal will be considered at the January meetings for both J18 and JTF2.

Liaison Reports:

Electric Machinery Committee - M Yalla
Murty Yalla attended PES General Meeting in Portland and attended EMC.

Proposal to merge C50.12 and C50.13 was voted down. C50.13 was revised in 2014. C50.12 (salient-pole machines) - PAR approved, work has started. Revise considering new grid codes. Where do wind turbines belong? Murty will be monitoring C50.12 revision and note any applicable changes to C37.102.

Industry Applications Society (IAS) / Industrial & Commercial Power Systems (I&CPS)
Marcos Donolo has been attending IAS/I&CPS meetings, but could not attend this meeting so no report.

Nuclear 1E WG - Prem Kumar
No report - Prem Kumar did not make these PSRC meetings.

Old Business:
Per Hugo Monterrubio, a new process for IEEE-SA awards is in-place. Technical reports, transactions papers, etc must be in PES format and posted in the PES Resource Center in order to be eligible for awards.

New Business:
J5, J12, J14 close to finishing. Some ideas for new working groups:

1. Use of protective relays and DFRs to monitor generator controls: Pressure, field quantities, from AVR, other signals etc fed into protective relays so relevant information would be in the same device(s) as the protection functions. May assist in post-event analysis.

2. Application of auto-synchronizers

3. Motor protection tutorial

Since JTF1 becomes a working group J19, Ritwik Chowdhury is now a member of the J subcommittee.

Dale Finney read an email with a query to the J subcommittee. The query concerned a 13.8kV steam unit with bus ground faults due to moisture ingress. 59G picked up but dropped out before tripping because the faults are intermittent arcing ground faults. The fault evolved to a multiphase fault resulting in significant damage. The subcommittee agreed the J12 report will address this problem and should mitigate.

Mukesh Nagpal shared an event of a phase-phase fault caused by lightning on a 500kV line. The result was maximum dc offset of 26kA. The generator protection misoperated due to CT saturation resulting in generator (525MW unit) differential trip simultaneous with line protection which cleared the fault in 3 cycles. If breaker had been slower than 3 cycles, the dc offset may have damaged the generator breaker because of the long time constant.

K: SUBSTATION PROTECTION SUBCOMMITTEE

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

The K-Subcommittee met on September 12, 2018 in Minneapolis, MN with 25 of 32 members and 46 guests in attendance. A quorum was achieved. Don Lukach requested a motion to approve the May 2018 subcommittee meeting minutes. Pat Carroll made the motion, Abu Bapary seconded. Vote was unanimous to approve.

Advisory Committee and other items of interest were discussed:

- Webinars have been requested to speed up WGs. See Kathy Dalton for help.

- Attendance sheets are not to have email addresses on them unless participants volunteer addresses giving consent to use them.

- When a WG is complete it is the responsibility of WG Chair/ViceChairs to apply for IEEE certificates. Don Lukach to send a note with the appropriate url addresses for both PAR related work via IEEE-SA and report related work via IEEE-PES.

- Terms such as should, shall, must, etc are restricted to the type of document, i.e. Standard, Recommended Practice, or Guides. Don Lukach to send some guidance to K working group Chairs/ Vice-Chairs. Also, the IEEE-SA editorial group will be supplying pre-ballot reviews upon request to assist us for the PAR documents. Discussions were held with the I Subcommittee to establish a standing editorial working group to review reports per the new PES style templates prior to subcommittee balloting.

- P&P Manual changes are forthcoming. Major changes to membership classifications are expected.

1.

- Don Lukach informed K Subcommittee that his assignment as Chairman will be completed at the end of 2018. Bruce Pickett will be moving to Chairman and Jeff Barsch accepted the Vice-Chairman role. [Post meeting the PSRCC Officers notified the Chairman that due to extraordinary circumstances the Chairman will be Jeff Barsch and the Vice Chairman will be Adi Mulawarman.]

- **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 8.2c

Assignment: To write a guide for the application of Protective Relaying for Phase Shifting Transformers (PSTs). The protection methods for different types of PST and operating conditions of PSTs will be reviewed. Representation of PST models to determine short circuit currents for relaying considerations will be considered. Protection CT sizing and location issues will be considered. Relay application and setting examples will be provided.

The K1 working group met in a Double session. 9 members and 6 guests were present. After the introduction, a call for quorum was made, quorum was achieved. A motion was made by Anthony Seegers, and seconded by M.

Thompson to approve the minutes of the last meeting in Pittsburgh, and the motion was approved. A motion was made by Randy Crellin and seconded by Abu Zahid to approve the minutes of the June 12 WebEx meeting, and the motion was approved.

The current draft of the document is 8.2c.

The Chair thanked the WG for their participation. The final draft 8.2c has been sent to IEEE SA REV Com for their approval at their next meeting on October, 15th 2018.

The following was discussed:

Lubo Sevov summarized the process and the results after the balloting and recirculating the Guide draft. He noted there were 124 comments and four negative ballots during the SA balloting. He also noted the resolution of the comments, and the subsequent recirculation of the draft. Three of the four negative ballots were withdrawn after the changes. The one negative ballot was resolved by the WG, but was not withdrawn as the balloter did not log any response during the recirculation of the draft, as well as no response was obtained during the attempts to contact him. The draft has been submitted to REVcom for final approval.

Lubo Sevov noted there were some concerns with the figures that he submitted. He spoke to two SA editors at the September Standards Chair meeting and they advised that the submitted Visio and Word files with figures should be OK.

Don Lukach noted that the standard still has to go through SA editorial process and there may be a need to keep the group together in case is needed to review any editorial comments after the RevCom review.

Preparation of a summary paper was discussed. It was agreed to form a new working group to prepare a summary paper for presentation at various protection conferences.

No meeting of this WG is requested at this stage for the January JTCM meeting.

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

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

K10 met on Tuesday at 11:00AM. There were 8 members and 8 guests in attendance.

We had a virtual guest speaker, Dr. Andy Hoke from NREL, who is the chair of 1547.1. He presented the how the changes in 1547 are going to be handled by the testing standard 1547.1. The current track is to have 1547.1 balloted by early next year, to be ready for publication in late 2019. The next 1547.1 meeting is being hosted by SCE October 9th-11th. The registration link is: http://www.cvent.com/events/2018-p1547-1-p1547-2-working-group-meetings-october/event-summary-e8831c91edfb4a76bed737e93b723145.aspx. The 1547.2 working group will meet at the conclusion of the 1547.1 working group meeting.

During Dr. Hoke's presentation, a question was asked regarding if 1547 or 1547.1 included cyber security to prevent unauthorized settings changes. Mark Siira agreed to give a more complete answer which follows as such. IEEE 1547 is focused on defining the communication interfaces for the interconnection. This means that the DER is required to have the capability to provide data and communication. The requirement is set by the distribution utility, who will also specify security, protocols, etc. This will be controlled through the three step verification process – Design Evaluation, Installation Evaluation and Commissioning. At each of these steps settings are verified to the utility interconnection agreement. If settings are changed outside the initial verification, the DER system may have to be recommissioned.

Bob Cummins mentioned that NERC is completing some work related DER performance requirements. He will send the information to Ben for distribution to the group once it is available.

Finally, Mark Siira reviewed other SCC21 activities as summarized below:

IEEE P1547.2 (*Application Guide for IEEE Std 1547*)

Two initial P1547.2 (Application guide for IEEE Std 1547) were held in conjunction with P1547.1 WG Meetings. We anticipate Monthly web meetings to resume in late October 2018. PSRC members would be a big contributor to this working group.

IEEE P1547.9 (Guide for Energy Storage Systems …)
Michael Ropp is appointed chair and Charlie Vartanian is Sectretary of IEEE P1547.9)

The first IEEE P1547.9 meeting will be at the February 26-28 2019 meetings at NERC's offices in Atlanta, GA. We are passing around a draft outline of IEEE P1547.to the WG officers. At this time we welcome inputs from anyone regarding items that people feel fall into or outside of the scope of IEEE P1547.

IEEE 2030 Series

IEEE 2030.4 (*Guide for application of the IEEE 2030 Smart Grid Interoperability Reference model*)

IEEE 2030.9 (*Recommended Practice for Planning the Design of the Microgrid)*

Review and feedback from select SCC21 members will provide feedback in early September to Entity working group. Particular attention paid to consistency or reference to IEEE 2030-2011 and IEEE 2030.7-2017.

IEEE PV Standards

5 PARS were submitted to initiate Sponsor Ballot for Solar PV Energy Storage Standards. These projects are needed to update the current recommended practice to reflect improvements and changes in industry technology and processes. We will involve the IEEE SCC21 members and IEEE PES ESSB members to review these and provide comments. No changes will be made to the approved document prior to this ballot. These comments will provide valuable feedback on the validity of these documents and identify gaps. It is anticipated that these will be submitted to RevCom in October 2018.

IEEE P937 (*Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems*)
IEEE P1013 (*Recommended Practice for Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems*)
IEEE P1561 (*Guide for Optimizing the Performance and Life of Lead-Acid Batteries in Remote Hybrid Power Systems)*
IEEE P1562 (*Guide for Array and Battery Sizing in Stand-Alone Photovoltaic (PV) Systems)*
IEEE P1661 (*Guide for Test and Evaluation of Lead-Acid Batteries Used in Photovoltaic (PV) Hybrid Power Systems*)

Transmission interconnected Solar PV

The IEEE Power & Energy Society (PES) Energy Deployment & Power Generation (ED&PG) Committee has approved at its July 2018 meeting in Portland to sponsor, jointly with the IEEE PES Electric Machinery (EM) and IEEE Power System Relaying and Control (PSRC) Committees, a new IEEE P2800 series of projects for transmission- and sub-transmission connected inverter-based resources (BPS-connected IBR), including a performance standard (P2800) and a test, verification, and model validation guide (P2800.1)

For the next meeting we request a single session in a room that can accommodate 20 persons. Please avoid scheduling conflicts with C36 and C38.

K11: Open Phase Detection for Nuclear Generating Stations

Chair: Charlie Sufana
Vice Chair: M. Urbina
Output: Report
Draft 7.20
Assignment*:* Write a report to the K Subcommittee entitled Methods for Analyzing and Detecting an Open Phase Condition of a Power Circuit to a Nuclear Plant Station Service or Startup Transformer.

Introductions were done after a welcome by Chairman Charlie Sufana. There were 2 members, 3 guests, and 1 SC officer in attendance for the September 12, 2018 meeting in Minneapolis.

The minutes from the Sept 13, 2017 K11 meeting were read and approved. The working group also saw the patent slides and no objections were noted.

Charlie then went over the report draft 7.10. The report was put into the new IEEE style format and the Working Group went through the entire document to see if there were any obvious problems. Some corrections were made.

It is hoped that the final version of the report can be completed in about a month so that the Working Group can vote. Once the working group has voted and any issues cleaned up, then the report will be sent to the K Subcommittee for their consideration to allow the report to be posted to the PSRC webpage. The K Subcommittee Chair has requested that the Working Group provide a draft for balloting as soon as possible.

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

Respectfully submitted by Charles Sufana K11 chair

2 Members that attended

Last Name	First Name	Membership	Company	Affiliation
Warren	Ted	member k11	Southern Company Services	Southern Company Services
Sufana	Charles	member chairman k11	Retired	Retired

3 Guests that attended

Last Name	First Name	Membership	Company	Affiliation
Farrar	Tim	guest k11	TRC	TRC
Janssen	Brandon	guest k11	Mid American Energy	Mid American Energy
Niemira	Jim	guest k11	S&C Electric Co.	S&C Electric Co.

1 K Subcommittee officer

Last Name	First Name	Membership	Company	Affiliation
Pickett	Bruce	K SC Vice Chair, member k11	ECF	ECF

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 (SUB I9 holds PAR, and has extended it past 2018).
Draft 19.0
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 Working Group K12 met on Wednesday, September 12, 2018 with 2 members and 2 guests. Quorum was not met.

The K12 meeting minutes from January JTCM meeting with the Substations I9 Working Group was reviewed. The meeting minutes will be approved after the meeting through email.

- The meeting notes from the May meeting in Pittsburgh were reviewed.

- The current draft of the Guide is 19.0, and the K12 Working Group reviewed revised Figures 1 – 7 and associated sections of the Guide. The WG noted that revised Figure 1 is not complete, and better identification of primary, secondary, and backup relays is needed. In either Figure 6 or the text associated with it, the WG would recommend that transformer and bus protection should be applied as separate systems, whenever possible.

- There was some confusion on whether Section 4.8 centers on HV or MV equipment. Much of the discussion seems to center on MV equipment, but the associated figure shows HV equipment.

- The next K12 meeting will in January 2019 in Garden Grove, CA. This may be a joint meeting with Substations WG I9.

The requirements are a single session, a meeting room for 20 people, and a computer projector.

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

Chair: Ilia Voloh
Vice Chari: Luis Polanco
Established: September 2013
Draft 1.13
Assignment: Revise IEEE C37.116 "Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks**".**

K13 did not meet. Their work was approved at REVCOM in September, 2018 and is expected to be published after the IEEE-SA final editorial review.

See New Business for disbandment motion.

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: 13
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 19 members and 16 Guests on September 12, 2018 at the Hyatt Regency, Minneapolis, MN.

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.

The Vice Chair explained the newly enacted requirements for attendance sign in and read the IEEE- Security – Privacy statement. A new sign-in sheet was circulated to ensure the privacy policy is adhered to.

Quorum was achieved throughout the meeting.

Minutes from the May 2018 meeting in Pittsburgh - motion to accept by Brian Boysen, second by Pat Carrol motion unanimously approved.

Draft 12 had been sent to the WG for consensus and returned with over 75% approval. Many technical comments received were discussed and accepted. Several assignments were made to clarify Fig 4 (Will English) and Fig 22 (Ritwik Chowdhury) and also to edit text in 6.3.3 (Mike Thompson), 6.4.3 (Tom Beckwith) and 7.2.3.2.1 (Mike Thompson).

A planned webinar is to be scheduled to finalize the remaining outstanding technical comments.

Having no more business a motion to adjourn was made by Don Lukach and second by Brian Boysen.

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

Avoid WG conflicts with K22.

K17 Geomagnetic Disturbances (GMD)

Chair: Qun Qiu
Vice-Chair: Luis Polanco
Draft: 6.0
Assignment: To submit a WG report to the PSRC K Substation Subcommittee evaluating the performance of protection systems during Geomagnetic Disturbances.

K17 met on Tuesday September 11th 2018 with 21 participants (14 guests and 7 signed members).

Meeting minutes of the K17 May 2018 meeting was previously approved via email.

Chair presented report progress, latest comments resolved and updated document.

Chair provided went over the updated outline of the report, discussed major comments received during a WG conference call in August, related to the capacitor bank protection, GIC blocking device, etc.

Chair requested WG members and volunteers to provide editorial review of the WG report with the focus on identifying inconsistencies, formatting discrepancies, typos or grammar errors.

Chair/vice-chair will follow up with team members on any additional comments due by mid-November 2018, to make sure to stay on schedule, incorporate all comments into a Final document and to circulate within the WG members for approval.

The next steps are to have January meeting for reviewing final report, discuss and resolve any comments and submit to K Subcommittee.

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

The WG report draft # is 6.0

Avoid conflicts with D35, D39

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: 2.15
Assignment: To revise and update C37.108-2002 –Guide for the Protection of Secondary Network Systems.

1. Chairman Adi Mulawarman began the meeting with introductions. The sign up sheet was distributed, patent slides were shown and no patent issues were mentioned.
2. Nine out of sixteen members attended, there were 22 total attendees including guests and a quorum was achieved.

   The previous May (Pittsburg) meeting minutes were approved by vote after a motion by Robert Frye and a second by Don Lukach.

   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.

   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.

Bruce Mackie reported that he has corresponded with Travis Spoone from the Eaton company about statements made in appendix C. Travis indicates that his company is actively looking into some of these issues. His company is not concerned with statements of section C-2 as they are instead applying a full circuit breaker with CTS included for those types of applications. They are also not concerned or working on issues described in section C-3.

Adi stated that if further updates to these sections are wanted by anyone they must be submitted within the next 2 months timeframe.

Jim Van de Ligt presented his recommendations and corrections to the annex B fault calculation example. There was discussion about proper values for impedance of this size transformer. Jim explained that if the transformer impedance is changed to 5.75% and the total low side fault current (3ph) is 170,000 amperes then the numbers make sense in the example and these match the diagram. The group agreed and the example will be updated in the latest draft.

Mike Conrad mentioned that new network protector devices that claim to prevent backfeed might be limited to two seconds duration.

There was discussion about if the document is ready to be presented to the K18 workgroup for a vote to go to ballot. K chair Don Lukach warned that the IEEE SA will enforce its policy that certain words such as “must” and “should” and “shall” are not allowed to be used in a IEEE guide. Robert Frye recommended that the chair send out a .pdf file of the current document after the must, should, and shall, words are corrected as a final review before requesting a workgroup vote.

Adi agreed to send out the pdf document and he will give members two months to respond, to provide their final comments and make any editorial and or technical recommendations.

Roger will update roster.

For the next meeting we will request room for 20 people.

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

Chair: Randy Crellin
Vice Chair: Michael Thompson
Established: January 2017
Output: Revise C37.112
Draft:3.0 (recirculated Draft 3.0)
Expected Completion Date: September 2018Assignment: To pursue the renewal of C37.112

The working group did not meet during these meetings. This standard was originally written in 1996, reaffirmed in 2008, and expires the end of this year.

Over the summer, we re-balloted the document with revisions addressing comments that we received during the initial ballot. We successfully re-balloted the document with 110 balloters in the pool, had a 90% response rate, which was greater than the 75% minimum requirement. We received a 100% approval rating and 10 additional comments. Nine of these comments were editorial in nature.

We met with Michelle Turner, the Manager of Content Production and Management, with the IEEE Standards Association, and discussed the remaining editorial changes. The necessary documents have been submitted to RevCom for the December 4th meeting.

For the next meeting, we will not need to meet, but would like to keep the working group together in case we need to provide a final review of the IEEE document before publication.

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

Chair: Abu Bapary
Vice Chair: Alla Deronja
Established: September. 2016
Output: Revise C37.324
Draft: 4.0
Expected Completion Date: September, 2019
Assignment: Revise and ballot IEEE Standard C37.234 prior to its expiration in 2019.

The WG K22 met on Tuesday, September 11th with 27 voting members, 1 corresponding member, and 10 guests.

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 quorum was met so the May 2018 and June 21 (webex) meeting minutes were approved as follows:

May 2018 minutes - motion: Brian Boysen; second: Don Lukach; vote: approved.

June 2018 minutes - motion: Jim O'Brien; second: Ian Tualla; vote: approved.

The future timeline for completing the present guide revision was discussed. A desire of the WG is to complete the revision before the current 2009 version of the guide expires in September of 2019. It may or may not be possible, but K22 working group is trying to achieve that goal. The WG agreed to have monthly webex meetings before the January 2019 meeting to finish addressing all the review comments received.

The status of received and outstanding assignments was discussed. The assignment tracking spreadsheet showed that all sections of the guide had been reviewed.

The following assignments have been received:

- Ratan Das reviewed Annex A
- Jeff Barsch removed figures 25 and 26 and made citations to appropriate papers on waveforms in high impedance differential circuits.

- Rene Midence reorganized clause 7.1 to improve the organization of the discussion of the various differential current schemes.
- Ilia Voloh wrote a contribution on centralized and decentralized bus protection.

The WG reviewed Rene's 7.1 reorganization. No comments were made, and a decision was made to have it reviewed by few more volunteers.

Ilia presented his contribution on centralized and decentralized bus protection to the WG. He will provide the complete titles for the references he used to be added to Bibliography. No comments were made, and Charlie Sufana agreed to review it.

The following reviewing assignments were made.

- Charlie Sufana will review 5.4 *Centralized and decentralized bus protection*.
- Joerg Blumschein, Kent Ryan, and Abu Zahid will review 7.1 *Differential methods*.
- Joerg Blumschein, Adi Mulawarman, and Hillmon Ladner will review Appendix A *High-impedance bus differential application and setting example*.

New assignments are requested by October 15, 2018.

The first webex meeting will be scheduled at the end of October after the review assignments have been received. Based on its progress, potentially two more meetings will be scheduled in November and December.

We request a single meeting with room for 50 and a computer projector for January 2019 with no conflicts with WG K16, K21, and C31 & C35.

Liaison Reports:

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

The subcommittee did not meet recently.

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

Fred Friend reported on highlights from recent activities. The report is attached to the minutes.

Old Business:
None

New Business:

Lubo Sevov motioned to form a working group that would develop a summary paper based on the K1 working group's update of C37.245. Abu Bapary seconded. Vote was unanimous to approve. Working group will be K24. Chair will be Brandon Davies. Vice Chair is TBD.

Ilia Voloh motioned to disband K13 as their work is complete. Will English seconded. A summary paper will not be developed as the changes were minor. Vote was unanimous to approve.

Alla Deronja motioned to from a task force that would investigate the need to revise C37.109 IEEE Guide for the Protection of Shunt Reactors. Steve Conrad seconded. Vote was unanimous to approve. Task Force will be KTF26. Chair is Kamal Garg and Vice-Chair is Ilia Voloh.

Meyer Kao motioned to from a task force that would investigate the need to revise C37.99 IEEE Guide for the Protection of Shunt Capacitors. Jeff Barsch seconded. Vote was unanimous to approve. Task Force will be KTF25. Chair is Meyer Kao and Vice-Chair is TBD. Requested conflicts to avoid are D38, J17, D40, and K16.

A motion to adjourn was made by Mike Thompson, seconded by Roger Whittaker and passed unanimously.