POWER SYSTEM RELAYING AND CONTROL COMMITTEE
OF THE IEEE POWER AND ENERGY SOCIETY
MINUTES OF THE MEETING
May 7-10, 2018 Pittsburgh, PA

A. Call to order/ Introductions Pratap Mysore

Chairman Pratap Mysore called the meeting to order at 8:00 am on Thursday, May 10, 2018.

All attendees introduced themselves. A quorum check was conducted and it was verified that the quorum was met with 65 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. A call for motion to approve Jacksonville, FL 2018 meeting was made by Bob Dempsey and seconded by Gene Henneberg. Meeting minutes were approved unanimously.
2. The financial status of PSRC is in good standing.

C. Chairman's Report Pratap Mysore

The joint meeting with IEEE Power Systems Communications and Cybersecurity (PSCC) committee in Pittsburgh had one of the largest attendees for the May meeting. We also had a record number of new comers at this meeting. Thanks to all the participants and attendees in making this a very successful meeting. Cathy Dalton and Mal Swanson are recognized for their efforts to publicize our activities and to keep in touch with recent attendees encouraging them to participate in PSRC activities. I take this moment to thank all utilities, manufacturers, consulting firms and all other organizations for supporting their employees who contribute to our success.

I am sad to report that we recently lost two past members of our PSRC community this year - Professor James Thorp and Harley Gilleland Jr.

As was mentioned in a tribute to Prof. Thorp, *"He has been a towering figure in Power Engineering Research community with many very significant papers (more than 200) and books to his credit. To his students and colleagues, he was a great mentor making them better professionals and better persons".* He will be remembered for his contribution to PSRC, academic community and the industry and we deeply miss him.

Harley Gilleland was an active member of PSRC who contributed to documents associated with instrument transformers. We deeply miss him.

I wish you all a great summer and I am looking forward to seeing you all in Minneapolis, Minnesota in September. I am sure that you will enjoy the fall weather and excellent downtown surroundings.

Sincerely
Pratap Mysore

Reports of Interest

A. Report from the Vice- Chair – Russ Patterson

a. Technical Paper Coordinator's Report.

- Thirty-nine (39) conference papers were reviewed. Seventeen (17) were accepted.

b. Future Meetings

- January 2019 JTCM meeting will be held in Orange Grove (Anaheim)CA.
- May 2019 IEEE PSRC meeting will be held in Cincinnati, Ohio.

B. CIGRE B5 Activities Report – Rich Hunt

CIGRE Report
Rich Hunt
May 10th, 2018

CIGRE has approved the addition of a second regular member from the U.S., focusing on distribution activities, for Study Committee B5. This member will be announced as Mladen Kezunovic.

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. Contributions from the Next Generation Network (NGN), the CIGRE USNC young professionals' organization, are encouraged.

The call for papers is out. Complete papers (not abstracts), written in the CIGRE format, must be submitted by July 27th, 2018 to GOTF@tamu.edu. Complete details can be found at: http://cigre-usnc.org/grid-of-the-future/ .

New CIGRE Working Groups

CIGRE has approved two new working groups in areas of interest to PSRC members. These are:

WG number: B5/D2.67
Name of Convener: Yubo Yuan (CN)
Title: Time in Communication Networks, Protection and Control Applications – Time Sources and Distribution Methods

WG number: B5.65
Name of Convener: Dr. Farfilho (Brazil)
Title: Enhancing Protection System Performance by Optimising the Response of Inverter-Based Sources.

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

CIGRE 2018 General Session

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

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

C. IAS Power System Protection Committee – No report

D. IEC Report - Eric Udren

IEC REPORT

E.A. Udren

TC 95, Measuring Relays and Protection Systems
TC 95 creates IEC protection system standards – electrical and physical environment type testing, design, safety, and functional behavior. Technical work is carried out by Maintenance Teams (MTs) and by Working Groups led by 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 60255-1: **Part 1** - ***Common requirements*** – the USNC is reviewing a new committee draft for vote (CDV), with vote and comments due on June 15. We are focused on the gaps of substance between 60255-1 and IEEE C37.90; Oscar Bolado, Chair of C37.90 revision WG, is helping. Anyone wanting a chance to review and comment on this draft should contact Eric Udren for a copy.
- IEC 60255-26 Ed. 4: Measuring relays and protection equipment – **Part 26 - *Electromagnetic compatibility requirements***. IEC has circulated the

international compilation of comments from the Feb. 23 deadline on the last committee draft (CD) of this document. We await the next CD or a CDV.

- IEC 60255-181 ED1, ***Functional requirements for frequency protection*** – CDV was successfully voted and the FDIS will be issued shortly.
- IEC 60255-118-1, ***Synchrophasor standard*** – CDV was successfully voted and the FDIS will be issued shortly.
- 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.
- IEC 60255-21, ***Vibration, shock and seismic tests: Part 21-1 – Vibration tests; Part 21-2 – Shock and bump tests; Part 21-3 – Seismic tests*** - MT3 has begun a project to revise these standards. An opening draft (not yet an official CD) has been published, presenting the existing state with proposed changes described. Most vendors could be impacted by any changes to these type-testing standards; this early stage of development is the best opportunity for US and North American input to standards development. Contact Eric Udren for a review copy.
- 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 under Normann Fischer set up to deal with this when CD arrives.
- TC 95 Ad Hoc Working Group (AHWG) 3 on relay response to sampled values data streams from 61869-9 switchyard merging units - these digital measurement sources, with their relay-independent input filtering and sampling synchronization schemes - impact functional behavior and standards. The AHWG has identified issues for protection applications and has created documentation as basis for a WG activity to guide relay developers.
-

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 Fall Winter-January, 2018

PSR Standards Coordinator's Report May, 2018

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

RevCom = Revision of existing standard
NesCom = New Standard

IEEE Privacy Policy change in effect May 25th
(Refer to Data Privacy for IEEE Data Managers)

ANSI recently notified IEEE of a change to the ANSI/IEEE license agreement for the publication and sale of National Adoptions of ISO and IEC Standards (NAIS). Effective immediately all new or revised adoptions of ISO and IEC standards by IEEE must include a U.S. national forward and national branding on each page. Active marketing and sales of all new or revised adoptions outside of the United States is also not permitted.

These changes to the ANSI/IEEE license agreement are inconsistent with IEEE-SA's position as a developer of global standards. Therefore, at this time, IEEE will no longer be adopting ISO and IEC standards. Additionally, revision of IEEE standards previous adopted from IEC and ISO will also be terminated.

If you have any questions, please contact your IEEE-SA Program Manager.

Main Committee PAR Submission approved at May meeting:

- P2030.12; chair M. Venkata
- PC37.90; chair O. Bolado

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

- C37.230
- C37.110 (contingent upon approval of WG)
- C37.2 (contingent upon approval of WG)

Revision to Existing Standards Completed

- none

PAR for revising existing standard or creation of new standard Approved

PAR Nu	Project	Commi	Title	Scope	Purpos	Approval D	PAR Expi	Invitatio	Ballot Cl	Status
PC37.92	Revision	PE/PSRCC	Standard f	This stand	This Stand	Pending				NesCom Agenda 01-May-2018
PC37.104	Revision	PE/PSRCC	Guide for	This guide	The guide	Pending				NesCom Agenda 01-May-2018

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	Commi	Title	Scope	Purpos	Approval D	PAR Expi	Invitatio	Ballot Cl	Status
P60255-11	Revision	PE/PSRCC	Measuring	This standard is for s		14-Jun-13	12/31/2018	10/28/2016	2/15/2018	Sponsor Ballot: Comment Resolution
PC37.112	Revision	PE/PSRCC	Standard f	The scope	The purpc	23-Mar-17	12/31/2021	5/11/2017	8/11/2017	Sponsor Ballot: Comment Resolution
PC37.116	Revision	PE/PSRCC	Guide for	This	The	11-Dec-13	12/31/2019	10/13/2017	4/11/2018	Sponsor Ballot: Comment Resolution
PC37.237	New	PE/PSRCC	Standard f	This stand	This stand	5-Dec-2012	12/31/2018	2/20/2016	5/3/2018	Sponsor Ballot: Comment Resolution
PC37.245	New	PE/PSRCC	Guide for	This Guide	The purpc	8-Jun-2012	12/31/2018	2/17/2018	3/24/2018	Sponsor Ballot: Comment Resolution

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

-

PAR Nu	Project	Commi	Title	Scope	Purpos	Approval D	PAR Expi	Invitatio	Ballot Cl	Status
P60255-11	Revision	PE/PSRCC	Measuring	This standard is for s		14-Jun-13	12/31/2018	10/28/2016	2/15/2018	Sponsor Ballot: Comment Resolution
PC37.91	Revision	PE/PSRCC	Guide for	The	The purpc	27-Mar-14	12/31/2018			WG Draft Development
PC37.230	Revision	PE/PSRCC	Guide for	This guide	This guide	27-Mar-14	12/31/2018			WG Draft Development
PC37.237	New	PE/PSRCC	Standard f	This stand	This stand	5-Dec-2012	12/31/2018	2/20/2016	5/3/2018	Sponsor Ballot: Comment Resolution
PC37.245	New	PE/PSRCC	Guide for	This Guide	The purpc	8-Jun-2012	12/31/2018	2/17/2018	3/24/2018	Sponsor Ballot: Comment Resolution
PC37.249	New	PE/PSRCC	Guide for	This guide	This guide	24-Jun-14	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	Commi	Title	Scope	Purpos	Approval D	PAR Expi	Invitatio	Ballot Cl	Status
P1646	Revision	PE/PSRCC	Standard (	This stand	Uitilities v	23-Mar-17	12/31/2021			WG Draft Development
PC37.90.2	Revision	PE/PSRCC	Standard f	The scope	The purpc	6-Dec-2017	12/31/2021			WG Draft Development
PC37.101	Revision	PE/PSRCC	Guide for	The	This guide	28-Sep-17	12/31/2021			WG Draft Development
PC37.102	Revision	PE/PSRCC	Guide for	This	This Guide	23-Mar-17	12/31/2021			WG Draft Development
PC37.108	Revision	PE/PSRCC	Guide for	Devices ar	This guide	5-Dec-2015	12/31/2019			WG Draft Development
PC37.110	Revision	PE/PSRCC	Guide for	This guide	The purpc	11-Jun-15	12/31/2019			WG Draft Development
PC37.112	Revision	PE/PSRCC	Standard f	The scope	The purpc	23-Mar-17	12/31/2021	5/11/2017	8/11/2017	Sponsor Ballot: Comment Resolution
PC37.116	Revision	PE/PSRCC	Guide for	This	The	11-Dec-13	12/31/2019	10/13/2017	4/11/2018	Sponsor Ballot: Comment Resolution
PC37.120	New	PE/PSRCC	Protectior	This guide	A guide to	28-Sep-17	12/31/2021			WG Draft Development
PC37.233	Revision	PE/PSRCC	Guide for	This guide	This guide	5-Dec-2015	12/31/2019			WG Draft Development
PC37.234	Revision	PE/PSRCC	Guide for	Concepts	The purpc	23-Mar-17	12/31/2021			WG Draft Development
PC37.235	Revision	PE/PSRCC	Guide for	This	This	11-Jun-15	12/31/2019			WG Draft Development
PC37.242	Revision	PE/PSRCC	Guide for	The	This guide	26-Oct-15	12/31/2019			WG Draft Development
PC37.251	New	PE/PSRCC	Standard f	This stand	The purpc	5-Feb-2016	12/31/2020			WG Draft Development

PARS expiring 2022

PAR Nu	Project	Commi	Title	Scope	Purpos	Approval D	PAR Expi	Invitatio	Ballot Cl	Status
P2030.100	New	PE/PSRCC	Monitorin	This guide	To provide	8-Mar-2018	12/31/2022			WG Draft Development
PC37.300	New	PE/PSRCC	Guide for	This	This Guide	8-Mar-2018	12/31/2022			WG Draft Development

Additional notes:

PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:

Meeting schedule

-

Deadlines for submittal to RevCom or NesCom

NesCom/RevCom Submittal Deadlines:

20 December 2017
26 January 2018
16 March 2018
04 May 2018
27 July 2018
06 September 2018
15 October 2018

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

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

We would like to highlight the following work in the PSCC:

1. P1 WG, revision of C37.238, Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications. After presenting a paper a GA Tech and submitting a paper for WPRC, their work is complete and the group has been disbanded. The PSCC recalls when the SUBS committee approached the PSRC in September 2008 to join the H7

working group and expand its scope to more completely cover substation IEDs. Congratulations to Galina for leading this work for 10 years.

2. P3 WG, Exchanging Information Between Networks Implementing IEC 61850 and IEEE Std. 1815 (DNP3). The standard has been published and the group is currently looking for feedback from users on their experience in implementing the mapping between these protocols. Contact any of the PSCC officers, Marc Benou the subcommittee chair, or Ron Farquharson, the WG chair at r.farquh@telus.net.
3. P10, IEEE Standard for Streaming Telemetry Transport Protocol (STTP). The group is currently working on submitting a PAR for a new protocol that is being developed by the DOE. The protocol is being designed to be used within a control center and between control centers of large amounts of data quickly and without data loss. It also allows the data to be broken down easily into data types. They are looking for people that are experts in computer based systems and database systems to become members of the group.
4. P12 TF, Analog Leased Line End of Life and Migration Report. This is a report for users of existing leased line circuits and discusses the existing state of leased lines along with options going forward. Many utilities are migrating or considering the migration of their protection and SCADA communication circuits from leased lines to other technologies.
5. S1, IEEE 1686 Standard for Intelligent Electronic Devices Cyber Security Capabilities is working on revising the standard. It is presently developing use cases to ensure proper coverage of all IED capabilities related to cybersecurity.

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

G. NERC Report - Bob Cummings
NERC Report to IEEE PSRC - Bob Cummings
10 May 2018

1. Fault-Induced PV Inverter Disturbances

- Inverter Task Force Report released 8 June 2017.
    - 1200 MS 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 156, 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-SolarPhotovoltaic-Resource-Interruption-Disturbance-Report.aspx
- **Canyon 2 Fire Disturbance Report**:
  http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced- SolarPhotovoltaic-Resource-Interruption-Disturbance-Report.aspx
- **Webinar on Both Disturbances**:
  http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-SolarPhotovoltaic-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-PerformanceTask-Force.aspx

2. **Single Point of Failure (FERC Order 754)**
   - 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- and further clarifications in the standard
3. **System Protection Coordination (Phases 1 & 2)**
   - PRC-027-1-Coordination of Protection Systems for Performance During Faults
     - Replaced R3 and R4 from PRC-001-1.1 (ii)
   - PER-006-1-Specific Training for Personnel
     - Moves R1 from PRC-001-1.1 (ii)
   - Both Standards were filed with FERC on 9/2/2016
   - Notice of Proposed Rulemaking issued by FERC Nov. 16, 2017
   - Proposing to approve PRC-027-1 and PER-006-1 and to direct NERC to develop certain modifications to PRC-027-1 within 12 months of Final Order:
     - Require an initial baseline protection system coordination study demonstrating
     - Comments on the NOPR were due January 29, 2018.
   - Awaiting final rule by FERC

- 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- PCR-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 01/01/2017
  - 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.

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

- The PRC-025-2 standard will be posted for final ballot from January 9 through January 19, 2018.
  - 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
- PRC-025-2 was filed with regulatory authorities on March 16, 2018

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
- 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

May 2018 Meeting Minutes:

The B1 Working Group met on Monday May 7, 2018 in Pittsburgh, PA with 7 members,
one substitute member (K SC) and one guest. The January 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 – To expand our reach for additional industry related IEEE and IEEE-PES Individual awards the WG members discussed and adjusted the process in which we identify and nominate PSRC members to be nominated for these awards. This new process will allow us to go after a wider range of relevant IEEE and PES awards.

3. The WG discussed and identified potential candidates for the following awards:
    a. IEEE PES Award for Excellence in Power Distribution Engineering
    b. IEEE PES Douglas M. Staszesky Distribution Automation Award
    c. IEEE PES Wanda Reder Pioneer in Power Award
    d. IEEE PES Leadership in Power Award
    e. IEEE PES Lifetime Achievement Award
    f. IEEE SA Standards Medallion
    g. IEEE SA Lifetime Achievement

The WG members took assignments to research and collect the necessary information from the potential nominees. Final determination of PES nominees will be made in the September meeting. For SA awards since the deadline is July 1, final determination and selection of nominees will be made by email.

3. The following awards were announced or issued on Thursday May 10, 2018 during the PSRC Main Committee Meeting

a. 2017 Young Professional Award
- **Michael J. Higginson, PE**
  In recognition for his commitment and services to this Committee

b. IEEE-SA Award – Certificates of Appreciation
PSRC WG I23 – Revision of C57.13.1 – Guide for Field Testing of Relaying Current Transformers

- **Bruce Magruder – Chair**
- **Will Knapek - Vice Chair**

Members:

Jeff Burnworth	Gordie Halt	Michael Stojak
Rene Aguilar	Jay Gossalia	Anthony Newman

Heather Malson John Herron	Fred Friend Lee Bigham	Jason Strebe Joe Uchiyama

Respectfully Submitted
Hugo Monterrubio, B1 Chair

B3: Membership Activity Report

Chair: M. Swanson
Vice-chair: Cathy Dalton
Assignment: Assist in searching for new attendees.
Requesting support from attendees' employers.

Attendance during the Pittsburgh meeting was 241, which exceeded the previous attendance track record. Twenty-three (23) new attendees participated in the Newcomers Orientation meeting on Tuesday. Mal Swanson sent a pre-meeting welcoming email and a follow up to each newcomer for first impressions. Cathy was unable to attend due to a work conflict with team meetings in Dallas, so Mal covered for Cathy during the Newcomers presentation. The presentation went well Hugo Monterrubio did a good job introducing the officers, and promoting the Newcomers meeting during the Monday dinner.

Retention Program:
Three gentlemen Mentors attended the Newcomers meeting and offered assistance to one attendee. Solveig Ward hosted the Women's Mentor luncheon, with three attendees. They wanted to be integrated with the men. They discussed hosting a luncheon for all the newcomers during the next meeting, Tuesday lunch. Pratap and Murty were receptive, but some practical considerations need to be discussed. PSCCC had their own Newcomers meeting on Monday afternoon.

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

No Service Awards were presented.

Regards,

Malcolm J. Swanson
Membership Chairman

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

No activity to report.

Chair: R Hunt: WG Training:
No WG training took place at this meeting.

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.

Assignment:

- Promote IEEE PES PSRCC activities globally.
- Facilitate global outreach using tools such as webinars, tutorials, trade publications, and other similar methods.
- Strengthen PSRCC awareness by preparing technical articles as may be required for the promotion of technical committee working group activities about the art of relaying, and the work of the PSRCC.

The subcommittee chairs are to send a brief summary of their activities for inclusion in the PSRC update for PACWorld magazine. Craig Preuss will be coordinating with Cathy Dalton regarding PSCCC publicity.

B8: Long Range Planning

Chair: Mike McDonald
No report from the 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 webmasters will not have access to the FTP for directly modifying the website. They will be responsible for notifying the webmaster of subcommittee changes via a spreadsheet tool.

Easy123 integration is in the works and we should know more by the September meeting.

I. 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:

   Proposed Title: Guide for the Design of Microgrid Protection Systems.

   Proposed Assignment: Create the Guide for the “Design of Microgrid Protection Systems”.

   Proposed Chair: S.S. (Mani) Venkata

Proposed 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 and transitions between modes.

Proposed 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 the 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.

The motion was seconded by Phil Winston and the PAR was approved unanimously by the main committee members.

2. The following motion was moved by Karl Zimmerman (D28): "Mr. Chair, the Line Protection Subcommittee, D, requests approval for transmittal of PC37.230, "Guide for Protective Relaying Application to Distribution Lines", to the IEEE SA for balloting. Provided the ballot is favorable, the proposal will be sent to the IEEE SA for approval and transmittal to ANSI for approval as an American National Standard.

   The motion was seconded by Bob Dempsey and the motion was unanimously approved by the main committee members.

3. The following motion was moved by Brian Mugalian: "Mr. Chair, the Relaying Practices Subcommittee, I, requests the approval to form a balloting body for the "Revision of C37.110 Guide for Application of Current Transformers for Protective Relaying Purposes" (I29).

   The motion was seconded by Jim Niemira and the motion was approved unanimously by the main committee members.

4. The following motion was moved by Brian Mugalian (I-SC Chair): "Mr. Chair, the Relaying Practices Subcommittee, I, requests the submission of a PAR to the IEEE SA with the following details:

   Proposed Title: Standard for Relays and Relay Systems Associated with Electric Power Apparatus

   Output: IEEE Standard**, Project Number:** PC37.90

   WG Assignment: Revision of IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

   Proposed Scope: This standard specifies standard service conditions, standard ratings, performance requirements, and testing requirements for relays and relay systems used to protect and control power apparatus. A relay system may include computer interface equipment and/or communications interface equipment, such as teleprotection equipment. It does not cover relays designed primarily for industrial control, for switching communication or other low-level signals, or any other equipment not intended for control of power apparatus.

Proposed Purpose: The purpose of this standard is to establish a common reproducible basis for designing and evaluating relays and relay systems.

Proposed Chair: Oscar Bolado

The motion was seconded by Fred Friend and the motion was approved unanimously by the main committee members.

5. The following motion for balloting for PC37.2 was made by Brian Mugalian, "Mr. Chair, the Relaying Practices Subcommittee, I, requests approval for transmittal of PC37.2 Standard for Electrical Power System Device Function Numbers, Acronyms and Contact Designation" to the IEEE SA for balloting, pending approval of the Working Group." Provided the ballot is favorable, the document will be sent to the IEEE SA for approval.

   The motion was seconded by Oscar Bolado and approved unanimously by the main committee members.

SUBCOMMITTEE REPORTS

C: SYSTEM PROTECTION SUBCOMMITTEE

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

System Protection Subcommittee Scope

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

Meeting Minutes
The System Protection Subcommittee of the PSRC met on May 9, 2018 in Pittsburgh, PA. The participants introduced themselves, a quorum was achieved (33 of 56 members and 35 guests), and the September 2017 minutes were unanimously approved (Tony Seegers made motion, Charlie Henville seconded). Six new members were recognized: Mital Kanabar, Mahendra Patel, Evangelos Farantatos, Mukesh Nagpal, Dean Ouellette, and Kevin Jones, in addition to Jessica Harris the C Subcommittee web master.

Advisory Committee Items of Interest
- WG Chairs required to post their agenda at least two weeks prior to the meeting.
- WG meeting minutes due to Fred and Gene by this Friday, May 11.
- The new IEEE privacy policy to comply with the European Union requirements will be implemented on May 25.
- WG chairs will initiate the preparation of awards through the IEEE SA web page for completed standards.
- All technical papers, reports, etc. must use the official PES template in order to be considered for an IEEE award.

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.

WG C-19 is resolving the ballot comments for C37.247, IEEE Standard for Phasor Data Concentrators (PDC) for Power Systems.

CTF-38 investigating the need to create a Guide for the Design of Microgrid Protection Systems was approved to become a working group (C38). It will be part of the IEEE P2030 series.

Old Business
There was no old business.

New Business
There was no new business.

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

9 Attendees: 3 members, 2 corresponding members & 45 guests attended. The meeting roaster is attached.

- Patent/IP related IEEE slides were shown
- We did not have a quorum. However, 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
    - 60 have been accepted with or without modifications
    - 14 relate to formatting issues that will be dealt with after all other comments have been addressed.
    - 57 comments are yet to be addressed.
    - 2 comments do not need any action.
- The WG expects to complete handling of comments by end of June, and do a recirculation ballot shortly after.
- The PAR expires at the end of this year, and there is sufficient time to complete the standard.

Next meeting requirements: single session for 20 attendees.

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

Chair: Yi Hu
Vice Chair: Gene Henneberg
Output: IEEE Guide C37.250
Draft: 0.62
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, May 9, 2018 in Pittsburgh, PA in single session chaired by Yi Hu and Gene Henneberg with 10 members and 4 guests attending (one additional guest became a corresponding member). Each attendee introduced themselves and described their affiliation.

Yi Hu presented the IEEE patent slides. No attendee indicated any knowledge of any patents critical to implementation of the proposed PC37.250 Guide.

The proposed agenda was approved.

A quorum was achieved and the January 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.

The WG has been holding regular web meetings on Wednesday mornings (Eastern Time) resulting in the present version 0.62 draft. This version was distributed to the working group members prior to today's meeting. Comments received since about April 28 are not yet included.

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

The WG reviewed comments from Tony Seegers on the SIPS definition and acronyms. The definition will also be reviewed at the I2 meeting later today. The acronyms will be revised in line with Tony's recommendations, e.g. use lower case, in the next revision.

Parts of version 0.62 often uses a "fault" as the initiating event for SIPS action. This has been partially edited to "contingency," but more editing in the same direction is needed in the next version.

During remote editing sessions the WG decided to move most of the detailed discussion of redundancy to an Annex and discuss at a later date the extent that we will keep this material as part of the final Guide. Additional discussion generally on redundancy included voting and the possibility that two schemes may initiate different actions. These sketchy references will be further reviewed.

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

Meeting minutes by Gene Henneberg and Yi Hu 05/9/2018.

Requirements for next meeting: Room for 20, single session.

C-23: Coordination of Synchrophasor Related Activities

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

The ongoing task force will provide three main functions:

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

Meeting Minutes:

1. **Attendance: (11 members present)**

   Mahendra Patel, EPRI
   Jim O'Brian, Duke Energy
   Fred Friend, AEP
   Bill Dickerson, Arbiter Systems
   Steve Klecker, MidAmerican Energy
   Evangelos Farantatos, EPRI
   Matthew Reno, Sandia Lab.
   Jason Allnutt, IEEE-SA
   Dinesh Gurusinghe, RTDS
   Ken Martin, EPG
   Bob Cummings, NERC

2. **Introductions**
3. **IEEE Activities**

   Discussed and received updates on the following;

   Standards

   a. H11 – Revision of IEC60255-118-1 (Synchrophasor standard)
   b. C19 - PDC Standard
   c. P8 - Development of standard Mapping between C37.118 and IEC 61850-90-5
   d. P9 - C39.118.2 (Protocol) revision
   e. P10 – Advanced Synchrophasor Protocol
   f. H3 - Time Tagging for Intelligent Electronic Devices (COMTAG)
   g. ICAP Synchrophasor Conformity Assessment Steering Committee

   Guides

   h. C28 - Guide for Synchronizing, Calibration, Testing, and Installation of PMUs
   i. H40 – Recommended Practice for databases used in SAS

4. **NASPI activities**

   Discussed other possible Guides – Technical Briefs – Test Data

   a. MicroPMU
   b. Control Applications
   c. Synchrophasor performance during faults & other fast state changes
   d. Data mining of archived data
   e. Data Repository for benchmarking synchrophasor applications
   f. Consistency in use of STAT word
   g. State Estimation (Linear, Hybrid)
   h. Interoperability Issues
   i. Other time synchronized measurements (sampled values, harmonics)
   j. Outreach Requirements

5. **Outreach Need**

   Discussed an industry need for outreach efforts needed to educate members on synchrophasor standards, time tags and conformity assessment needs. Possibilities of developing tutorial, webinar etc. were discussed.

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.

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.

Agenda

1. Introductions
2. Approval of minutes of the January 2018 meeting
3. Model benchmarking results of wind plants with Type III WTGs
4. Review draft report and assign full reviews
5. Adjourn

The meeting started with introductions, and then the January 2018 minutes were approved.

First, the status of the report was explained to the attendees. All the contributions have been received and included in the draft report. The chair (Sukumar Brahma) and vice-chair (Evangelos Farantatos) are in the process of reviewing and editing the report to have a comprehensive document by mid-June. Manish Patel, Jim Van de Ligt and Mohammad Zadeh volunteered to review the report. Review is expected by end of July. Once the report is reviewed, it will be sent to the WG members and guests for final review before the September meeting.

Dean Miller will contact Vestas to request scheduling a webcast to review the data Vestas provided on their Type IV WTG. Also data for Vestas Type III WTG will be also requested.

Then Evangelos Farantatos gave a presentation on model benchmarking of two wind plants with Type III WTGs. The model benchmarking included comparison of fault records (previously reported in C17 WG report and provided by Dean Miller) with the response of a generic EMT Type III WTG model and the EPRI Type III WTG phasor model. The benchmarking showed good results and the attendees agreed to include those in the WG report. Some recommendations were provided for improvement of the benchmarking and Evangelos will work on those.

Finally, some recommendations were provided by the attendees for the content of the report related to clarifications that the proposed model can be used to represent an aggregate wind or solar plant. Also the tables that the WG is recommending for manufacturers to provide data, were further discussed.

There were total 25 attendees in the meeting, 9 members and 16 guests.

For the next meeting in September 2018, we need a room with capacity of 30. Please avoid conflict with WG C30, C32, CTF34 and C25, in that order.

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

Chair: Martin Best
Vice Chair: Keith Houser
Output: PSRC Report
Draft: 4.2
Established: September 2013
Completion: December 2018
Assignment: Write a report to provide guidance on relay protection and coordination at wind electric plants. This report will cover protection of generator step up transformers, collector system feeders, grounding transformers, collector buses, reactors, capacitors, main station transformers, tie lines and points of interconnection and associated arc flash issues. Although the report will address coordination with wind turbine generator protective devices and static var sources, the protection of the wind turbine generators and static var sources will not be included.

Working Group [WG] C25 met in Pittsburgh on Tuesday, May 8 at 1:30 pm with 12 members and 11 guests. **Mohammad Zadeh** joined as a new member. Copies of the agenda, the January 2018 meeting minutes, and revisions to Draft 4.2 of the Report were reviewed. After introductions, the January 2018 meeting minutes were reviewed and approved.

Jim Van de Ligt is still working on Section 3.1.4 on removal of WTGs and Static VAR devices from Collector Feeders under faults, and expects to have it completed within the next month. **Juan Gers** is presently completing Sections 3.5.1 on Capacitor and

Harmonic Filter voltage protection and 3.5.2 on Capacitor and Harmonic Filter overcurrent protection.

The WG began by reviewing Section 3.1.1.2 by Ritwik Chowdhury and Charlie Henville on Directional Overcurrent Protection of Collector Feeders. Martin explained that Figure 15 in the example shows the Phase A voltage and current angles as they would appear to the relay at the main collector feeder breaker. **Mohammad Zadeh** volunteered to send some additional figures that may better illustrate the example. There was general agreement that the load encroachment setting example in Figure 16 is illustrative of how the collector feeder relay trip zone can be effectively defined and managed.

There was some discussion of what criteria should be used to establish the pickup current setting of a directional phase time overcurrent element. A very low pickup setting makes the element more susceptible to misoperation under certain load flow conditions, while a pickup setting above normal load compromises sensitivity.

The WG next reviewed some additional material that Charlie Henville added to Section 3.6 on Transmission Tie Line Protection.

Martin Best will check with **Keith Houser** to see if the information on the characteristics of the WTG types in System Grounding Section 2.4 on can be moved and combined with the information in Wind Electric Generator Characteristics Section 2.5.

Specific key words need to be added to the Keywords section in the front of the report. **Martin Best** will update the present draft with the final writing assignments as soon as he receives them. He will send out a clean copy of the draft for final review by the WG members. In the meantime, Martin will start reviewing and resolving the existing comments. Meeting Adjourned @ 2:30 pm.

The group requests a single session, meeting room for 25-30 at the September 2018 meeting. **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**.

Minutes Submitted 5-8-2018,
Martin Best and Lynn Schroeder

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, chaired by Don Ware, met on Tuesday, May 8, 2018 with 13 members, 7 Guests and 1 new member and 2 new corresponding members.

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

We spoke about the comments received from Nina Selak. Group discussion took place with tabling most comments waiting to include Nina.

Action items:

Steve Turner and Tony Seegers agreed to review Nina's redundancy statements and are considering consolation.

Gene Henneberg and Scott Short suggest removing the term certification and replacing with the word verification in section 4.7.1.

Vahid Madani suggest leaving sections on testing definitions and terms as is due to previous work from original document and meeting body agreed.

Terminology Liaison, Tony Seegers, spoke on how SIPS and MOV should be labeled. SIPS is System Integrity Protection Schemes and MOV is metal oxide varistor without the hyphen.

Angelo Tempone and Jun Verzosa to re-review section 4.6.4 and specifically the paragraph below Fig. 7.

Section 7.2 on IEC 61850 will be reviewed by Eugenio Carvalheira and Jun Verzosa and Vahid made mention of referencing PMU considerations.

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

The version of the Guide PC37.233 is v2.19 as of May 8, 2018**.** Our next meeting will need a single session and room for 40. Avoid conflict with K16, C31 and I2.

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

Chair: Allen Goldstein
Vice Chair: Harold Kirkham
Output: IEEE Guide, C37.242
Draft: 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 following are addressed in this guide:

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

b) Considerations for the installation of PMU devices based on application requirements and typical bus configurations. New lessons learned since the publication of this guide may be accounted for in a revision to the guide.
c) Techniques focusing on the overall accuracy and availability of the time synchronization system. New technologies and further information about synchronization may be accounted for in a revision to the guide
d) Communications testing for connecting PMUs to other devices including Phasor Data Concentrators (PDCs). Lessons learned from the field may be included in a revision of the guide.

1) 11 in attendance, 6 members, 3 contributing members, 3 guests. No quorum
2) Introductions
3) Patent policy announcement. No one has any awareness of relevant patents.
4) The working group is continuing to hold bi-weekly teleconferences to revise the guide. This face-to-face meeting was no different. We are now on the final section (7); the annexes are to follow.
5) On draft 20180508
6) Working group expects to request to form a ballot group at the September C subcommittee meeting.

Next meeting requirements: single session for 20 attendees.
Avoid conflicts with all synchrophasor work in PSRC and PSCC: P8, P9, P10, C19, H3, C23, H11.

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

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.

1. Introductions/Sign-in sheet
14 Total with 7 Members and 7 Guests
September meeting requests – room for 30, avoid conflicts with D29 and H45 if possible
2. Review minutes from web meetings
Minutes were reviewed and approved by those present.
3. Review assignments dates and fill holes
Jim Van de Light (not present) reaffirmed his writing assignment before meeting. Submission from Ratan Das was reviewed. Mohammed Zadeh discussed EMTP used and said he would follow up with him. Eugenio Carvalheria will contact Rob Fowler on sec II and with Kevin Jones on Sec IV.

Also reviewed the concept and possible outline of Sec IV, added at last web meeting. First part to match previous, then the rest was flexible for the authors and more inputs.

4. New Technical Report Format Discussion
Showed progress and layout, formatting
5. Slack site
Discussed access/invitations to all, link to site in minutes and possibly on PSRCC site for all to see, find. Pros – replacing bulk of email, not losing anything, document repository, history always available to new people. Challenges – getting people introduced to a new tool.
6. Open discussion
See #5
7. Next web meeting – TBD
Not less than 2 weeks, probably a month, after the material is formatted and more is received for document.
8. Other business
9. Adjourn
The meeting concluded at 1043

Additional information:
Mentioned the Assumptions list, checklist of data coming from D29 with settings matching a list of same for data needed when creating test plan under C29. More information to come, working with D29.

Slack invitations will be sent to all on DL, add site address to minutes. Add invitation link with no expiration if possible (will check), send out tutorial out to group, provide more information on businesses using slack today.

Slack WG C29 Homepage - https://psrc-wg-c29.slack.com
(available after registering via invitation link below)

Slack Invitation Link for new member/guest access (will not expire).
Will be asked for email, name, and display name. **PLEASE USE your full name so you are easily identified if you contribute to a discussion or the document.**
Example – heather.malson for display name – thanks!!
https://join.slack.com/t/psrc-wg-c29/shared_invite/enQtMzYxMjEwNjQ1NzkyLTQyMDdiZGY0NTY4Nzk3NzIwZjllMmNjMzFkZTZlZDhhMWRhMmJmMGU4ZGMwMzJkNGNjOWUxZGRlOGRmZjhhYzM

Requests for next meeting: Room for 30 people
Avoid conflicts if possible with J5, D29, C26, and D37 and (not) 0800 on Tuesday, if possible.

C-30: Microgrid Protection Systems

Chair: Michael Higginson
Vice Chair: Fred Friend
Output: PSRC Report
Draft: 5
Established: January 2016
Expected Completion Date: December 2018
Assignment: Prepare a report that will investigate and assess techniques, approaches, and potential solutions to the challenges of microgrid protection.

The working group meeting was conducted on Tuesday afternoon at 3:00 PM with 41 attendees, including 22 members (3 new) and 19 guests.

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

Some comments were received and the following were discussed:

1 Resynchronization (Clause 2.5)
    a. Machines, inverters, etc.
        i. Discussion around the rotating loads – strike first bullet
        ii. Add bullet about DC link issues
2 Reconnection protection (Clause 1.2.1.2)
    a. PCC protection (Ben Kazimier will review for correct usage)
    b. IEEE 1547 should generally apply
    c. Discussion on adding a definition clause
        i. PCC, POC, POI will be incorporated into Clause 1.1
        ii. Include title of 1547.

Additionally, the working group discussed the plan to complete the report. The working group agreed to provide any remaining comments on the draft report by May 31, 2018. A team of volunteers was formed to address comments, including: Michael Higginson, Fred Friend, Ben Kazimier, Wayne Hartmann, Manish Patel, Kamal Garg, Amin Zamani, Jim Niemira, and Matthew Reno. Depending on the volume of comments received, the working group tentatively plans to send a final draft with comments resolved by August 1, 2018 to the working group for ballot. The comment resolution team will plan to address any comments received from balloting. We hope to discuss the ballot comments as needed at the next meeting. We are targeting finalizing the report and submitting to C subcommittee leadership at or shortly after the September PSRC meeting.

Mani Venkata presented to the working group about CTF38, and the proposed Guide for the Design of Microgrid Protection Systems.

Finally, the working group discussed a review of current membership. This is planned in the coming months.

Next meeting: Room for 50 attendees.
Please avoid conflict with I2, I29, C32, and CTF38 – schedule C30 prior to CTF38).

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

Chair: Solveig Ward
Vice Chair: Alla Deronja
Output: IEEE Guide
Draft: 2.4
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, May 9, 2018 at 11:00 AM in a single session with 13 members, 2 corresponding members, and 15 guests attending. 1 guest became a member and 1 – corresponding member. Another guest with a consistent attendance was offered and accepted membership. The quorum was not met so the January 2018 meeting minutes will be approved via email.

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

The chair mentioned the new IEEE Privacy policy going into effect on May 25, 2018.

The Chair reviewed the status of all assignments made at the previous WG meetings. Also, new writing assignment were made as presented below.

Review Assignments:

a. **Clause 4, General Considerations review: Don Ware [Lead], Phil Tatro, Jim O'Brien. Status: pending (Don), example to be added to 4.2.5 (Don).**
b. **Clause 6, Redundancy Applications Considerations review: Craig Palmer [Lead], Aaron Martin, Gary Stoedter. Status: pending.**
c. **C16 PSRC Report Relay Scheme Design Using Microprocessor Relays, 2014: Robert Frye. Status: pending.**
d. K5 Ancillary functions: Alla Deronja. Status: complete.
e. NPCC redundancy requirements – Jeff Pond. Status: complete.

Writing Assignments:

a. Qiaoyin Yang will extend sub-clause 5.2.3 Sampled Value Systems and/or non-conventional instrument transformers on digital sample redundancy. Status: complete.
b. Qiaoyin Yang will extend sub-clause 5.7.2 Ethernet LANs. Status: complete.
c. Alan Goldstein will provide new material on redundant synchronization time. Status: pending.
d. **Section 5. Craig Palmer will investigate the available power line carrier technical documentation and correct Figure 12 Two PLC channels, coupled together via phase to phase. Status: pending.**
e. **Figure managers: Alexis Mezco, Jeff Brown. Status: pending.**
f. **Clause 6: Adding control application section – Roy Moxley [lead], Solveig Ward – out of scope? If affecting protection – in scope. Status: new.**
g. Clause 6: Add reclosing redundancy from K5 report – Alla Deronja. Status: new.
h. Clause 6: Add breaker failure redundancy considerations/practices from K5 report – Alla Deronja. Status: new.
    - Pros, cons (maintenance, operations)
    - BF considered 2nd contingency
i. Clause 5: Add combining functions in physical device – Gary Stoedter. Status: new.
    - Pros, cons (maintenance, operations)
j. **Clause 4: Add human factor (simplicity in scheme design) – Robert. Status: new.**
k. **Clause 5: 5.5 Breaker trip coil circuit redundancy (Alla). Status: new.**
l. Clause 5: 5.6.3 Relay control function/logic redundancy. Status: dropped.
m. **Sub-clause 6.5: Reactor protection (Gary Kobet). Status: new.**
n. **Sub-clause 6.6: Capacitor bank protection (Nathan Gulszynski). Status: new.**
o. **Sub-clause 6.9: Crossover/mixed use SIPS/primary protection/automation (Aaron Martin). Status: pending.**
p. Clause 6: Refurbishment considerations. Status: dropped.
q. **NERC redundancy definitions for comparison (Solveig Ward). Status: new.**
r. **N-1, N-2 considerations (Alla Deronja). Status: new.**

s. **Sub-clause 6.8 SIPS + general review: Robin Byun. Status: new.**

The WG decided to postpone webex meeting commencement until after the September 2018 meeting to start reviewing and editing the guide.

All the outstanding and new assignments (in bold above) are due to the Chair by **August 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.

1. Working Group C32 met with 27 members and 44 guests present.
2. Minutes from the January meeting were reviewed. No changes were requested by attendees.
3. The following presentations were made:
   a. Mike Jensen presented an update on the "IEEE/NERC Task Force on Short Circuit and System Performance Impact of Inverter Base Generation". Mike presented a schedule update and rough outline on content for the report. Final draft should be ready by the end of the May with approval in June and NERC inclusion in July. Discussion centered around the quick approval time. It was noted that the report is an IEEE-PES/NERC report rather than a PSRC report. PSRC task force CTF34 was formed in January to provide an ongoing review of the work of the TF related to protection issues and will be meeting on Wednesday for further review. It was also noted that some of the issues identified in the joint task force report will be assigned to C32 for resolution in the C32 report.
   b. Manish Patel provided a presentation of fault current reduction for 30% inverter based generation penetration. The results indicated the fault duty reduction can be significant in a localized area (i.e. a couple of busses surrounding the replaced generation) however the reduction is much less on the busses more distance from the interconnection point. The conclusion is, for now, fault reduction from inverter based generation is more of a localized issue rather than a system wide concern.

4. Discussed the report outline/draft.
   a. The chair requested suggestions for additional content for Section 3 which focuses on solutions.
   b. A recommendation was made to move Sections 2.2 and 2.6 into 2.1 to maintain the flow of the document. The chair will review the request.
   c. The group recommended Section 3.2 include recent NERC Alert (Loss of Solar Resources During Transmission Disturbances) information. Bob Cummings agreed to provide.

5. Writing assignments were discussed as the report draft was reviewed:
   a. The following writing assignments have been received since the January meeting:
      i. Section 2.2: Interaction of inverter controls and impact on protection by Yu Xia (Draft outline received – additional content expected.)
      ii. Section 2.6: Response of traditional protection elements to fault currents produced by inverters by Evangelos Farantatos
   b. The following individuals volunteered for writing assignments during or after the meeting:
      i. Section 3.1.6: Emerging Protection Technologies (Fernando Calero to provide writeup on travelling wave relay.)
      ii. Section 5.7: Utility Procedure and Documentation Requirements to Place Site in Service (Aaron Martin, Lynn Schroeder, and Abu Zahid volunteered to provide information for this section to David Morrissey)
   c. A list of all outstanding writing assignments is attached to these minutes.
   d. Writing assignments are due by August 1, 2018. Please submit all writing assignments to Mukesh Nagpal and Jimmy Deaton
6. Meeting adjourned.

7**. A meeting room with capacity of 60 is requested for the September meeting.**
8. Avoid conflicts with C18, C24, C25, and C30.

Outstanding Writing Assignments as of 5/8/2018
(Assignments due 8/1/2018)
1. Section 1.2 Description of Typical Wind Plant – Marilyn Ramirez
2. Section 1.3 Description of Typical Solar PV Plant – Nina Selak
3. Section 2.3 Interaction of inverters with control of shunt capacitor banks, SVC's – Bob Cummings
4. Section 2.4 High Penetration of Inverter Resources, Low System Fault Current, Low Inertia – Jim van de Ligt, Wayne Stec
5. Section 2.6 Response of traditional protection elements to fault currents produced by inverters – Athula Rajapakse, John Seuss
6. Section 2.7 Inverter Setup and Configuration Considerations – Michael Higginson, Bob Cummings, Mukesh Nagpal, Steve Miller
7. Section 3.1 Utility Owned Transmission Line Relaying (Tie Line/Adjacent Lines) - Hillmon Ladner, Addis Kifle
8. Section 3.1.6: Emerging Protection Technologies - Fernando Calero to provide writeup on travelling wave relay.
9. Section 3.3 Solutions for Control Interactions – Nuwan Perera
10. Section 4.1 Short Circuit Model - Kevin Ridley
11. Section 4.4 Islanding Considerations – Duane Buchanan
12. Section 5.7 Utility Procedure and Documentation Requirements to Place Site in Service – David Morrissey with input from Aaron Martin, Lynn Schroeder, and Abu Zahid.

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

Chair: Michael "Mischa" Steurer
Vice Chair: Georg Lauss
Temporary PSRC Chair: Gene Henneberg
PSRC Chair: Dean Ouellette
PSRC Vice-Chair: TBD
Output: Coordination with WG P2004

Draft: 1
Established: September 2017
Expected Completion Date: December 2021
PSRC Scope:
Support the development of this IEEE recommended practice in cooperation with PELS, IAS, and IES efforts.

This recommended practice provides **established practices** for the use of the method of **Hardware-in-the-Loop** (HIL) **Simulation** based **Testing** of Electric **Power Apparatus** and **Controls**. It is intended to be **generically applicable** in synergy (in conjunction) with any specific testing standard (if applicable).

Meeting Minutes

Roll call—3 members, 6 guests from PSRC and 2 members from P2004 join via a web
conference.
Patent slides were not 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.
Review of P2004 group and its aims for IEEE PSRC CTF-33

- Dean Ouellette (chair, CTF-33) their first "product"/aim will be to assist with P2004 recommended practice
- Gene Henneberg mentioned noted that CTF-33 may soon be converted to a working group and we should decide during next September meeting
- Dean Ouellette: discussion about getting a vice chair for CFT-33, try to contact Sakis from Georgia Tech

Upcoming P2004 Meetings

- Next meeting Oct. 10-12, 2018 – in person at IEEE COMPENG 2018 in Florence, Italy and
- via web conference
- Possible future meeting locations could be held concurrently with upcoming IEEE PSRC
- meetings:
    - Sept 10-13 Minneapolis, MN, USA

Review of past P2004 progress, ongoing discussions

- Summary of Hamilton, NZ meeting and ongoing web meetings
    - Structure of P2004 document was reviewed and noted that they are looking for
    - chapters leads to help writing the document.
    - Dean Ouellette asked about the time frame to complete the document. Mishca
    - said there is 4 more years to complete P2004.
    - Mischa mentioned there is a web survey invite posted on May 07, 2018 to ask
    - for chapter leads for the P2004 document.
    - Mischa would like support from PSRC members whom have experience with
    - CHIL testing, namely protective relay testing.

- Scott Short asked if the CHIL interface methods would include IEC 61850 SV and GOOSE. That will be brought during the writing of the CHIL chapter.

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

Presentation: "PHIL Interface Methods and Characterizing a Spizenberger & Spies Amplifier
Interface", (Dinesh Gurusinghe, RTDS)

- See presentation posted on P2004 collaboration website
- Jay Anderson: What are the typical delays that you would see for a PHIL? It depends on the hardware characteristics of the interface and amplifiers as well as the amplifiers.
- Scott Short: "Will fiber optic connections be mentioned for interface to CHIL? The length of amplifier leads and quality of the leads will affect the amplifier performance"

Approval of Meeting Minutes from 1/7/2018 meeting – motion was not made and will be sent
to members and guests of the January meeting for approval.

The next joint PSRC CTF-33/WG-2004 meeting is scheduled in Minneapolis, MN in Sept 2018.
We will need a room for 20, a computer with audio and web access. Revision of P2204 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.

ATTENDANCE
40 Total with 7 members and 33 Guests.

GENERAL ITEMS

WG CTF34 met in single session on May 9 in Pittsburgh, PA with 7 members and 33 guests.

In the absence of the Chair, Vice-Chair Gary Kobet reviewed minutes from the January 2018 meeting in Jacksonville FL, as well as minutes from web/phone

meetings which were held March 12, 2018 and March 26, 2018. All three sets of minutes were subsequently approved.

The Vice-Chair then reviewed the NERC Statement of Work regarding the PES/NERC joint task force (JTF) addressing Low Short Circuit Current Impacts, and displayed the JTF membership, as well as related IEEE/PES/PSRC working groups (C32, C24, C25, J18).

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

The Vice-Chair noted the JTF timeline, which requires the work to be completed by June/July of this year 2018. To this end, the JTF has plans to complete final first draft by end of May 2018.

Draft 3.0 was emailed to CTF34 members on April 30, 2018 for review and comments to be submitted by March 7, 2018. Five members responded. The Vice-Chair incorporated those comments and created Draft 4.0.

Draft 4.0 was then reviewed for comments by Ritkwik Chowdhury and part of the comments submitted by Michael Higginson. Some comments were incorporated.

The balance of comments will be reviewed at a web/phone conference to be scheduled next week. CTF34 must be complete with their review by the next NERC/PES TF meeting which is scheduled for May 21, 2018.

REQUIREMENTS FOR NEXT MEETING:
As the NERC/PES TF is to issue their final document in July 2018, it is not expected that CTF34 will require a meeting in September 2018.

CTF-35: IEEE Transactions Paper Development for C37.246 Guide for Protection Systems of Transmission-to-Generation Interconnections

Chair: Alla Deronja (aderonja@atcllc.com)
Vice Chair: Keith Houser (keith.houser@dom.com)
Output: Conference and IEEE transactions paper
Draft: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.

Task force CTF35 met on Wednesday, May 9, 2018 at 8:00 AM in a single session with 5 members and 9 guests attending.

The Chair explained the WG assignment by reviewing the scope, purpose, and table of contents of C37.246 IEEE Guide for Protection Systems of Transmission-to-Generation Interconnections. The guide has not been published yet pending the final editorial review.

The paper's content is almost 100% complete so the chair proposed a next step of reviewing the paper. Initially, the chair wanted to assign individual reviewers to each of the sections; however, the WG thought that it was not necessary since the paper is

not a lengthy document. Therefore, an editorial team was created with the assignment to review the paper by July 1, 2018: Mike Jensen, Jeff Barsch, Abu Bapary, Lynn Schroeder, Craig Holt, and Gaston Ortega.

The action plan for the upcoming work is as follows:

1. Editorial team will review the paper by July 1, 2018.
2. After the comments from the editorial team are addressed, the paper will be sent for review to the whole WG, with the comments due by September meeting.
3. WG Chair will submit paper abstract to 2019 relay conferences: Texas A&M (late August of 2018), Georgia Tech (end of September of 2018), WPRC (mid-April of 2019), and MIPSYCOM (end of February of 2019).
4. At the September meeting, any outstanding comments will be addressed by the WG.
5. The paper will be sent to the C-subcommittee for review and approval between the September 2018 and January 2019 meetings.
6. A Power Point presentation will be developed between September 2018 and January 2019 meetings. Volunteers are needed; please contact the WG chair or vice chair. For an approximately 30-minute presentation, about 25 slides with many figures from the guide need to be developed. The text should be minimal presented as short phrases in bullets; the rest should be included in the speaker notes.
7. The PP presentation will be dry run with the WG at the January 2019 meeting. All WG members are strongly encouraged to attend.
8. The paper would be presented at the 2019 relay conferences. Volunteer presenters (most desirably, from original WG C18) are needed for all but MIPSYCOM conferences; please contact the WG chair or vice chair.
9. The conference paper will be converted into an IEEE transaction paper at that time.

Action items:

1. Editorial team [**Mike Jensen, Jeff Barsch, Abu Bapary, Lynn Schroeder, Craig Holt, and Gaston Ortega**] to review the paper by July 1, 2018, and submit comments to chair, Alla Deronja (aderonja@atcllc.com) and vice chair, Keith Houser (keith.houser@dom.com**).**
2. **Alla Deronja** is to submit the paper abstract to the protective relay conferences as soon as the guide is published.

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

C36: IEEE Transactions 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.

C-36 met on Tuesday in Grand Ballroom 3 at 4:30pm there were 4 members and 6 guests.

Alex was not present and only three of the members present at the meeting were part of the C2 working group. It was decided that no writing assignments would be made at the meeting. It is asked of the membership to review the C2 paper and note the sections of particular interest for the C36 transaction paper. For those who participated in writing the C2 report, please identify which section you authored or know well and provide a response on your ability to fast-track those sections for preparation into the transaction paper. At the next meeting we will discuss writing assignments and begin working towards a first draft.

Link to C2 paper:
http://www.pes-psrc.org/kb/published/reports/PSRC%20WG%20C2%20-%20Role%20of%20Protective%20Relaying%20in%20the%20Smart%20Grid.pdf

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

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 Monday morning with 10 attendees; 5 members and 5 guests.

The Task Force met and discussed what the potential working group (WG) scope would be. During the discussion, if the scope is to develop a IEEE Transaction Paper, then a member mentioned that the new WG would need to mention more about AC Protection effects. After the meeting, a discussion with the C Subcommittee chair clarified the intent of the potential WG. Since there was not much attendees, the TF Chair will reach out to the original members of the C20 WG for potential assistance, if not we request to disband. Next Step is a presentation on the C20 Technical Report and the WG Vice Chair will reach out to WG Chair on that process.

Next meeting Requirements [September 2018]: single session, 20 attendees

Meeting adjourned @ 09:00 local time.

C38: Guide for the Design of Microgrid Protection Systems

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

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

S. S. (Mani) as Acting Chair introduced objectives and history of the need to develop an IEEE-SA Guide for "The Design of Microgrid Protection Systems".

32 people were in attendance. The list of attendees is attached here.

In working on the P 2030.7 and P2030. 8 on "Microgrid Controller Functions and Testing Methods", the need for developing an IEEE Guide on "Microgrid Protection" was identified but not considered.

Task force reviewed the PAR from Mani

- Originally proposed completion 12/2020 and submittal to RevCom 08/2021
- We will try to complete the work at the end of 2020
- We will request four years from IEEE-SA to ensure that we have enough time allocated and will not need to file an extension
- The group discussed whether to engage IEC and decided not to for schedule reasons at this stage.
- The group discussed testing methodologies and decided not to discuss testing because we are a guide and not a standard.

To present it to the C- Subcommittee, the proposed PAR and the name of the working group (P2030.12), attendance list, and meeting minutes are provided here.

This will be discussed at the subcommittee. But will need to be approved by the main committee.

Sukumar Brahma made a motion to approve the PAR as discussed today and seconded by Michael Higginson.

- The motion was approved unanimously.

Gene Henneberg as the Chair of the C-Subcommittee requested that the letter be submitted to main committee and incorporated a short presentation.

Mani to ask at C subcommittee meeting to form a working group

- The assignment will be to create the Guide for the "Design of Microgrid Protection Systems".

Mani has received an endorsement letter from Dan Ton of DOE, and showed it to the group

- The task force discussed some of the requests and agreed that we may not address all the points that Dan brought up.
- Matt from Sandia spoke on behalf of Dan Ton - indicated that a response is not necessary, and the points were potential research topics.

Respectfully submitted,
Mike Higginson

D: LINE PROTECTION SUBCOMMITTEE

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

The Subcommittee meeting was called to order on Wednesday, May 9, 2018 with 24 members and 34 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (24 out of 43 members present). Manish Patel was added to the membership of the sub-committee.

Minutes from the January 2018 meeting in Jacksonville were approved after motion made by Tony Seegers and seconded by Fred Friend.

The Chair reviewed items of interest from the Advisory Committee.

Working groups gave reports on their activity.

Reports from the WG Chairs:

D28: (PC37.230): Guide for Protective Relay Applications to Distribution Lines

Chairman: Brian Boysen
Vice Chair: Claire Patti
Established: 2013
Output: C37.230 – Guide for Protective Relay Applications to Distribution Lines
Draft : 2.0
Expected Completion Date: 2018
Assignment: To review and revise C37.230-2007, "Guide for Protective Relay Applications to Distribution Lines" to correct errors and address additional distribution line protection related topics**.**

The working group met in Pittsburgh, PA on Tuesday, May 8, 2018, 9:30 am EDT.

There were 17 members and 10 guests. The attendance list is attached.

The patent slides were presented. No concerns were brought forth.

September meeting minutes were presented. Pat Carroll motioned to approve the minutes. Randy Crellin seconded the motion. The minutes were approved.

The chair and vice chair presented the modifications resulting from their respective reviews.

The chair presented a motion to form a balloting body. Randy Crellin seconded. 17 members were present and 17 members voted in favor.

Assignments: None ! Old Business: None !

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

The chair of the sub-committee will present the request to go to ballot at the main committee meeting.

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 May 8 in Pittsburgh, PA with 5 members and 14 guests.

Gene Henneberg sat in for Kevin Jones and Heather Malson sat in for Normann Fischer

NOTE: all red text indicates action items and **bold text** are minutes from meeting

1. Introductions / Sign-up sheet

19 Attendees, 5 Members and 14 Guests present.

2. Review minutes from January 2018 meeting in Jacksonville, FL

January meeting minutes were reviewed and approved by those present.

3. D29 test system developments PowerPoint provided by Kevin Jones

For testing, Kevin reverted back to original test system model – see PowerPoint for complete details. Results for critical clearing time study calculated, yielding CCT, angular deviation at CCT, and max slip rate in Hz (suggest adding degrees/s to table). From the table, requests for the calcs to be provided along with the presentation to the DL for group to review/better understand – Kevin Jones

*****Question - With all the wind gen, what happens to frequencies and slip rates? Should be addressed, considered. Recent trip in Texas? Couple weeks ago.** Find out who's event it was – ask Rafael Garcia, Oncor? AEP Texas? Was not Xcel. Let Kevin Jones know and he will provide any details to the group – anyone if not done by time minutes as issued to WG.

Full Load Rejection Study Observations included in next table.

Next steps for simulations – all Kevin Jones

More testing on the model to continue

Once system model is finalized, files will be shared with those testing in various Vendor programs to run independent tests.

CCT & FLR values will be compared with independent results for verification/comparison and shared with WG after completion.

Jun Verzosa presentation – prepared material on GE/Alstom method of OOS PSB relay operation, since no one had previously done so.

Jun provided related material on relays for document. Looking for GE/Alstom reviewers. Heather volunteered to ask people. Send write up to Heather Malson.

4. Review and discuss writing assignments, making additional assignments as required

Some holes still need to be filled and potential gaps from original assignments with shifting priorities of people that may not be attending regularly going forward.

5. Open discussion (new items for consideration) – N/A

6. Other business – N/A

7. Adjourn – **meeting adjourned at 1747.**

ADDITIONAL NOTES:

Kevin will schedule web meeting(s) in summer months, TBD.

Kevin emphasizing deadline for paper is January 2020 JTCM. If you have assignments, start, refine, finish, or request assistance prior to summer web meeting(s)

For the next meeting, D29 will need a room for 30 and an overhead projector.

D30: Tutorial on Application and Setting of Ground Distance Elements on Transmission Lines

Chair: Karl Zimmerman (Karl_Zimmerman@selinc.com)
Vice Chair: Ted Warren (JTWARREN@southernco.com)
Output: Tutorial
Established: January 2014
Expected Completion Date: December 2018
Draft 2.0
Working Group Assignment: Write a tutorial on factors affecting the application and setting of ground mho and quadrilateral distance elements on transmission lines.

Working group D30 met in a single session in Pittsburgh on May 8, 2018, with 6 members and 12 guests.

After introductions, the WG Chair reviewed the assignment and most recent contributions (from Gary Kobet, Josh Lamb, and Aaron Martin)

Aaron Martin presented some revised material on the operation of a ground distance element during a single-pole open condition on a parallel transmission line.

Josh Lamb presented his writing assignment which shows the challenges of applying ground distance elements looking through an auto-transformer. His write-up includes cases where the CTs and VTs are on different windings of the transformer (e.g. CTs on 161kV winding, VTs on 138kV winding).

The WG Chair volunteered to incorporate all up to date contributions and send to web site for distribution to WG members by May 18. The Chair then asked for 2-3 WG

members to review the entire document start to finish for consistency and technical content. Josh Lamb, Ted Warren, and A. Deronja agreed to this. The Chair will schedule a webex in July (TBD) to meet and discuss revisions. The goal is to revise and then send to the entire WG with a ballot style comment form.

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

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

Chair: Normann Fischer
Vice Chair: Joe Mooney

D34 did not meet in Pittsburgh 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:
Draft: 3

Working Group D35 met on Wednesday, May 9th, 2018 at 8:00am in a single session with 17 members and 12 guests.

After introductions, we started reviewing the submission in the Communication Path technology section that added single sentence summaries on what schemes are best applied to each technology.

We reviewed the Westinghouse flowcharts again, but decided that a visual like that would be the end game for the paper.

We then looked at each of the Visio diagram provided for the different system topologies and got general approval of their presentation. We discussed combing the two three terminal line sections (Adi).

To wrap up, two individual sections were reviewed - Double Circuit Overhead with Mutual Effects and Grounded Bank Tapped on the Line. There were many good comments implemented, but more review should be done.

The question has been asked why PUTT was not included in the scope. This is due to its scarcity, but we will add a very brief section on uncommon pilot schemes including references to the IEEE C37.113.

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. Single Circuit Transmission Line with Weak Infeed - Qiao Yin Yang / Jun Verzosa / Nuwan Perera
3. Overhead Line with Inline Transformer - Vinod Sekhar / Wani Hakim
4. Transmission Line with Single Pole Tripping - Aaron Martin / Qun Qiu
5. Underground Cable Line - Demetrios

D37: Impact of Series Compensation on Transmission Lines

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

D37 met on May 8th 2018 with 12 participants (7 guests and 5 signed members).
D37 Chair (Mike Kockott) was not present this time at IEEE PSRC, and working group. Meeting was chaired by the vice-chair Luis Polanco.
Meeting minutes of the D37 January 2018 meeting in Jacksonville, FL was reviewed.
Vice-chair discussed existing report outline with WG members and guests.
WG members and guests provided valuable feedback on expanding existing outline.
WG Discussions related to:

- Roy Moxley raised the issue of delayed current zero due to transient offset. He volunteered to:
  - Research the subject and advise on his findings on added section 3.4.4.
  - Provide review comments on the Fault Levels Section 3.3
  - Tapan Manna volunteered to research current harmonic distortion on series capacitor.
- WG proposed to add Historical events section 5.2.1 to the report outline.
  - Charles Henville volunteer to provide references of reported events.(BC Hydro) for the Historical events section 5.2.1
  - Peter McLaren volunteered to research a Manitoba Hydro directional line protection trip during series compensation bank switching operation to incorporate on the historical events section 5.2.1.
  - Luis Polanco to research on three (3) Gas-Turbine Generator failures that occurred on south-america few years back to incorporate on the historical events section 5.2.1.
- Section 6.1 was updated to reviews of records during Internal and/or external events.
- Section 6.2 was updated to reviews of protection based on network topology changes.
- Section 7.1 was modified to group all directional comparison communication aid-schemes together. Current differential scheme remained a separate section.
- Nuwan Perera volunteered to draft two (2) sections:
  - Section 7.2 on Faulted phase selection.
  - Section 7.5 on Staged fault testing.
- Vice-chair will follow-up on previous assignments:

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

John Lane for section 3.1 on Understanding series capacitors

Vice-chair indicated that all Contributions are due by 15th August

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 (1a)

DTF38: Impact of High SIR on Distance Relaying

Chair: Chris Walker
Vice Chair: Greg Ryan
Task Force Assignment: Investigate the need for a working group on the Impact of High SIR on Distance Relaying

D38 met on May 9, 2018. The meeting started with introductions. Russ Paterson 1st motion to approve previous minutes, Bruce Mackie 2nd. After minutes approved Chris introduced Pratap for his presentation. "**Impact of Parallel Network Connections and Remote End Sources on Voltage Discrimination".** Much discussion centered on if SIR is the focus the group should have. Voltage discrimination is only one factor and perhaps the working group should expand the focus to a more broad focus taking into account all factors and work towards a better guidance on determining Zone 1 reach. The origins of the long, medium, and short lines from C37.113 were questioned. There was discussion about requesting information from manufacturers.

Chris introduced an outline.

We questions if we should we go back to the subcommittee to revise our assignment. We decided to leave the assignment as is with the knowledge that we can change it in the future.

30 Attendees: 18 members and 12 guests

For the next meeting we request a room for 40 attendees and a projector.

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

Chair: Manish Patel
Vice Chair: Brandon Armstrong
Established: 2018
Output: C37.104 – Guide for Automatic Reclosing on AC Distribution and Transmission Lines
Draft: 0.0
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, May 9, 2018 at 9:30am EST in a single session with 26 members and 16 guests. This was the first meeting as a working group. The WG is still waiting for approval of the PAR by NESCOM.

The meeting started with introductions. The patent slides were reviewed. No one knew of any patent issues at this time. The working group reviewed and approved meeting minutes from the January 2018 TF meeting.

The working group discussed the schedule at a very high level. To finish the work by the expected completion date of December 31, 2022, the chair proposed to have a clean draft of the guide ready for final WG review by mid-to-late 2021. Following topics were discussed briefly but no decisions have been made.

1. Use of term “circuit breaker” vs. “interrupting devices”
2. Use of term “smart circuit breakers”
3. Transferring content regarding load restoration after an underfrequency event from the UFLS guide C37.117 to this guide.

Following assignments were made to help review the existing guide:

- Craig Holt – Sections 4-7
- Gary Stoedter - Section 5
- Adi Mulawarman - Section 6
- Rafael Garcia - section 4
- Quin Qiu - Section 4
- Sukumar Brahma - Section 7
- Brian Boysen - Section 5
- Mat Garver - Section 7
- Don Lukach - review of guide C37.117 in regard to load restoration after an UF event.

Mat Black and Rick Gamble volunteered to investigate load restoration after an UV event and be sure nothing contradicts with the distribution line guide. Miguel Rios volunteered to manage all the figures in the guide. Contributions are requested by July 31, 2018.

For the next meeting, D39 will need a room for 40 and a computer projector.

DTF40: <u>Future Plan for Transmission Line Guide C37.113</u>

Chair: Jeff Barsch
Vice Chair: Don Lukach
Task Force Assignment: Provide recommendations to the Line Protection Subcommittee by reviewing the scope of material and investigate how to improve future revisions of IEEE Line Protection Guide C37.113. Considerations will include reducing the size of existing guide by breaking sections into standalone guides and reviewing technical reports on topics that are subsets of existing line guide.

The DTF40 task force met for the second time on May 8, 2018. There were 35 people in attendance.

Jeff Barsch reviewed the topics that were discussed at the January 2018 task force meeting. The group then discussed the pros and cons related to the following two ideas: 1) breaking C37.113 into smaller guides, and 2) keeping C37.113 largely intact.

After a lengthy discussion, Alla Deronja made a motion that the guide should be kept intact. Jay Anderson seconded the motion. The task force unanimously voted to

keep the guide intact. This proposal was presented to the D Subcommittee and accepted.

The group also proposes that a new ongoing working group be formed with the following assignment: Manage the development of line protection topics and harmonize efforts with C37.113. The output of this working group would be to make recommendations to the D Subcommittee on topics that could be developed into guides, perhaps using reports or tutorials as their starting points. This proposal was presented to the D Subcommittee and accepted. A new working group D40 will begin in September with Jeff Barsch as the chair and Don Lukach as the vice chair. The DTF40 task force's assignment is complete.

The September 2018 meeting for the D40 WG will require a single session, computer projector, and a room for 40 attendees.

H: RELAYING COMMUNICATIONS SUBCOMMITTEE

Chair: Galina Antonova
Vice Chair: Aaron Martin

The Subcommittee met on May 9, 2018. The meeting continued with 21 members of 42 total, comprising a quorum. 32 guests were also present. Minutes of the January 2018 meeting were approved without objections.

The Chair presented new several announcements

a. New items from May 2018 Adcom Meeting
   i. Meeting cancellations to be scheduled well in advance
   ii. WG are encouraged to host Webinars
b. New items from Awards and Recognition Meeting
   i. PES templates to be used to post on PES Resource Center
   ii. WG Chairs to request awards for completed standard work
c. New items from Standards Coordination Meeting
   i. WG chairs with PAR are to attend Coordination meeting
   ii. Respond to IEEE data privacy emails, in effect May 25, 2018
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. Standard format for SC H vote mailings (Subject line):

New business:

Qiaoyin Yang suggested software defined networks (SDN) as a topic for a new Task Force. Discussion reveled that input from PSCC committee is required to discuss this further.

Bill Dickerson shared the need for educational material on synchrophasor applications and suggested forming a Task Force to generate a Tutorial on this topic. Allen Goldstein spoke in support. This was discussed in multiple WG meeting in May. HTF48 was formed with an assignment to investigate a need for forming a Working Group to generate a Tutorial on Synchrophasor applications.

James Bougie during Working Group report expressed the need to work on a document that describe time sources, such as GPS receivers. There was no time to discuss this proposal further.

Gary Kobet stated that educational material on using packet-switched networks for protection is very much desired by utilities such as his. One approach to provide education to protection and communication engineers is to generate a Tutorial that could be placed on IEEE PES Resource Center. A discussion on H32 report followed, as its scope is similar. It was noted that comments on H32 report has not been addressed yet. It would be beneficial to distribute current draft to SC D Line Protection for review. It was also noted that input from PSCC is required to discuss Tutorial topic further.

Erin Spiwick explained the new IEEE privacy Policy and reminded attendees to look for IEEE privacy notice email.

The IEEE Standards Association Working Group Awards has a new Procedure to request awards for completed (Approved Standard) work.

WG business:
H35 Report to be sent to the WG and the subcommittee for review – and then on to the H Subcommittee
Get a copy to Murty Yalla to share with TC-95 – with whom the Dual Logo with COMTRADE exists

Old business:

Reports from the WG Chairs

H3: Time Tagging for Intelligent Electronic Devices (COMTAG)

Chair: W. Dickerson
Vice Chair: J. Hackett
Substations C4 Co-Chair: M. Lacroix
Output: Standard
Established: 2006
Expected completion date: December 2016
Assignment: Develop an IEEE Standard for time tagging for power system IEDs. This will include common requirements for time tags, and show how to apply them to various classes of time sequence data. Requirements and methods for stating the resulting time accuracy will be included.

The WG met on Tuesday with 5 members and 5 guests. The patent policies were discussed, and no issues were identified.

The last modifications to the document were approved by the experts who submitted the comments.

Document revision 1.00 will be sent to RevCom for publication. Next RevCom meeting is in September.

A paper will be prepared to publicize the work done by the group.
The list conferences, where to propose the paper, will be decided later.

H6: IEC 61850 Application Testing

Chair: C. Sufana
Vice Chair: B. Vandiver
Output: Report
Established: 1999
Expected completion date: December 2014
Assignment: Write a report to the H Subcommittee on application testing of IEC-61850 based protection and control systems. Emphasis will be on the GOOSE functions.

No Meeting no report

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

Chair: K. Martin
Vice Chair: A. Goldstein
Output: Standard
Established: 2006
Expected completion date: December 2017
Assignment: Develop a joint IEC/IEEE standard for synchrophasor measurements based on the IEEE Stds. C37.118.1-2011 and C37.118.1a-2014 according to the PAR issued June 2013.

The attendance was 8 members, and 5 guests. Attendees introduced themselves, and a sign-in was circulated. No comments were received back from the attendees regarding the patent announcements. The chair reviewed the current status:

All balloting and comment resolution is completed. The completed draft was sent to the IEC for preparation of the FDIS in March. The IEC plans to have the FDIS ready for WG review in early June. At that time the WG will make a final review for errors and omissions (no technical changes will be done). The IEC will then start its 6 week FDIS circulation and the WG will submit for IEEE revCom approval before July 27. This will allow final IEEE approval by RevCom at their September 27 meeting. The final IEC approval should happen around the same time. The latest (and final) draft is draft 9.

The WG discussed the planned summary paper and different ways to present the material to make the standard known. The original plan was for a transactions paper, there are challenges with presenting new material as required for journal papers. A conference paper is easier to produce by a WG and may get out the information better. The idea of a tutorial, a Webinar, or a self-guided training was discussed. The WG did not meet a solid consensus on what to produce. Consequently the Chair will draft an outline for a potential conference paper making an overview of the standard and also investigate the options of a short tutorial for an IEEE GM presentation. This will be circulated to the WG for decision on the next steps.

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

Recorded,

Ken Martin

Convener/Chair

H17: Establishing Links between COMTRADE, IEC 61850 and CIM

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

Chair: Amir Makki **Chair C19: Denis Holstein**
Vice Chair: Cesar Calix
Secretary: R. Cornelison
Output: Guide
Established: January 2014
Expected completion date: January 2018
Assignment: Identify and categorize protection related data files based on content, use, and risk of disclosure or compromise. Protection related data files include but are not limited to files used for configuration, management, and analysis of protective relaying systems.

The Working Group met on time with 8 members and 3 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.

All assignments are complete. The group is now in the process of assembling the Draft Guide which we will have available to group members for balloting during our October meeting.

The Group discussed the expected completion date for the Guide. The date is at the end of this year which is not enough time for the balloting process. The Group therefore agreed to revise the PAR and file for an extension of two years. The revision will include three items: remove the joint effort with substations, revise to reflect the new makeup of the leadership (Amir Makki Chair, Cesar Calix Vice Chair), and a few editorial revisions to correct language and grammar. The marked-up PAR will be submitted to Galina Antonova for review.

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

H23: Guide for Naming Intelligent Electronic Devices (COMDEV)

Chair: R. Cornelison
Vice Chair: Eric Allen
Secretary: Amir Makki
Output: Guide
Established: January, 2013
Estimated Completion Date: January, 2017
Assignment: Develop an IEEE Guide for naming Intelligent Electronic Devices (IEDs) based on the report of Working Group 10.

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

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 2010
Estimated Completion Date:
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.

Presentations:

Reviewed PAR.

Held a discussion on a proposed first requirement for the COMSET file. We spent most of the time re-explaining concepts that have been covered in past meetings.

Held a discussion on whether or not non-user-configurable configuration data should be included in file.

Held a discussion on the inclusion of graphical logic in the file.

Ended the meeting with a promise for two GoToMeetings (hopefully monthly) before the next meeting in Minneapolis.

Action Items:

Mario to update the document describing the use cases and possible requirements for the COMSET file. Document will be sent for review/comment from members.
Mario will also re-prepare the demonstration implementation.
Mario to assemble web meetings.
Mario to establish iMeet website for management of documents.
Status: Draft 0.3 (no change)

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: September, 2015
Assignment: Collect user feedback from utilities and consultants for designing and implementing IEC-61850 based substation automation system. Prepare a report outlining the experienced issues and suggest enhancements to IEC-61850 standard and manufacturer implementations.

Introductions:
The group met on May 8th with 11 members and 16 Guests.

Deepak and Aaron reported that the opinions from WECC, NERC, and NPCC that they are not too interested in IEC 61850 beyond a reliability standpoint.

National Grid, US (Antonio Riccardo) made presentation on their IEC 61850 initiatives and lab testing comprising of GOOSE, Sample values with merging units, MMS protocols and PTP testing. Presentation topics included:
Differences and difficulties working with different manufacturer configuration tools.

Difference in vendor's implementation with regard to Test and Simulation modes.

Differences in operational behavior with time synchronization and loss of communication on PRP networks.

Deepak presented reliability implications with different network designs on GOOSE and sample value applications. The higher importance of time synchronization in process bus applications was highlighted. Reliability considerations in point-point fail-over links, PRP and HSR networks was reviewed with regard to MTBF, maintenance and forced outage conditions. Finally, the presentation was concluded with following remarks:
Users/implementers of IEC 61850 standard to consider the contingency conditions with regard to communication network and time synchronization and design adequate back-up protection based on 51/51V elements.

Feedback to manufacturers included –
Allow complete auto-configuration of communication network in substation with manual override capability.
Manufacturers to support 1G and 10G communication links with PRP, HSR and PTP support.
Explore to make the link fail-over technology superfast with less than 1ms detection and switchovers.

Feedback to IEEE and IEC organizations included –
Develop or share open standards for link failover technology
Develop or adopt standards to for end-end link integrity monitoring

Enhance network monitoring functionalities in relays such as providing statistical information or logging/detection loss of 1 or few network packets or out of time sequence arrival.

This feedback would be presented to IEC WG10 in User Feedback Task Force in the next meeting at New York in June-2018.

H31: Common Protection & Control Parameters for COMSET

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

The working group met on Jan-10th with 4 members and 7 Guests.

The working group met on May-9th with 5 members and 8 Guests.

The group discussed about the logic modeling aspects compared to the scope of H27 (COMSET). It was made clear that the scope of H31 is to identify models and parameters of all protection and protection related functions currently represented in manufacturers. The scope does not encompass any custom logic defined by users or vendors. The logic modeling aspects was left to the scope of H27 working group.
The chair made clear the naming conventions and corresponding description defined in the excel sheet containing all protection and protection related functions from (IEC 61750 7-4 standard). Members felt that the description text was not clear and there is a need to redefine them clearly. References to Statistical Calculation methods made it more cumbersome to understand. The Chair took it as an action item to study and redefine the all the description text for all protection and protection related parameters in a more cleared manner for next meeting.

Contributions from Todd Martin for Power functions (32 PDUP and PDOP) were discussed. On reviewing the IEC 61850 object model and the parameters from Basler, GE, SEL, Schneider and Siemens manufacturers, the group found following missing aspects:
There was no way to represent the inverse time characteristics for power elements. IEC 61850 had inverse time characteristics for current and voltage elements but lacked the details in power elements.

It was not clear where and how to represent over and under threshold for Imaginary power and complex power quantities.

In one of the previous meetings, Alex Apostolov had a made a proposal to represent the data models in a more hierarchical manner than what currently exists. Instead of merely identifying the missing parameters and adding new ones, the group felt the need to review the modeling concepts and redefine all these elements in more systematic manner, which has potential to become a new standard.

H32: Performance Requirements for Ethernet Circuits Applied to Teleprotection

Chair: K. Fodero
Vice Chair: W. McCannon
Output: Report
Established: September, 2014
Estimated Completion Date: September 2018 Assignment: Develop a report on the use of Ethernet transport for teleprotection services and line current differential

protection. This report will define the channel performance requirements for Ethernet transport systems / circuits that carry pilot protection communications.

No meeting. No Report

H35: XML Translation for COMTRADE

Chair: M. Adamiak
Vice Chair:
Output: Report
Established: May, 2015
Estimated Completion Date: December 2019
Assignment: Create a report with recommendations and implementation guidelines for the update of COMTRADE - specifically with the inclusion of XML definitions of the Configuration, Header, and Data areas.

The working group met with 11 members and 6 guests.

Presentations:

Mark reviewed the purpose of the working group.

Mark displayed Revision 7 of the paper that the working group is producing.

For each concept that is being proposed for addition to COMTRADE 2020, there is a section in this paper.

Discussion moved onto data types. It is proposed to add more data types to COMTRADE, such as new integer sizes.

Question is proposed about whether or not sampling information and timing info should mirror what is done with synchrophasors. How will dynamically-sampled data align with the periodic synchrophasors?

Discussed the various proposal sections found in the paper, such as:

Integrating sample data and derived data in the same channel.

Adoption of Unicode.

File compression.

Alignment with IEC 61850 recorders.

We haven't yet added anything on file security (possible reference H22 work).

Discussion of HHDR section, XSLT. Should the section for displaying Reports be free form? Or standardized?

Discussion on Derived Data, a term that indicates that a channel's quantity is not a pure physical quantity, but rather is the result of some sort of algorithm that utilizes information from other channels (and possible settings). Also, discussed "interleaving" vendor-calculated derived values into another channel.

Discussion on synchrophasors. This lead to a general consensus that we should really distinguish the data based upon its time sampling frequency and other factors, such as whether or not it is a pure physical quantity or a derived one.

We removed the details of "interleaving" the data from the paper. These are implementation details that the standard working group would have to address.

Suggested that data types should include multi-dimensional data. Complex values (real and imaginary, or phase and magnitude quantities) should not require multiple channels. "N-dimensional data" suggested as a data-type.

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: May 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 2 members and 7 guests in attendance.

Chair's Remarks: The Guide has been approved and is in the editorial review process. Thanks to everyone who help make this guide possible We are looking for the next step in the process of Time synchronization systems.

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 two more meeting with a goal of developing a summary paper and presentation for a presentation at the January JTCM 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

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
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 5 members and 8 guests in attendance.

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.

Chair's Remarks: Reviewed where we are at.

Approval of Previous Minutes: Minutes were not approved

Agenda Approval: Agenda approved.

Review/discuss draft document:
We revised the scope to better clarify the scope. We discussed the different types of databases and applications.

Chair will send out the latest draft of the guide.

H41: Revision of IEEE 1646 Communication Delivery Time Performance Requirements

TF Chair: D. Holstein
Vice Chair: T.W. Cease
Output: Recommendation for Assignment for Formation of New Working Group
Established Date: 2017 January
Completion Date: 2020 January
Assignment: Revise IEEE standard 1646-2004 – IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation"

The WG met on Tuesday, with 6 members and 4 guests in attendance. A quorum (6 of 9) was present. This was the third official meeting. Attendees introduced themselves and affiliation.

Attendees signed the attendance list and indicated if they were a member or guest.

Action item 03-01: Update iMeet to include new members and guest with an invitation to register for P1646 [DH].

The call for patents was presented – no response.
The agenda was reviewed and approved without change.
Meeting #2 (Jacksonville, FL) minutes were reviewed and approved as written.
Action items were reviewed and all action items from meeting #2 were closed.

WG P1646 started clause-by-clause review.
The approved PAR title P1646 “Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation.” The scope states “This standard defines communication delivery times of information to be exchanged within and external to substation integrated protection, control, and data acquisition systems.”

Action item 03-02: Include definition of communication delivery time [CP].
Action item 03-03: Check with Mel Swanson to define style guide/rules for definitions [DH & CP].
Action item 03-04: Reach out to P1854 to understand the synergism with P1646 [CP].

Definitions will be revisited and updated based on the context in which they are used.
No changes were recommended for clauses 1.2, 1.3 and 1.4.
Clause 2, Normative references, includes IEEE Std 1588:2002. Unless this standard is cited as a normative requirement in clause 5.5 it will be deleted or moved to the bibliography as an informative reference with the note that it is updated.

Beginning with clause 4, the clause-by-clause review will continue at the next meeting.

New business: A new CIGRE JWG B5/D2.67 has formed. Holstein is a members and will keep the group updated on its relevance to P1646.

Action Item 03-04: Post their terms of reference on iMeet [DH].

H44: <u>Enhancing GOOSE I/O Monitoring</u>

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

Introduction – 15 members, 12 guests
Chair presented IEEE standard related slides
Group Approved new wording of Purpose Statement reviewed
Craig Preuss gave a presentation on GOOSE monitoring which included IEC 62351-7

Group agreed that three main areas need to be monitored:
GOOSE Control block, or Sample Value Control block, (Publisher),
Monitor LGOS or LSVS of Subscriber,
Passive Monitor (Network), Mirror Port

The following assignments included:

Aaron Martin to write Background
Discussed LSVS and LGOS and profiling LSVS and LGOS.
Herb Falk and Ralph Maekiewkz agreed to write about LGOS
Qiaoyin Yang and Dean Ouellette agreed to write about SV monitoring and LSVS.

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

Chair: R. Das
Vice Chair: Kanabar
Expected Output: GuideEstablished: January 2018
Expected completion date: January 2021Assignment: 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 May 9, 2018 with 27 participants (10 members and 17 guests). Four 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 approved scope and clarified questions. Chair also provided the background for the WG formation.

A high-level project plan was discussed, and participants agreed on a plan to move forward. More details will be added to the project plan as the work progress and the project plan will be periodically reviewed to meet the project deadline. Presentations related to CPC will be arranged starting with the next meeting and we have five volunteers who offered to present during the September, January and May Meeting.

WG then discussed a draft outline based on two proposals from WG members. WG will continue discussions on the guide based on comments received before the September meeting. WG will meet in a single session during the next meeting.

HTF46: 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: 1.3.1
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 5/7/18 at 13:30 EDT with 10 members, 21 Guests, and 10 remote attendees via skype. The goal for this meeting is to set the working group up for success by refining the Task Force's end product to a manageable, achievable deliverable.

The SCADA control capability was discussed and the parallel regarding HMI control was explored. The scope is being more thoroughly vetted and at least one more meeting of the Task Force will be necessary. Further web meetings will be held between now and September meeting in Minneapolis, and the scope and purpose will

be more thoroughly defined to present to the H subcommittee for PAR approval (subsequently to the Main Committee).

At a previous Task Force meeting in January the Task Force removed the graphical displays on the front of the relays from the scope of this document. One would stand to reason that we will have an upper limit as to what we can explore in the way of system level drawings, etc. Font sizes/Line weights have been discussed in-depth by the ISA and it is unclear as to whether it will be within the umbrella of this proposed document.

Bridget Fitzpatrick will serve as our representative from ISA101.

A note was made regarding the IEEE graphics library being antiquated and not even active. IEC has an "online" graphics database, but the user unfriendliness has been noted and the viability of using it moving forward has been called into question.

Multiple parties have volunteered for the future H46 leadership possible candidates are: Dustin Tessier and Matt Black.

IEC TC57 provided some feedback on the report draft.

The Task Force discussed the use of "Utility Automation" in the title, which could be seen as slightly misleading. The HMI aspect of this report is dedicated to the screens, and a HMI that makes decisions regarding the operation of the power system is outside of the scope of this report.

The Task Force discussed the use of the theory of "complex network graphics," being used within this report.

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.

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 were performed.
2. We have quorum with 20 members present
3. Approval of Minutes of the January 2018 meeting
    a. Motion entered by: Mike Meisinger

b. Motion seconded by: Mal Swanson
c. Motion approved

4. Coordination & Advisory Committee Meetings Items of Interest
    a. 241 attendees, 23 newcomers
    b. Future Meetings:
        i. September 2018 – Minneapolis MN
        ii. January 2019 – Orange County (Garden Grove) CA
        iii. May 2019 – Cincinnati OH
        iv. September 2019 – Denver CO
    c. **Please submit your rosters so we can meet September directory deadline. Also review and remove members for non-participation**
    d. 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.
    e. ***Join.me*** is available for conference calls/screen sharing – Contact Erin Spiewak to set up an account for the WG/TF Chair
    f. 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.
    g. Looking for presentations for the Main Committee meetings – please contact Andre Uribe or Brian Mugalian. Many I WG have concluded their work and could be considered for September 2018.
    h. For May 2018, I Subcommittee will have a total of 15 WGs and TFs
    i. 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.
    j. Use of 75 minutes in your Working Group
5. Administrative Items
    a. **E.U. GDPR (General Data Protection Regulation effective May 25, 2018. Results in changes to IEEE Privacy Policy (see examples)**
    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. Includes creation of a new PAR
        iii. Includes changes to PAR scope, purpose
        iv. Working group submits to the Subcommittee the new or revised PAR, scope, purpose, minutes of their meeting, attendees, their affiliations, any disagreements are noted in the minutes.
        v. Subcommittee reviews it, the SC Chair presents it at the Main Committee
        vi. Motion to approve the new or modified PAR is done at the Main Committee meeting
        vii. PSRCC is the Sponsor

viii. 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 September 2018 meeting that you include "do not conflict with I50, D87, …"
h. As Chair or Vice-Chair of WG or TF, please contact Brian and Andre ***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 Steve Turner with copies to Brian Mugalian and Andre Uribe. Steve will review and forward to: webmaintenance@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 ***August 2018***. Andre Uribe will set up the conference bridge for these calls.

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

6. Working Group Reports

Reports from the Working Group Chairs

I2: Terminology Review Working Group
Chair: M. Swanson
Vice Chair: F. Friend
Output: Definitions for IEEE Definition Database (formerly IEEE Std. 100)

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, May 9, 2018 with 7 members and 1 guest.

Quorum was achieved and minutes from the January meeting in Jacksonville, FL were reviewed and approved, following a minor correction.

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

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

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

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

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

I4: IEC Advisory Working Group

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

The WG met on May 8 with 6 members and 2 guests to review TC 95 standards activities. The January 2018 minutes were approved. Main discussion points are as follows:

- IEC 60255-1: **Part 1** - ***Common requirements*** – the WG reviewed the new CDV, with vote and any comments due on June 15. We focused on the gaps of substance between 60255-1 and IEEE C37.90, with Chair for revision of latter, Oscar Bolado, present to help with resolution. We intend to vote in favor, with some possible comments on gaps that cannot be closed due to standards environments of IEEE versus IEC. Anyone wanting a chance to review and comment on this draft should contact Eric Udren for a copy.
- IEC 60255-26 Ed. 4: Measuring relays and protection equipment – **Part 26 -** Electromagnetic compatibility requirements. IEC has circulated the international compilation of comments from the Feb. 23 deadline on the last CD of this document.
- IEC 60255-181 ED1, Functional requirements for frequency protection – CDV was successfully voted and the FDIS will be issued shortly.
- IEC 60255-118-1, Synchrophasor standard – CDV was successfully voted and the FDIS will be issued shortly.
- 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.
- IEC 60255-21, Vibration, shock and seismic tests: Part 21-1 – Vibration tests; Part 21-2 – Shock and bump tests; Part 21-3 – Seismic tests - MT3 has begun a project to revise these standards. An opening draft (not yet an official CD) has been published, presenting the existing state with proposed changes described. Most vendors could be impacted by any changes to these type-testing standards; this early stage of development is the best opportunity for US and North American input to standards development. Contact Eric Udren for a review copy.
- The next TC 95 Plenary Meeting, and maintenance teams MT1-4 meetings, will take place in Frankfurt, Germany during November 5-9, 2018.
- TC 95 Chair Murty Yalla gave an update on the TC 95 MT1-4 activities above, and the following:
- TC 95 MT1-4 met in Oslo, Norway, April 9-13, 2018 to work on projects discussed here.
- 60255-27 (Safety) standard revisions are still in process by MT1.
- 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 under Normann Fischer set up to deal with this when CD arrives.
- TC 95 AHWG3 for relay response to sampled values from 61869-9 impacts functional standards – has identified issues for protection applications and has created documentation as basis for a WG activity to guide relay developers.

I24: <u>Use of Hall Effect Sensors for Protection and Monitoring Applications</u>
Chair: Jim Niemira
Vice Chair: Jeff Long

- Our paper has been submitted to the I SC Chair and he has submitted it to the Main Committee leadership.
- We have a meeting scheduled for tomorrow, Wednesday May 9, 2018, at 9:30 AM in Grand Ballroom 1 of the Marriott City Center, Pittsburgh, PA.

- The only items to discuss is any final wrap up issues of our WG such as perhaps creating a short presentation to the Main Committee or presentations for various regional relay conferences.
- We expect it to be a short meeting.

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

Chair: Mike Meisinger (S&C)
Vice Chair: Steve Turner (Electrical Consultants, Inc.)

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

Agenda

1. Introductions
2. Approval of minutes from January 2018 meeting
3. Discussion of CT saturation testing
4. New assignments

Peter McLaren gave a presentation on CT saturation testing that was conducted by GE using an analog power system model. These tests included the simulation of remnance via reclosing. We need a volunteer to run these cases (e.g., EMTDC, EMTP, PSCAD, etc.) using a non JA model. Peter Some alternation work is required then this can be submitted for review (**ACTION** – Peter McLaren).

Contact Alejandro Avendano to see if he is available to assist with simulations (**ACTION** – Steve Turner).

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

Saki Meliopoulos has written a paper on CT saturation and we would like for him to present this at the next meeting (**ACTION** – Amir Makki).

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

Chair: Roy Moxley
Vice Chair: Cathy Dalton

The I-27 Working Group respectfully submits our report on “Investigation of Protective Relay Self-Monitoring” and request it be reviewed and approved for publication. It was balloted and approved by the working group with over 80% in favor and none opposed. All changes requested have been incorporated.

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

Chair: Joseph Valenzuela
Vice Chair: Michael Higginson
Established: Sept, 2014
Expected Completion Date: October, 2018

The working group convened with 14 attendees, including 6 members and 8 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.

Since the in-person January meeting, we have had five online meetings as well as independent work to resolve comments from the working group ballot. The working group reviewed the significant changes that have been made so far, and made decisions on open technical questions that we needed to resolve.

To continue addressing the internal WG ballot comments and to resolve anticipated comments from the upcoming balloting, the working group formed a ballot comment resolution team. Guillermo Weyer, Jim Niemira, and Jeff Long volunteered to help Joseph and Michael with ballot comment resolution. The following new assignments were made:

1. Joseph and Michael to comment on figures indicating which are being redrawn and revised.
2. Joseph to send out draft report to working group for review.
3. Joseph to reach out to Alla about joining the ballot comment resolution team.

The working group discussed our path to completion. We will have an internal e-mail circulated to the WG members for approval to ask the sub-committee to form a ballot body contingent on our completion of the guide. A final draft will be circulated for review by the chair for working group review and approval for submittal to the ballot body. After WG approval, 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.

At the Main Committee, Brian Mugalian requested, 'Mr. Chair, the Relaying Practices Subcommittee requests approval for transmittal of C37.110 GUIDE FOR THE APPLICATION OF CURRENT TRANSFORMERS FOR PROTECTIVE RELAYING PURPOSES to the IEEE SA for balloting, pending approval of the Working Group.' Provided the ballot is favorable, the document can be sent to the IEEE SA for approval.

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

Chair: Ljubomir Kojovic
Vice Chair: Robert Frye
Output: Revise C37.235
Established: 2015
Expected completion date: 2019
Draft: 5
Output: Revised version of C37.235

I-30 met on Tuesday, May 8th at 3:00PM with 6 members and 8 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 remains open and awaiting input from ABB.

A motion was made to approve the May 2017 minutes. Moved by Ratan Das and seconded by Mark Schroeder. Minutes were approved.

A motion was made to approve the January 2018 minutes. Moved by Scott Short and seconded by Edgar Flores.

The group discussed IEC 61869, Part 10 and whether it was published or not.

The group reviewed Draft 05 of our document.

The group discussed the various output voltages of Rogowski Coils.

The group had lots of discussion related to Rogowski Coil testing. These discussions related to "how do you test a Rogowski coil in the field, do you inject primary current, how do you test the full range, and can we test three points and assume linearity?

We also discussed how to test Rogowski Coils to meet NERC requirements.

Scott and Edgar suggested labeling for Figure 24 in the document: Label the left drawing in Figure 24 as "Ratio Testing" and to label the right drawing in Figure 24 as "Application Testing."

We are on Draft 05 of the document.

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

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

I31 met with 16 local and 2 remote attendees (shown below).

The chair called the meeting to order at 8:18 am and reviewed the agenda. There were no objections to the agenda.

After introductions and showing of the patent slides where no patent claims were made.

The copyright policy was reviewed. Under old business, the chair indicated that the vote from January 2018 meeting on which option to undertake did not pass because there was an incorrect count of members present, so a majority was not reached and the motion did not pass.

An update from the EMC Society was provided, indicating that the EMC Society was concerned only about threats and levels and was willing to discuss with working group members any specific changes to the levels, especially if supported by a use case. The EMC Society cannot write the acceptance criteria, this must be performed by the domain experts in the PSRCC. The EMC Society recommends a similar approach that the Food and Drug Administration (FDA) takes on test levels. The FDA has acceptance criteria based upon function, so a medical device supporting multiple functions has separate acceptance criteria for each one.

Quorum was announced by the chair.

Mike Meisinger made a motion to approve the minutes from the January 2018 meeting, which was seconded by Jeff Pond and passed without opposition.

Under new business, the chair opened the topic of the formation of a subgroup. The working group P&Ps were reviewed for rules on subgroup formation. The subgroup scope and duties were discussed as follows: to determine a path forward on revising the scope and title of P1613 and recommend changes to the working group by the September 2018 meeting.

Mike Meisinger made a motion to approve the subgroup's scope and duties, which was seconded by Jeff Pond and passed without opposition.

The chair requested working group member participation, which included Jerry Ramie, Craig Preuss, Claire Patty, Mark Simon, and Jay Anderson. The chair took an action item to appoint a chair of the subgroup. An action item for the subgroup is to create a name that is easily referenced. The subgroup must follow the working group P&Ps for voting rights.

Mike Meisinger made a motion to adjourn, which was seconded by Mal Swanson and passed without opposition. The chair adjourned the meeting at 9:08 am.

I32: A Survey of Protective System Test Practices

Chair: Andre Uribe
Vice Chair: N/A

Committee did not meet this session.

I33: Review of Relaying Testing Terms

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.

May 2018 (Pittsburgh) Meeting Minutes:

The WG met on Wednesday May 9, 2018 with 6 members and 1 Guests. The January meeting minutes were reviewed and approved.

The WG is looking for a new leadership for the group as the current chair (Jay Gosalia) would no longer be attending PSRC meetings. On a temporary basis and until new permanent leadership can be found Amir Maki will be the acting Chair and Hugo Monterrubio the acting VC. The I SC Chair recommended that the acting Chair email group members to ask for volunteers to lead.

The WG agreed that the report will be based on the 24 terms that have already been identified and the following assignments were made:

Jack Jester – Define the format (template) in which each of the terms will be defined (should each term have an example?) A recommendation was made to cover the What, Why, and Where for each term and to use one of our identified terms as an example.

Hugo Monterrubio - Define Hardware in loop (HIL) Testing.

Mike Bloder– Define Interoperability Testing.

Luke Hankins – Post the documents and power point so the WG members can start taking assignments and continue the work.

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

Chair: Mike Dood
Vice Chair: Marc Lacroix
Output: Comments resolution for an updated version of the standard
Completion Date: End 2018
Version no: 0.2

I35 met with 5 members and 1 guest to discuss the final version of the document.

The patent slides were showed at the participants.

Mike Dood describes next actions for standard publication. The document will be finalized with the latest IEEE template. This version will be published in iMeet central for last verifications. A WEB meeting will be organized before voting to go to ballot.

At the Main Committee, Brian Mugalian requested, 'Mr. Chair, the Relaying Practices Subcommittee requests approval for transmittal of PC37.2 STANDARD FOR ELECTRICAL POWER SYSTEM DEVICE FUNCTION NUMBERS, ACRONYMS AND CONTACT DESIGNATION to the IEEE SA for balloting, pending approval of the Working Group.' Provided the ballot is favorable, the document can be sent to the IEEE SA for approval.

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 May 8, 2018 with six members and three guests.
Quorum was reached: 6 members
Reviewed SA - Patent Slide set for Standards Development.
Minutes of January 2018 meeting were approved.

The working group reviewed the listing of documents that have been uploaded to I-Meet Central and discussed methods to track revisions to documents. It was agreed that members will input changes for the revised standard draft to Jeff Burnworth, who will maintain a master document using the IEEE standard template.

The working group discussed the review of previous C37.90.2 ballot comments that was performed by Roger Ray. The group agreed to include all editorial comments. Other comments were identified within the review listing if they will be addressed in the revision of the standard. The review listing with the group's conclusions is located on I-Meet Central.

Jerry Ramie gave a presentation on Radiated RF Immunity Testing of Protective Relay Systems (Located on I Meet Central). The presentation included proposed test frequencies and methods for inclusion in both IEEE 1613 and IEEE C37.90.2.

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

1. Jerry Ramie – Provide additions or changes for the draft revision of IEEE C37.90.2 for proposed frequency test additions.
2. Jeff Pond - Provide changes for the draft revision of IEEE C37.90.2 for those items identified in the ballot comments review listing.

I37: Revision to IEEE Standard C37.90-2005
Chair: Oscar Bolado
Vice-Chair: Marilyn Ramirez
Meeting Date: May 8, 2018 @ 4:30 PM; Pittsburgh, PA
WG Output: Standard
Assignment: Review of C37.90 Standard for withdrawn in 2021

Working group I37 met on Tuesday, May 8th at 4:30 PM with 8 out of 10 members and 6 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 from the January meeting were approved.
4. PAR application completed in January was reviewed and approved. Will request to the SC and Main committee permission for transmittal of the PAR application.
5. The WG agreed to revise the document outline in order to modernize the document.
6. Discussed the discrepancies found between IEEE C37.90 and IEC 60255-1.
    a. IEC agreed to change a few of them and we discussed changing the rest on our end to harmonize both standards.
    b. Pending a decision on the altitude requirements. The WG will survey manufacturers for their input.
    c. It was proposed to reference to IEC on the humidity requirements.
7. Got requests to include:
    a. Requirements for non-conventional analog inputs.
    b. Considerations for fast trip outputs with trickle current.
    c. Considerations for minimum pickup value for DC inputs.

With no additional business to discuss the meeting was adjourned.

At the Main Committee, Brian Mugalian requested, 'Mr. Chair, the Relaying Practices Subcommittee requests approval for transmittal of C37.90 STANDARD FOR RELAYS AND RELAY SYSTEMS ASSOCIATED WITH ELECTRIC POWER APPARATUS to the IEEE SA.' It should also be noted by the SC Chair that 'all of the necessary documentation required in the PSRCC Policies and Procedures Manual has been submitted by the Working Group to support this request'.

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

Chair: Robert Frye
Vice Chair: E.A. Udren
Output: Review C37.92
Established: January 2018
Expected completion date: Meetings are continuing
Output: Approved IEEE Standard C37.92, *Standard for Analog Inputs to Protective Relays from Electronic Voltage and Current Transducers*

I-38 met on Wednesday, May 9, 2018 with 6 of 8 members and 13 attendees total. The minutes from January 2018 were reviewed and approved.

After introductions and IEEE patent slide review, the Chair explained the status of the PAR submission, including last-minute wording adjustments. NesCom has approved the PAR, which should be approved by mail ballot of the Standards Board during the week of May 14.

The Chair reviewed the project strategy of submitting the prior standard version as-is for balloting, to solicit industry feedback. There are no known technical issues to correct at this time. Forming a balloting body and conducting the ballot takes about 6 months. Any resulting revisions and recirculation cycles will increase this time requirement.

The meeting concluded with discussion of ways to increase industry acceptance and absorption of this standard, whose practical applications span real-time power system simulation testing, maintenance and troubleshooting, and engineering type testing. These interfacing needs are seen more frequently than those for low-energy instrument transformers like optical voltage and current sensing systems, and Rogowski coils.

WG I38 will need room for 20 people in September. This meeting should not conflict with I-30.

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

Chair: Craig Preuss
Vice Chair: Angelo Tempone
Output: Report that recommends whether standard development is appropriate for the topic.
Established: January 2018
Expected completion date: September 2018

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).

Summary: The TF met on Tuesday May 8th, 2018 for the second time. The were 12 attendees, all locally. Five of these indicated interest in becoming members. Increase in membership continue to support our previous assessment of the need for this document in our industry. The current version of the report is v1.1 and work continues to finalize it for submittal to the subcommittee. Several volunteers have expressed interest in working group officer positions.

Details:
After quick introductions, the minutes from the previous meeting, Jacksonville January 2018, were reviewed. Motion was approved for last meetings' minutes.

- James Formea, and Angelo Tempone (Seconded motion).

Some members expressed concerned on not receiving communications, and Chair and Vice-chair reviewed members list to correct any issues.
The pre-PAR slides were shown, and no issues were identified. The IEEE copyright policy was reviewed.

Under new business the following items were discussed:

1. Newly added members requested for all previous documentation for this task force to be sent out, in order to get up to date with the task force's developments.
2. Chair and Vice Chair roles were discussed in order to gain additional volunteers for more formal position (officers). Information was given on where to find more details (PSRC's website). Jose Ruiz, Doble Engineering, has volunteered to become an officer of the Working Group after its creation. Angelo Tempone, Duke Energy, has volunteered to become an officer of the Working Group after its creation.
3. Discussions on the following topics had these results:
    a. Inclusion or exclusion of electro-mechanical relays in the scope of the standard. This section is mainly covered on PSRC's I37 Working Group.
    b. Inclusion or consideration of NEMA standards as part of this Standards. To be determined, but we believe most of the IEC documents already cover some of these areas.
    c. History of previous documents that can be associated with this task force. Why/when they were created, but due to Substation Committee reorganization, task force was put on hold.
    d. Classification on what voltage/current levels should be discussed for IEDs I/O. It was decided that this topic should be addressed upon work group creation.
4. Review of the ITF REPORT with the following comments:
    a. Include the following wording: Protection, control, and Automation Systems (PCAS).
    b. Include the word: Physical, in reference to inputs/outputs in order to narrow scope and reduce ambiguity on the Standard. Also, to eliminate any possible infringement into IEC 61850 standards.
    c. Completion of Purpose and other sections of document.
5. Other related work
    a. Task Force report will be modified by Chair & Vice-Chair and submit it for further review to all Members of the task force.

b. Web-conference meetings are to be planned and completed prior to the next PSRC meeting in September.

6. Meeting adjourned (James Formea). Jose Ruiz (Seconded Motion)

Future meetings were discussed and be held per the PSRC meeting schedule in addition to possible web-conference meetings.

7. Liaison Reports
   a. Instrument Transformer Subcommittee – Fred Friend
   b.

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.

In clause 8.4.5 it was agreed to use NEMA 107-2016 as the reference document replacing NEMA CC-1.

In Clause 8.4.3 It was agreed to use the lightning impulse clause in C57.13.5.

In Clause 8.4.7.6 it was agreed to remove the reference to thermally upgraded paper.

In 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.

In 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:

-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.

8. 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***

    b. Update: IEEE Std. C37.98 – IEEE Standard for Seismic Qualification Testing of Protective Relays and Auxiliaries for Nuclear Facilities and IEEE Std. C37.105 – IEEE Standard for Qualifying Class 1E Protective Relays and Auxiliaries – *submitted to NesCom for their September 12, 2017 for review to determine whether to forward to the Nuclear Power Engineering Committee.* ***NPEC will take ownership of these two standards. This item is closed.***

    c. Scope revision of our Subcommittee – Look at the revised PSRCC Scope, suggestion to form a Task Force with SC members and

past MC Officers – first meeting held on September 11, 2017. *Please provide feedback by October 31, 2017.* ***Work continues, some revisions being reviewed; will plan to meet in September 2018***

9. New Business

   a. Mal Swanson is able to provide IEEE PSRC reference letter to attendees that want to participate with a working group. These letters can be submitted to their managers for sponsorship approval to attend our meetings.

   b. Motion was entered by I29 chair to submit their guide to IEEE-SA for ballot by June 2018. Joe Valenzuela motioned to make it contingent to WG approval. Meisinger 2nd. Approved by I subcommittee members.

   c. Motion was entered by I35 chair for submission of Guide to IEEE-SA for ballot contingent to WG approval. They will also file for a one year par extension. Meisinger 2nd. Approved by I subcommittee members.

   d. Motion was entered by I chair to submit I37 PAR for Main Committee approval.

   e. Amir commented that we are able to approve a par request via electronically in the case that the subcommittee does not have a quorum or the WG is not ready to motion during the meeting.

   f. Preuss asked about the process for submitting a PAR. Erin responded that anyone can submit a draft PAR but Adi Mulawarman would have to assign a Chair which then would submit it for approval.

   g. ITF40: New Task Force – Review of IEEE C37.90.1 – Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus. Withdrawal date is December 2022. Task Force starts in September 2018. Jeff B volunteered for Chair and Bruce Mackie as VC.

   h. ITF41: New Task Force – Review of IEEE C37.90.3 - IEEE Standard Electrostatic Discharge Tests for Protective Relays. Withdrawal date is December 2022. Task Force starts in September 2018. Steve Tuner volunteered for Chair.

   i. Preuss recommended that the TF Chair and VC to publish their TF initiative to draw more interest and participation via electronically email or through media such as PAC World.

   j. To qualify for an award for all technical documents which includes reports, transactions, journals and conference papers, the following requirements must be meet:

i. Must be formatted in the corresponding official PES template format. You can download the corresponding templates from the following links:

1. PES Technical Paper Templates (Transactions/Journal and Conference Papers) https://www.ieee-pes.org/templates-and-sample-of-pes-technical-papers

2. Template for IEEE/PES Technical Reports: https://www.ieee-pes.org/images/files/doc/tech-council/PES-Technical-Report-Template_Jan_2016.docx

ii. Must be submitted and posted in the PES Resource Center and PSRC website before it's disbanded. You can find the PES Resource Center Submission instruction here: Checklist, this list can be downloaded from here:

1. http://ieee-pes.org/images/files/doc/tech-council/Submission_Checklist_PES_Resource_Center.docx

k. The IEEE Standards Association Working Group Awards has a new procedure for requesting awards for the completion of a WG Standard.

i. The Standard needs to be approved by the main committee before requesting for an award.

ii. The request can come from either the Chair or VC of the WG.

iii. The awards certificates can be shipped directly to the requestor or the hotel of our next PSRC meeting.

iv. The request for the SA WG awards should be made at: http://standards.ieee.org/develop/awards/wgchair/wgawards.html

10. Motion by Swanson and second by Niemira to Adjourn. Next meeting in Minneapolis MN in September!

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 17/35 members and 14 guests, reaching quorum.
Jan 2018 J SC meeting minutes were approved.

10 J SC WGs met

J5: <u>Application of Out-of-Step Protection Schemes for Generators</u>

Chair: **Sudhir Thakur**
Vice Chair: **Manish Das**
Output: **Report to the Subcommittee**
Established: **2011**
Status: **16th Meeting**

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

The Working Group met for a single session with 4 members and 5 guests present. The Vice-Chair of ran the meeting in absence of the Chair.

There were no comments to the January minutes. The Vice-Chair stated that the majority of comments from the WG ballot were addressed, the report was converted to the new PES format and is currently under ballot by the J subcommittee.

The Vice-Chair stated that he would like to request any remaining ballots come through in the next two weeks.

The Vice-Chair stated that there was a one change that had been suggested by two WG members – to update the single blinder scheme calculations in Appendix A to use the manufacturer's suggested range for the mho diameter (2-3 times X'd). This change will be incorporated along with any other comments from the subcommittee ballot.

A WG member suggested that if still practical at this point the units be harmonized to the SI system. A J member stated that he would forward some minor formatting comments.

A single session with space for 20 people and a computer projector is requested for the Sep 2018 meeting.

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

Chair: Dale Finney
Vice Chair: Manish Das
Established: Jan 2013
Output: Report to subcommittee
Status: 15th Meeting
Assignment: To review new methods related to generator ground fault protection.

The WG met on Tuesday 5/8/2018 with 9 members and 5 guests. The quorum was not met.
The Chair presented the latest report draft R9b and held discussions on a few final items.
The WG agreed to

- Add a discussion/plot in the Appendix on PT fuse coordination, including some discussion on coordinating with PT primary fuses.

- Add the figure from the Russ Patterson paper (B-phase grounding) to the report
- Using Vn instead of Vo in the CFE sequence voltage acceleration method to eliminate the requirement of Wye Grounded PTs. Consider adding an alternate logic and related text.
- Consider discussing a mechanism for a (worst case) estimate of PT impedance using PT thermal rating and Accuracy class, to support the use of negative sequence voltage method. Nate Klingerman and Chris Ruckman stated they will attempt to check further with any PT manufacturer data or personnel contacts they have.

Nader suggested adding some discussion about sub-harmonic injection schemes from different manufacturers.
The Chair mentioned that the discussions from this meeting will be incorporated into the report and it will be presented for WG ballot a month prior to the September meeting.

The working group will have its 16th meeting in Sep 2018, with the need for a single session, computer projector and seating for 35 people.

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

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

WG Report
The working group met with 10 members and 12 guests present. A quorum was not achieved.

The working group will send a clean version of the draft report to ESCS and PSDP for comment. A conference call meeting will be arranged with each group if comments are received that require discussion to resolve.

Juan Gers reviewed a proposed example based on actual data for a generator in the ERCOT Interconnection. Sample simulations will be with and without controls modeled including governor, AVR and PSS, to demonstrate the impact on settings. Examples will include faults and other abnormal operating conditions for which consideration of generator controls is necessary to set the generator relays. The working group will consider providing a tool (such as an Excel spreadsheet) to translate the generator capability curve from the P-Q plane to the R-X plane.

The working group discussed references to NERC Reliability Standards. All discussion will be included in a new section at the end of the report. A brief description of four standards relevant to this report will include titles, purpose, and overview of requirements. The discussion will include guidance on consideration of the steady-state stability limit (SSSL).

Sandro Aquiles-Perez will assist Juan Gers with the example section of the report.

Charlie Henville will provide input on the governor controls section and the SSSL discussion.

Phil Tatro will assist with descriptions of the relevant NERC requirements.

Juan Gers and Phil Tatro will incorporate all comments received prior to this meeting and assignments from this meeting and distribute the report for working group review by mid-June, with comments due by the end of July.

The working group goal is to complete the report and submit for subcommittee balloting by the end of 2018.

The requirements for the next meeting are a double 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: 11th Meeting

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

Chair kicked off the meeting with introductions.

Chair reported that all writing assignments and reviews have been completed. Only minor editing related to the references needs to be finalized.

Will English noted that the report contains a direct quote from IEEE C37.102 describing the operation of the single-blinder out-of-step scheme. He asked that, since C37.102 is a copyrighted document, if this created any issues. There was some discussion but, ultimately, they Chair will forward the concern to either someone on the PSRC Main Committee or directly to IEEE for a final ruling.

Chair thanked the Working Group members for their contributions.

Next Steps and Assignments. Chair will finalize the document in the next few days and forward to the Working Group members for approval. Responses should be provided no later than December 1st. Chair will collect any comments and either incorporate them or assemble them to be addressed at the January meeting. Once 75% approval is received, the Chair will forward to the J subcommittee for approval. Depending on the comments received during both ballots, one or two additional meetings are required to finalized the report.

Chair requests a single session at the Minneapolis meeting for 25 people with a computer projector.

Adjourn – Meeting adjourned at 5:05pm.

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:
Assignment:

1. Review, compare, and contrast NEMA MG-1 with ANSI C50.41 regarding transfer criteria.
2. Examine published reports and papers on motor bus transfer criteria to compare the conclusions with NEMA MG-1 with ANSI C50.41 regarding fast transfer criteria.
3. Investigate existing open-transition motor bus transfer (MBT) actual data from multiple events at the medium voltage level. Examine for current and torque ratio versus Volts/Hz at transfer periods to see if there is a correlation.
4. Examine published reports, papers, C50.41 and NEMA MG-1 on motor fast bus transfer criteria to reconcile the conclusions with the field-measured results.
5. Study existing motor protection oscillography voltage and current to identify which motors are generating and which are motoring. Examine v/Hz of composite bus and individual motors, and individual motor reacceleration current versus total bus reacceleration current (if available).
6. Produce a Report to Subcommittee with findings of the above

Activity:

1. The WG met May 9, 2018 with 8 members and 7 guests.
2. Chair reviewed a brief history and purpose of WG, including the focus of reviews, presentations and questions to effect the assignment. Also reviewed were the WG expectations for meeting order and etiquette.
3. Tom Beckwith and Dr. Murty Yalla presented on Calculation of Transient Torques on Motors during Residual Voltage Motorbus Transfer. Motor bus residual transfer results for a three motor system noting torque trends when the bus voltage falls below 30% were reviewed. The team summarized that all residual transfers are not safe, in fact, at large angles residual transfers cause high transient torque. When transferring motors, for any type of transfer (fast, in-phase and residual voltage), coming in at or near zero degrees phase coincidence produces the least transient torque. In addition, field results that were reviewed during the presentation showed that putting subjective time limits on a fast transfer could inhibit a potentially successful fast or in-phase transfer that would complete after 10 cycles.
4. The chair noted that he will start the draft of our paper with the outline that was previously sent to the working group for review.

Assignments:

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

Next Meeting:

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

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

Chair: Nate Klingerman
Vice Chair: Sudhir Thakur
Established: 2016
Output: Guide
Status: 6th Meeting

The group met on May 8, 2018 in Pittsburgh, PA with 16 members, and 8 guests in attendance. Quorum was not achieved.
The Chair presented the patent slides, no claims were made.

The chair reviewed the completed and outstanding tasks were presented.
The chair gave an overview of iMeet task assignments, and discussed how completed assignments should be attached to the task as a separate document. The chair will initially be responsible for merging the individual assignments to the latest version of the document. Members were encouraged to contact the chair any there are any concerns using iMeet.

The chair reviewed the submitted assignments for legacy schemes – the assignments will not change at this time, but will be reopened for additional review.

The chair presented the latest version of the outline. The working group generally agreed that there is significant duplication in the existing guide, and it's possible to significantly stream-line the document. The working group consensus was that the new outline is a better way to arrange the information in the guide.

There was a discussion on whether hybrid is a variant of low or should have its own section.

There was a discussion on multiple high impedance grounded machines and where that this fits in the outline. At the moment, this topic will have its own section but this could change.

Dale and Ritwik will upload the 3rd harmonic paper to imeet folder.

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

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

Chair: Manish Das
Vice Chair: Gary Kobet
Draft: 0
Established: May 2017
Status: 4th WG meeting, Pittsburgh, PA
Expected completion date: December 2021 (initial sponsor ballot by January 2021)

Assignment: Revise C37.102 Guide for AC Generator Protection

Working Group J17 held its meeting in a double session on Tuesday, May 8, 2018. This was the 5th meeting for this working group (4th in-person meeting; a web meeting was held April 16, 2018).

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

Minutes from the January 2018 meeting and April 16, 2018 Web meeting were approved.

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

The Chair stated there are comments from the 2012 reaffirmation ballot and also some comments made by Alla Deronja that may still need to be addressed. In addition, the work of J3 (published in 2012) which reviewed the NERC Plant Transmission Protection Coordination Technical Reference Document (either Rev 0 dated Dec 2009, or more likely Rev 1 dated July 2010) and made several comments for C37.102 should also be addressed. The reviewers of each section should check these three sources of comments and see about resolving each (these 3 files are located in iMeetCentral in folder *"C37.102/Comments from previous revisions*)

The Chair then began by initiating a review of comments received for subclauses 4.5.6, 4.5.7, 4.5.8, 4.6, 4.7 in Draft 1.2 located in iMeetCentral C37.102/Drafts/Drafts in Progress:

- **Subclause 4.5.6 Overvoltage**
    - Main paragraph section comments accepted
    - Subclause 4.5.6.1 Protection
        - Sentence struck regarding the relay requiring an instantaneous and inverse time delay unit
        - Extensive discussion over filtering and time delays, as well as the need for the element to be immune to frequency
    - Some discussion over whether the voltage measurement is phase-phase, three-phase, positive sequence, etc., depending on the machine grounding method.
- **Subclause 4.5.7 Undervoltage**
    - Some discussion over whether UV tripping is warranted, and the need for UV ride-through (or low voltage ride-through LVRT)
    - Some discussion over whether the voltage measurement is phase-phase, three-phase, positive sequence, etc., depending on the machine grounding method.
- **Subclause 4.5.8 Abnormal frequencies**
    - Some discussion on stimulus frequencies, also steam turbine capability and the ability of CTGs to better handle stress during system restoration
    - Mike Thompson accepted an assignment for subclause 4.5.8.3 Underfrequency protection
    - Much discussion over NERC compliance and PRC standards, that the document should not discuss particular regulatory requirements, rather that appropriate protection should take those requirements into account. Specifics may be included in the Annex A.

- **Subclause 4.6 Backup protection**
  - Mike Thompson reviewed his proposed revision, which were accepted.
- **Subclause 4.7 Generator breaker failure protection**
  - Some material added, being sure not to overlap with C37.119, but to point to that document.

The latest C37.102 word draft from this meeting (Draft 1.3) will be available in iMeetCentral folder *C37.102/Drafts/Drafts in Progress* by May 18.

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

***

Subclause Review Assignment Instructions:

- Any new review comments must be made in the latest C37.102 word draft found in iMeetCentral folder *C37.102/Drafts/Drafts in Progress* using "tracking on" and include your proposed new verbiage. In general, comments that don't offer suggested verbiages will not be considered.
- Address comments in the below 3 files available in folder "C37.102/Comments from previous revisions":
  - C37.102 -2012 Reaffirmation – ALL comments.xlsx
  - C37.102_Comments_Alla Deronja_20110509.docx
  - J3 Power Plant and Transmission System Protection Coordination – Final Report – 2012.pdf
- Coordinate with the Figures group if your subclause figures need to be updated.
- Address any formatting, editorial or other comments made by the IEEE-SA team (Daniella Martinez and Michelle Turner) in the C37.102 word document. Note that there's one major change since the 2006 version which is that all figures have been renumbered to appear in the draft sequentially rather than by clause #.
- Each group must only upload a single commented word copy with input from all group members. Identify the clause/subclause # in the filename.
- All new uploads after the May 2018 meeting and prior to Sep 2018 meeting should be made into the folder "C37.102/Assignments/2018-08-03".

***

Latest Subclause Assignments

Subclause	**Description**	**Assignees**
Figures	Consistency of Figures throughout C37.102	Mircea Rusicior, Don Burkart, Jason Espinosa, Dale Finney, Meyer Kao
3.0	Description of generators, excitation systems, and generating station arrangements	Onur Usmen, Normann Fischer
4.2	Field Thermal Protection	Onur Usmen, Normann Fischer
4.4	Generator Rotor Field Protection	Onur Usmen, Normann Fischer
4.8	Excitation System Protection	Onur Usmen, Normann Fischer
4.1	Generator Stator Thermal Protection	Dale Finney, Nate Klingerman, Russ Patterson
4.3	Generator Stator Fault Protection (Excluding 4.3.3)	Dale Finney, Nate Klingerman, Russ Patterson
4.3.3	Stator GF w/ concurrent review of C37.101	Gers, Beckwith, Hartman, Klingerman, Finney, Nader
4.5.1	Loss of Field	Gary Kobet
4.5.2.	Unbalanced Currents	Russ Patterson, Bob Pettigrew,

		Sudhir Thakur
4.5.3	Loss of Synchronism	Jason Espinoza, Dennis Tierney
4.5.4	Overexcitation w/ concurrent review of C37.106	Will English, Jason Espinosa, Murty Yalla
4.5.5	Motoring	Kelvin Barner, Jason Espinosa
4.5.6	Overvoltage	Ryan Carlson, Prem Kumar, Manish Das
4.5.7	Undervoltage	Ryan Carlson, Prem Kumar, Manish Das
4.5.8	Abnormal Freq w/ concurrent review of C37.106	Jason Espinoza, Mircea Rusicior, Lifeng Yang
4.6	Backup Protection	Phil Tatro, Mike Thompson
4.7	Gen BF w/ concurrent review of C37.119	Phil Tatro, Mike Thompson
4.9	Power Transf Prot through mechanical fault detection	Don Burkart, Zeeky Bukhala
5.1	Current Transformers	Hasnain Ashrafi, Zeeky Bukhala
5.2	Voltage Transformers	Hasnain Ashrafi, Zeeky Bukhala
5.3	Protection during Startup or Shutdown	Sungsoo Kim, Ratan Das
5.4	Inadvertent Energizing	Russ Patterson, Jun Verzosa
5.5	SSR	Steve Conrad
5.6	Transmission Line Reclosing w/ review of J7 output	Gary Kobet, Chris Ruckman
5.7	Synchronizing	Randy Hamilton, Mike Thompson
6.0	MGPS	Gustavo Brunello, Kelvin Barner
7.0	Protection Specification	Manish Das, Sungsoo Kim
Annex A	Sample Calculations	Onur Usmen, Juan Gers, Ritwik Chowdhury

***

NERC Standards Review Assignments:

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

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

***

Recent and Ongoing J Reports to be used as feeder into C37.102:

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

All PSRC published publications: http://www.pes-psrc.org/kb/published/reports.html

J18: Impact of Inverter based sources on Rotating Machines

Chair: Normann Fischer
Vice Chair: Mike Jensen
Output: Report
Established: September 2017
Status: WG
J18 had its first meeting as a working group

The chair was unable to attend so the vice-chair ran the meeting

DER should probably be included in the scope

Should try to avoid any overlap between JTF1 and J18

Dale F raised the question of voltage unbalance as a possible problem but was agreed by the group that it should not be a problem
Step changes in machine loading due to loss of renewables

Increased plant cycling should include all plants in addition to thermal units

Inverter manufacturers could have frequency measurement errors during faults that can cause them to trip.

Mike J mentioned that some inverters have 1547 settings even though they are connected to transmission.

Luis P will look into effective grounding in microgrids.

Mike J pointed out that, in California, there hasn't been a noticeable increase in harmonics and that the open phase detection at Diablo Canyon has had problems with triplen harmonics in the transformer neutral.

Dale F to look at harmonics

Fault current reduction may have an impact on motors. Check on whether motors are included.

Next meeting:
Single session, a projector and a room for 20.

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: 1st TF meeting, Pittsburgh, PA
Expected Completion Date: Sep 2018
Assignment: Develop and submit a PAR for C37.106

It was the first meeting for our task force with 10 attendees. We intended to go over the general parts of the document to develop the PAR components. We considered the title, need, scope and purpose for the PAR. We made acceptable progress, there is some work remaining in the scope but we should be able to submit the PAR to NESKOM in the second half of this year after reviewing the changes to the scope.

We had some discussions about sub-synchronous resonance (SSR) and whether it makes sense to add some more information associated with conventional generators in this document (and not other forms of SSI such as SSTI/SSCI). We decided that we do not need to address this right now to finish the scope and can address it in the body as required.

Bob Cummings raised a good question for which we decided to seek advice from sub-committee members. Since the title/scope of PSRC (relaying committee) changed to PSRCC (relaying and control committee), should we be addressing issues such as misoperations from the DCS, such as boiler, governor and speed controls? This is the main source of misoperations Bob has been seeing and we would like to consult with all of you whether it makes sense for 106 to address control issues.

In the sub-committee meeting Mike Thompson indicated that when the name change for PSRC occurred to PSRCC, the intent was not to handle all the different controls, Pratap agreed. Hence, the scope of this guide will not include the DCS. There may be a future J task force to consider this issue, those interested should participate.

Assignments:
Review the PAR fields so we can start reviewing the guide.

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.

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

ATTENDANCE: 14 attendees

Roy asked about inter-area oscillations. Rene responded by defining the range of inter-area from ~0-2Hz, subsynchronous from ~2-50Hz

Dean mentioned that we should also consider the effect of damped interactions on protection, in addition to undamped cases

Dale mentioned that ERL Phase and ABB have solutions, may be worth talking about it in PSRC. May also be worth asking someone from GE to do a presentation on their device.

Rene mentioned that some of the discussions may more be system oriented and be more aligned with the C working group

Dean mentioned that PV inverters cause similar behavior. We should perhaps then handle Type 4. But none of the attendees have seen a field case with Type 4/Solar

Nuwan mentioned that in a NASPI meeting where they played back the signals to a PMU and it came out as noise. Later we found that there were some PMU's looking specifically at the sub-harmonic frequencies and in those cases perhaps a PMU would help detection

Assignments for reading paper:
Han Chen – Rene, Ritwik
Rene Subharmonic – Ritwik
Gajic – Rene, Ritwik
Benfeng Gao HVDC LCC – Dale
2009 Texas Event Lawrence Gross – Kamal, Normann, Ritwik
NERC 3 page overview – Dale
Wall Synchrophasor UK – Rene
Novel Alstom 2015 Synchrophasor UK – Rene
Japan SSTI – Steve Conrad
Fatigue Turbine Gen Shaft Motor Drives Japan – Dale
China SSR Countermeasures Xu – Ritwik
Follow up papers:
Nuwan will send an Australian Paper
Dale will provide the Georgiatech 2018 AEP paper

Next meeting:
Single session, a projector and a room for 20.

Liaison Reports:

Electric Machinery Committee - M Yalla
Dir. Yalla had no report this meeting, but may have something in September following the IEEE General Meeting.

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

Nuclear 1E WG - Prem Kumar
Revised 741 was published in 2017 which in general was more prescriptive than the last version, especially in the voltage relay settings for degraded grid conditions

741 will develop new PAR for new standard to address Switchyard open phase conditions.

NERC - Mike Thompson
No report. Bob Cummings made a report in the main meeting

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

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

New Business:
Mike Thompson made a presentation about a recent out-of-sync close event.

K: SUBSTATION PROTECTION SUBCOMMITTEE

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

The K-Subcommittee met on May 9, 2018 in Pittsburgh, PA with 22 of 31 members and 27 guests in attendance. A quorum was achieved. Don Lukach requested a motion to approve the January 2018 subcommittee meeting minutes. Gene Henneberg made the motion, Pat Carroll seconded. Vote was unanimous to approve.

The Chairman briefly called for any topics for possible IEEE webinars and notified all in attendance of new forthcoming IEEE Privacy requirements.

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 8.2a

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

The K1 working group met in a single session. 12 members and 6 guests were present. After the introduction, a call for quorum was made, quorum was achieved.

A motion was made by Abu Bapary and seconded by Charlie Henville to approve the minutes of the last meeting in Jacksonville, and the motion was approved.

Current draft of the document is 7.3F. The draft for the next meeting will be 8.2a.

The IEEE Patent disclosure slides were presented. One letter of assurance has previously been received from a patent holder. This letter has been transmitted to IEEE. No additional patent claims were identified in this meeting.

The following was discussed:

- The results of the SA ballot were reviewed, overall 94% approval rate.
- Update of figures were discussed. All source files need to be submitted with the final draft. Steve has almost completed the update of figures to Visio and will send in both Visio and PDF for the group to review. Abu Zahid will help with the Visio figures. We will have a follow-up WebEx to review these updated figures.
- Ballot comments from disapproving ballots were reviewed.
- The group discussed updates to section 5 Figures 2-4, figure 5. Charlie Henville to update the sections for group review/approval.
    - The "-" sign on VR and V'R will be removed from figures 2-3.
    - Arrow heads will be removed from angles
    - Equation 5 will be updated to show angles delta plus theta rather than minus.
- Figure 24 was discussed and the group agreed that the connections shown are correct however given the three comments, the group agreed to add a supporting figure showing per phase zones of protection. Brandon Davies to propose a supporting figure for the group review.
- Lubo to schedule one or more Webex meetings between now and the September meeting with the intention of resolving all outstanding comments ahead of September meeting.
- Assignments are due May 27th.

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

Avoid conflict with K16 working group

K10: SCC21 Distributed Resources Standard Coordination

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

K10 met on Tuesday at 11:00AM. There were 6 members and 6 guests. We discussed updates to IEEE 1547, 1547.1, 1547.2, and the newly formed 1547.9. A presentation was given by Wayne and Ben regarding the changes to the newly published, as of April 8th, 1547-2018. Work on 1547.2 is ramping up. Wayne is the chairman of that group and would like assistance from PSRC members to aid in its development. If you are interested in participating please let us know.

For the next meeting we request a single session in a room that can accommodate 20 persons. Please avoid scheduling conflicts with C36, C26.

K11: Open Phase Detection for Nuclear Generating Stations

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

K11 did not meet in May.

K12 P1032 Guide for Protecting Transmission Static Var Compensators.

Chair: Satish Samineni
Vice Chair: Martin Best
Established: May 2013
Output: Guide for Protecting Transmission Static Var Compensators
Expected Completion Date: December 2018
Draft 17.3
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, May 9, 2018. 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 March 1, 2018 and March 15, 2018 I9/K12 Web-X meetings were reviewed.

- The current draft of the Guide is 17.3, and the K12 Working Group reviewed revisions to Section 4.8 on Breaker Considerations for DC Offset, Section 7.3 on Transformer Protection, and Section 11 on Geomagnetic Induced Currents. Revisions to Draft 17.3 will be sent to the Substations I9 Working Group.

The next K12 meeting will be September, 2018 in Minneapolis, MN. The requirements are a single session, a meeting room for 20 people, and a computer projector.

Minutes by Martin Best

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**"**

1. K13 met on May 9th 2018 with 3 participants (1 guest and 1 signed member).
2. K13 chair (Ilia Voloh) was not present this time at IEEE PSRC.
3. K13 Vice-chair (Luis Polanco) chaired the meeting.
4. Vice-chair received balloting results summary showing that from 91 eligible voters from the balloting body formed, the response rate was 76% with an approval rate of 92% exceeding both the ballot response and the affirmation minimum requirements.
5. K13 working group meeting focus on the 19 comments received from Dean Miller.
6. All the 19 comments were discussed, on 16 the disposition status can be considered Accepted and on 3 of the comments, the Vice-chair will discuss with chair and follow up via a conference call with Dean Miller for final resolution within the next month.
7. Chair and Vice-chair will incorporate all editorial comments received in the next weeks.
8. Chair and Vice-chair will follow up via emails, Webex meetings or conference calls with six (6) of the voters from the ballot group that provided technical comments that need to be resolved, to discuss final resolution before re-circulating document.
9. For next IEEE PSRC meeting in September 2018, we request tentative (pending to confirm 1.5 months before meeting) a room for 20 people. As of now K13 does not anticipate meeting, and should complete review process before September meeting.
10. The WG report outline draft # is ongoing (1.13)

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: 11

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 21 members and 7 Guests on May 9, 2018 at the Marriott City Center, Pittsburgh, PA

The chair displayed and reviewed the required patent information slides related to the PAR activity of the WG and provided opportunity for participants to identify patent claims. No one acknowledged or identified having a patent claim. The assignment of the WG was also reviewed / discussed.

As a requirement of standards development work all participants are required to indicate both their Company and Affiliation on the attendance sheet. The attendance sheet was circulated to collect the required information of each participant.

Quorum was achieved throughout the meeting.

The Jacksonville January meeting minutes were approved at this meeting motion by Brian Boysen and 2nd by Pat Carroll, motion carried.

Material added covering Converter transformers (7.5.1) and Scott and Le Blanc transformers (7.5.2) was briefly discussed.

Clause 7.6.2 Negative-sequence relays was modified to address a comment from a user related to Delta-Wye grounded transformers and the primary current in two phases for a secondary line-ground fault.

New material in Clause 7.2.11 Negative sequence differential protection is to be reviewed by Rene Midence and Randy Crellin.

Mike Thompson discussed the method to provide compensation for applications where a grounding transformer, Clause 13.1.3 is used within the power transformer differential protection zone. New figures to be added to the guide. Mike is to provide associated text material.

ABOVE ASSIGNMENTS ARE DUE ON MONDAY JUNE 4, 2018.

The figures (available on the collaboration site) are to be reviewed for accuracy and completeness by the following tribunal: Guillermo Weyer, Matthew Leyba, and Johan van den Berg.

Having no more business a motion to adjourn was made by Paul Elkin, 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: 5.2
Assignment: To submit a WG report to the PSRC K Substation Subcommittee evaluating the performance of protection systems during Geomagnetic Disturbances

1. K17 Working Group met on Tuesday May 8th 2018 with 12 participants (4 guests and 8 signed members).
2. Meeting started with Introductions, signing sheets and review of meeting minutes of the January 2018 meeting. The meeting minutes was previously approved via email.

3. Chair, after January 2018 meeting in Jacksonville, FL converted the K17 latest report to the new IEEE– PES-TR format in line with existing requirements.
4. Chair went over the latest outline of the report, and initiated review comments discussions with working group attendees on the comments received.
5. Majority of changes are General and Editorial, and on the report final structure.
6. WG discussed the following Items during the meeting:
    - WG discussed adding more items on the Keywords section to include: Half-cycle Saturation, in addition to the existing keywords GMD, GIC, Harmonics, and Protection.
    - WG agreed to move geomagnetic field measurement section to the appendix section.
    - Chair agreed to reorganize some of the sections to maintain consistency between report chapters.
    - WG discussed phase shifting transformers and shunt reactors to possible expand and/or add a paragraph on these. WG agreed that phase-shifting transformers are considered to be covered within the report existing transformer section.
    - Chair agreed to contact section author(s) that provided photo picture(s) to obtain picture reference, and update report with "Courtesy of…" and included as a reference to where the picture is from.
    - WG discussed comments on the section related to the impact on the generators (1.4.4) and revised it to remove comments about IEEE C50.12 and C50.13.
    - Updated the GIC impact on the current transformer saturation section figure 2.1 to remove repeated reference.
    - WG updated expression on section 2.2.1 related to the capacitor bank protection from "The popular" to "One of the" protection schemes.
    - WG member Charlie Henville agreed to expand 2.2.1 section to add other capacitor bank protection schemes, in addition to voltage unbalance protection (e.g., negative sequence protection) by June 29th.
    - WG updated the expression "GIC content on the primary CT secondary current" in the overcurrent element section and removed the word "primary" from the content to avoid confusion and/or misinterpretation.
    - WG report will add the transformer protection C37.91 on the bibliography references, and create a number to add to page 22 (Item 3).
    - WG discussed possibility of consolidating the overcurrent protection sections for transformers to one section related to the GIC. There are multiple overcurrent sections that have different descriptions for different conditions.
    - WG discussed the figure in section 2.3.2 Power Line Carrier, and recommended to update and shown GIC and harmonic flow information to be clearer.
    - WG member Tapan Manna agreed to provide 2 or 3 references to the GIC blocking section.

- Chair proposed to schedule two (2) Webex meetings, one in July and another in August to follow up on open items and consolidate comments.
- WG discussed possibility of requesting feedback from the harmonics sub-committees on the harmonics section.

7. K17 is expected to be ready to submit to K Subcommittee by Sept. 2018 meeting.
8. For next meeting chair requests a single-session and a meeting room for 25 persons, with AV capabilities.
9. The WG report draft # is 5.2.

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: 2.12
Assignment: To revise and update C37.108-2002 –Guide for the Protection of Secondary Network Systems

1. Introductions/ Sign-up sheet/Patent slides/ 50% Quorum?

   Adi asked, “Is there any patent issues?” Record answer in meeting minutes : “No”.

   19__ attendees 9__ out of _16_ members attended, A quorum is achieved.

   new members added

2. Approve last meeting minutes from January 2018

   1st Member name __Don Lukach _____ - motioned

   2nd Member name Robert Fry__ - seconded

   January minutes are approved.

Please note the September 2017 meeting minutes stand approved unanimous with eight members (out of fifteen total) voting by Email and approving.

Six online Webex meetings have occurred. The draft is being edited section by section. Don Lukach mentioned that each of the work at meetings without quorum, those minutes must be approved of.

Don Lukach motion to approve online meeting minutes. Rafael Garcia seconded. Unanimous vote to approve the online meeting minutes.

Roger W volunteered to clean up the draft edit wise which has been uploaded into the IEEE template.

3. Status on PAR process/submittal/schedule

   PAR Submitted for Approval : October 7th 2015

   PAR Approved by RevCom : December 5th 2015

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

   Projected Completion Date for submittal to RevCom : 08/2018

PAR will expire December 31st 2019

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

4. Title, Scope and Purpose restatement from accepted PAR

Title : Guide for the Protection of Secondary Network Systems

Scope : Devices and protection schemes that are being used in secondary network system protections are discussed in this guide. These devices should act to sense the fault and initiate fault interruption locally or remotely, thereby minimizing damage and restoration time.

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

5. Update on assignments

- Presentation on differential protection on network transformer from Oncor (?)
- Online meetings have been held to do line by line review of the guide. We plan to continue this at the face to face meeting in May.
- Need volunteer to clean up some of the format to match the IEEE style manual. The document has been uploaded into the current IEEE template.

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

We will review the schedule again in Spring or Fall to decide if we are ready for editorial review from SA before submitting to RevCom in January 2019.

Line by line review continues at Annex B. Robert Fry mentioned that voltage levels should be separated by a hyphen instead of a slash. Steve Conrad suggests check math for the example in Annex B to verify fault currents. 7% value does not seem typical. 5% would be more typical. Robert Fry will check the math to verify proper fault current values. It was decided that the numbers in the example should be followed as close as possible. Robert Fry agreed to perform review of the annex B example to verify correctness of entire example, figures and nomenclature and relation between the text wording and the figure acronyms.

Adi will continue with online meetings before next meeting.

Bruce suggests finding a utility that is currently practicing the example. Don suggests asking ConED folks.

PLEASE DOWNLOAD LATEST DRAFT FROM THIS LINK BELOW

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

(If you need access email chair/v-chair of WG)

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

Meeting minutes by Roger Whittaker. May 7, 2018.

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

Chair: Gustavo Brunello
Vice Chair: Abu Bapary
Established: May 2015

Assignment: To provide an advisory function to the IEC working group
The working group met with 4 members, no guests.

- Reviewed IEEE comments made on previous draft
- No new documents from IEC at this time
- Update from Oslo meeting (April 2018). Next stage for Standard document will be

FDIS, where no technical comments are allowed.

- Agreed to disband the WG as FDIS will not allow to make technical changes.

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

Chair: Randy Crellin
Vice Chair: Michael Thompson
Established: May. 2016
Output: Revise C37.112
Draft: 2.0
Expected Completion Date: TBD based on PAR
Assignment: To pursue the renewal of C37.112

The working group met for the third time on Tuesday May 8, 2018 with 9 members and no guests. The working group has 14 members and we made quorum. We approved the meeting minutes from our previous meeting. This standard was originally written in 1996, reaffirmed in 2008, and is due to expire the end of 2018.

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

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

The working group members discussed final outstanding review comments and completed technical revisions to the document. The IEEE editors still need to correct the figure and equation errors from the conversion process. The working group Chair will correspond with the negative balloters. We will need to re-ballot the revised document.

D. Lukach made a motion to accept the review comment changes and recirculate the document. H. Ladner seconded this motion. There was discussion and the working group voted to approve the motion.

For the next meeting, we hope to not need to meet.

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

Chair: Abu Bapary
Vice Chair: Michael Thompson
Established: September. 2016
Output: Revise C37.324
Draft: 3
Expected Completion Date: September, 2019
Assignment: Revise and ballot IEEE Standard C37.234 prior to its expiration in 2019.

The K WG22 met on Tuesday, May 8th with 24 of 43 members and 10 guests. Two attendees agreed to join the working group bringing the roster to 43 members.

Introductions were made.

The status of assignments was updated. The assignment tracking spreadsheet showed that all sections of the guide had been reviewed except Annex A. Ratan Das agreed to take review of this section as an assignment.

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

The minutes of the January meeting were discussed. D. Lukach motioned to approve the minutes of the January meeting. S. Conrad seconded the motion. The minutes to the January meeting were approved by a quorum of the working group.

With all sections of the guide reviewed, the working group is now switching to the process of creating a clean new draft. The sections of the guide that have been reviewed will have changes accepted and comments that have been resolved removed.

The working group started at Clause 6.1.5 which is where we had left off in previous reviews. We got through Clause 7.1.2.4 during the meeting. The Vice Chair will update draft 3 and post it to the imeet central as soon as possible.

The team lead by Jeff Barsch and including S. Elling, A. Mezco, and L. Sevov reported on their assignment to look at whether the versions of the visio files that did not include polarity marks should be used instead of the ones in the current version of the guide. The team recommended to the group that the polarity marks be removed and added a sentence to Clause 4 cautioning, “It is very important for the engineer to verify that the CT secondary currents flow correctly for the scheme that is used.” The working group accepted the recommendations of the team.

New assignments were made.

- R. Das to review Annex A
- J. Barsch to remove figures 25 and 26 and make citations to appropriate papers on waveforms in high impedance differential circuits.
- R. Midence to review organization of clause 7.1 to resolve if the organization of the discussion of the various differential current schemes is logical or if it can be improved. He will also review this section and others on whether the guide is consistent and properly using the terms low-impedance and percentage restrained differential protection. He will report his recommendations.

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

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

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

Liaison Reports:

No reports were given.

Information can be found at the following web addresses for T&D and the Transformers Committee.

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

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

Old Business:

None

New Business:

Gustavo Brunello motioned to disband the K19 working group as their work is complete. Motion was seconded by Gene Henneberg. Vote was unanimous to approve.

Roger Whittaker motioned to disband the K23 working group as their work is complete. Motion was seconded by Gene Henneberg. Vote was unanimous to approve.

A presentation from Ben Kazimier and Wayne Stec was given on Standard 1547.

A motion to adjourn was made by Abu Bapary, seconded by Luis Polanco and passed unanimously.