



**POWER SYSTEM RELAYING COMMITTEE  
OF THE IEEE POWER and ENERGY SOCIETY  
MINUTES OF THE MEETING  
Sept 11-14, 2016  
Cincinnati, OH  
Final**

**I. Call to order/ Introductions     Mike McDonald**

Chairman Mike McDonald called the meeting to order at 1:30 pm

After introductions, a quorum was verified and met. Main Committee Attendance sheet was routed.

**II. Approval of Minutes & Financial Report     Pratap Mysore**

Motion to approve Minutes of the May 2016 meeting in Denver, CO was moved and and was approved unanimously.

The financial status of PSRC is in good standing.

**III. Chairman's Report             Mike McDonald**

The Power System Relaying and Control Committee met jointly with Substations C0 group at the Westin in Cincinnati. At this meeting a final consensus was reached with the new PSCCC leadership as to where groups directly affected by the PES re-organization would be aligned. At the JTCM in January, the groups will be fully aligned in either the PSRCC or the PSCCC – completing several years of work positioning the PES for the future. This was an extraordinary effort by many people and I am very grateful to all who helped.

As I promised two years ago, the PSRCC will have joint meetings with the PSCCC for the foreseeable future. There may be tweaks needed to the schedule depending on how the PSCCC develops and grows but for now the intent is to have meetings scheduled similar in nature to the past September meetings. Specifics will be ironed out for meetings we plan in May and September. As always, the JTCM January meeting logistics are handled by others but we still will continue to coordinate our respective Committee meetings to minimize conflicts to the extent we can.

This was the last meeting that I presided over as Chairman. It was an honor to have served in this role. I offer a sincere 'Thank You' to all who supported me in my efforts as Chair, and especially past Chairs Miriam Sanders, Phil Winston and Roger Hedding who provided invaluable advice and support. The PSRCC has a very strong incoming leadership team with Pratap Mysore as Chair, Russ Patterson as Vice Chair, Dr. Murty Yalla as Secretary and Adi Mulawarman continuing as Standards Coordinator. With their stewardship, the PSRCC will continue to remain the best and most prolific PES Technical Committee.

Best regards,  
Mike - Chairman 2015-2016

**IV. Reports of Interest**

## A. Report from the Vice- Chair – Pratap Mysore

### a. Technical Paper Coordinator's Report.

2017 PES general meeting: Call for papers is in progress.

### b. Future Meetings

May 2017 meeting will be held from May 8-12, 2017 at Embassy Suites, Albuquerque, NM.

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

2018 venues are presently being worked out.

Details are posted on the PSRC website.

## B. CIGRE B5 Activities Report – Rich Hunt

No report.

Other CIGRE items of interest:

- Free access granted to non-members to the CIGRE technical library for most documents three years after their publication, in order to improve the awareness of CIGRE production for a wider audience outside of CIGRE.
- The publication of a new CIGRE journal, named "CIGRE Science & Engineering" to publish CIGRE reports.

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

CIGRE B5 webpage: <http://b5.cigre.org>

## C. IAS Power System Protection Committee - Suparat Pavavicharn

No information available.

## D. IEC Report - Eric Udren

### **TC 95, Measuring Relays and Protection Systems**

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

TC 95 will hold its Plenary Meeting in Paris on October 21; this will be preceded by co-located meetings of Maintenance Team MT4 October 17-20 to work on the standards projects listed here:

- 95/351/CD - IEC 60255-187-1 – Second draft - *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers*. PSRC K19 under Gustavo Brunello has reviewed this draft, which is close to ready for finalization, and US comments have been submitted to IEC for review at the MT4 meeting in Paris.
- IEC 60255-187-3 - *Functional requirements for biased (percentage) differential relays for transmission lines* – no official draft yet - development is being supported by PSRC WG D34 under Normann Fischer.
- 95/347/CD – 60255-181 – First draft - *Functional requirements for frequency protection* – deals with performance issues and measurement techniques for frequency and rate of change of frequency (ROCOF). Technical experts in PSRC I4 and H11/IEC TC 95 JWG1 (Synchrophasor Standard) developed comments submitted as official USNC comments for use by MT4 in reworking the draft at the Paris meeting.

TC 95 is revisiting several base requirements and type-testing standards to add requirements for smart grid protection or control devices (equipment on distribution circuits with distributed generation and inverters, or microgrids). Since the US has a tough time supporting travel of participants, the PSRC should set up WGs to support US input to these projects as drafts are developed.

- Update to IEC 60255-1 Ed. 1: *Measuring relays and protection equipment – Part 1: Common requirements*. The revision project asks if we test adequately for influences from Smart Grid devices (electronic power converters/ inverters/conditioners/controls).
- Update to IEC 60255-26 Ed. 3: *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*. As with Part 1, the revision addresses whether we test adequately for influences from Smart Grid devices.
- Update to IEC 60255-27 Ed. 2: *Measuring relays and protection equipment – Part 27: Product safety requirements*. Adapt the standard to meet the new requirements of the European Low Voltage Directive covering protection of people and animals from all risks.

TC 95 is obliged to handle interpretation requests – they handle these pragmatically.

**TC 57, Power systems management and associated information exchange**

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

**E. Standard Coordinators Report – Adi Mulawarman**

**PSR Standards Coordinator’s Report Fall September, 2016**

The status of standards activities that have taken place since the May 2016 meeting of the PSRC are as follows:

RevCom = Revision of existing standard  
 NesCom = New Standard

**Revision to Existing Standards Completed**

**PAR for revising existing standard or creation of new standard Approved**

- [P61850-9-3 \(PE/PSR\) IEC/IEEE Draft Communication Networks and Systems for Power Utility Automation - Part 9-3: Precision Time Protocol Profile for Power Utility Automation](#)
- [REVISION PC37.119 \(PE/PSR\) Guide for Breaker Failure Protection of Power Circuit Breakers](#)

**Standards due for 10 year review**

**Ballot Activity:**

*See attached spreadsheet.*

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

**PARS expiring at the end of 2016**

PC37.237	No extension needed, plan to be done. (Bill will submit extension; Adi has sent instructions-on-how-to).
PC37.241	

	Indicate may need extension and they will decide by May meeting. (Farnoosh already submitted extension as of Sep 2016 meeting)

**PARS expiring at the end of 2017-2018**

Red may require extension because it will expire this year and no PAR extension submitted.

Orange will expire at the end of the following year.

PAR Nu	Project	Comm	Title	Scope	Purpos	Approval Da	PAR Expiratio	Invitation	Ballot Clos	Status
PC37.238	Revision	PE/PSR/C: Standard	standard	The purpc		5-Dec-2015	12/31/2017	7/2/2014	8/18/2016	RevCom Agenda 06-Dec-2016
PC37.94	Revision	PE/PSR/C: Standard	This stand	This stand		12-Jun-14	12/31/2018	8/5/2015	9/23/2016	Sponsor Ballot: Ballot
PC37.237	New	PE/PSR/C: Standard	This stand	This stand		5-Dec-2012	12/31/2016	2/20/2016	5/16/2016	Sponsor Ballot: Comment Reso
PC37.241	New	PE/PSR/C: Guide for	This docu	To provid		25-Mar-10	12/31/2016			WG Draft Development
P60255-11	Revision	PE/PSR/C: Measuring	This standard	is for s		14-Jun-13	12/31/2017			WG Draft Development
PC37.116	Revision	PE/PSR/PI	Guide for	guide purpose		11-Dec-13	12/31/2017			WG Draft Development
PC37.246	New	PE/PSR/P:	Guide for	This Guide	This Guide	10-May-13	12/31/2017			WG Draft Development
PC37.247	New	PE/PSR/C: Standard	standard	The purpc		23-Aug-13	12/31/2017			WG Draft Development
PC37.248	New	PE/PSR/W: Guide for	This guide	The purpc		3-Sep-2015	12/31/2017			WG Draft Development
PC57.13.1	Revision	PE/PSR/C: Guide for	The scope	The purpc		11-Dec-13	12/31/2017			WG Draft Development
PC37.91	Revision	PE/PSR/C: Guide for	scope of	The purpc		27-Mar-14	12/31/2018			WG Draft Development
PC37.230	Revision	PE/PSR/C: Guide for	This guide	This guide		27-Mar-14	12/31/2018			WG Draft Development
PC37.245	New	PE/PSR/C: Guide for	This Guide	The purpc		8-Jun-2012	12/31/2018			WG Draft Development
PC37.249	New	PE/PSR/W: Guide for	This guide	This guide		24-Jun-14	12/31/2018			WG Draft Development
PC37.250	New	PE/PSR/W: Guide for	This docu	This Guide		27-Mar-14	12/31/2018			WG Draft Development
PC37.108	Revision	PE/PSR/C: Guide for	Devices at	This guide		5-Dec-2015	12/31/2019			WG Draft Development
PC37.110	Revision	PE/PSR/C: Guide for	This guide	The purpc		11-Jun-15	12/31/2019			WG Draft Development
PC37.233	Revision	PE/PSR/C: Guide for	This guide	This guide		5-Dec-2015	12/31/2019			WG Draft Development
PC37.235	Revision	PE/PSR/C: Guide for	guide	documen		11-Jun-15	12/31/2019			WG Draft Development
PC37.242	Revision	PE/PSR/C: Guide for	documen	This guide		26-Oct-15	12/31/2019			WG Draft Development
PC37.251	New	PE/PSR/W: Standard	This stand	The purpc		5-Feb-2016	12/31/2020			WG Draft Development

**PARS expiring beyond 2018**

See attached spreadsheet

Additional notes :

3 standards coming under PSRC. All going under SubCom H.

IEEE 1646, no active PAR as I can tell, the std expire in 2018.

P2030.100, active PAR exp 2017, comment resolution.

P2030.101, active PAR exp 2016 but has submitted PAR extension for 1 year, comment resolution.

**PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:**

**NesCom/RevCom Submittal**

**Deadlines:**

09 December 2015

22 January 2016

22 March 2016

20 May 2016

05 August 2016

17 October 2016

**F. C0: DATA ACQUISITION, PROCESSING, AND CONTROL SYSTEMS SUBCOMMITTEE**

**Chair: C. Preuss**

**Vice Chair: Vacant**  
**Secretary: Vacant**

No information available.

**G. NERC Report - Bob Cummings**

No information available.

**V. ADVISORY COMMITTEE REPORTS**

**Chair: Mike McDonald**  
**Vice Chair: Pratap Mysore**

**B1: Awards and Technical Paper Recognition**

**B1 WG Awards and Technical Paper Recognition Working Group  
Meeting Minutes for May 2016**

**Chair: Hugo Monterrubio**  
**Vice Chair: Mal Swanson**

The B1 Working Group met on Monday September 19, 2016 in Cincinnati with 6 members. The incoming C SC Vice Chair Fred Friend joined the group replacing Gene Henneberg. The group approved the May 2016 meeting minutes.

The following items were discussed during this meeting:

1. WG Awards – The WG discussed, nominated and selected WG’s for the following award categories:

- a. PSRC 2016 Outstanding Technical Report
- b. PSRC 2016 Outstanding Standard or Guide
- c. PSRC 2016 Price Paper Award

The winning WG’s will be announced and certificates will be issued to all the members in the January main committee meeting. These WG’s will also be nominated to compete at the PES level for WG’s of the year

2. Individual Awards

- a. PSRC 2016 Distinguished Service Award

3. The following awards were announced/issued during the Main Committee Meeting on 9/22/16

a. PSRC Service Awards

i. Bronze

- **Roger Whittaker**
- **Randy Crellin**
- **Randy Hamilton**
- **Jim M. O’Brien**
- **Krish Narendra**

ii. Silver

- **Mario M. Ranieri**
- **Roger A. Hedding**

b. PSRC 2015 Distinguished Service Award

- **Vahid Madani**

c. PES 2016 Young Professional Award – Claire received the PSRC 2016 Young Professional Award during the May 2016 meeting, she was nominated and was the winner at the PES level

- **Claire Patti**

d. IEEE SA Standards Medallion (Announcement)

- **Michael J. Thompson**

Respectfully Submitted

Hugo Monterrubio, B1 Chai B1 Chair

**B3, Membership Activity Report**

**Chair: M. Swanson**

**Vice-chair: Cathy Dalton**

No information available.

Malcolm J. Swanson  
Membership Chairman

**B4: O & P Manual and WG Training**

**Chair: Phil Winston: O&P Manual:**

No information available.

**Chair: R Hunt: WG Training:**

No information available.

**B5: Bibliography and Publicity**

**Chair: T.S. Sidhu**

**Vice Chair: M. Nagpal**

No information available.

**B8: Long Range Planning**

**Chair: Bob Pettigrew**

No information available.

## **B9: PSRC Web Site**

**Chair: Russ Patterson**

No report.

## **VI. Items from the Main Committee meeting:**

- A. There were no new Main Committee members announced
- B. There were no new Fellows announced
- C. The following three motions were made by SC chairs to the Main Committee and were approved:

“Mr. Chair, the H subcommittee requests approval for transmittal of P60255-118-1 - Measuring relays and protection equipment - Part 118-1: Synchrophasor for power system - Measurements, 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 adoption as an American National Standard.”

“Mr. Chair, the H subcommittee requests approval for transmittal of Guide for Common Format for Naming Intelligent Electronic Devices (COMDEV), C37.248, to the IEEE SA for balloting, conditioned on working group approval of a draft for transmittal. Provided the ballot is favorable, the proposal will be sent to the IEEE SA for approval and transmittal to ANSI for adoption as an American National Standard.”

“Mr. Chair, the Relaying Practices Subcommittee requests approval for transmittal of Guide for Field Testing of Relaying Current Transformers PC 57.13.1 to IEEE-SA for creation of a ballot body and subsequent ballot. The motion was approved by the Main Committee.” – from I subcommittee.

## **VII. SUBCOMMITTEE REPORTS**

### **C. SYSTEM PROTECTION SUBCOMMITTEE**

**Chair: J. O'Brien**

**Vice-Chair: G. Henneberg**

#### **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 September 21 in Cincinnati, OH in conjunction with the PSRC. The participants introduced themselves. A quorum was achieved (22 of 37 members and 43 guests) and the May 2016 minutes were approved.

#### **Advisory Committee Items of Interest**

- WG meeting minutes and membership directory updates are due to Jim and Gene by Friday, September 30.

- Working Group chairs are requested to bring about 10 paper copies of agendas and WG documents for newcomers and guests. When a WG is developing an IEEE standard document, the guest may not keep the paper copy.
- Send WG documents to Russ Paterson for posting to the PSRC web site
- Looking for Main committee presentations for January (C2 may be ready)
- Consider turning WG reports into transactions papers; PSRC has not been submitting many transactions papers.

### **Working Group Reports**

The minutes of the Working Groups are attached.

The final report of the C2 WG will be issued to the C subcommittee members in the next few days for review and comment. Subcommittee members are reminded that report review is part of the member's responsibilities.

The C19 Working Group did not meet in Cincinnati, so there are no meeting minutes.

WG C18 is ready to form a ballot body for the proposed C37.246 . Therefore, Mr. Chair, the C- System Protection subcommittee requests approval for transmittal of IEEE Guide for Protection Systems of Transmission to Generation Interconnections, PC37.246, to the IEEE SA for balloting on the condition that the working group completes addressing the revisions required by the working group ballot of the draft guide. Provided the ballot is favorable, the proposal will be sent to the IEEE SA for approval and transmittal to ANSI for adoption as an American National Standard.

### **Old Business**

There was no old business.

### **New Business**

Solveig Ward proposed expanding the I-19 Redundancy paper into an IEEE guide. CTF-31 was formed to explore this topic at the January meeting with proposed title of "Redundancy Requirements for System Protection Reliability."

Jim Deaton (and others) proposed forming a task force to investigate Protection Practices for Interconnection of Solar Generating Facilities to Utility Transmission Systems. This was approved and will meet at the January meeting as CTF-32, chaired by Jim Deaton. The proposed assignment and background information is included following the WG meeting reports.

Jim O'Brien noted that this is his last meeting as chair of the C subcommittee. Gene Henneberg will be subcommittee chair beginning in January 2017 and Fred Friend will be the new vice chair.

### **General Discussion**

Allen Goldstein is organizing two workshops to be scheduled in March 2017 for the various US national research labs. The purpose is to help provide research direction for the labs future work. The subjects will be

- Alternatives to GPS time signals
- Advanced sensors

Attendance will be by invitation only. If you are interested in attending, contact

Allen Goldstein, [allen.goldstein@nist.gov](mailto:allen.goldstein@nist.gov)

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



**Chair:** Alex Apostolov  
**Vice Chair:** Roy Moxley  
**Output:** PSRC Report  
**Draft:** Last  
**Expected Completion Date:** September 2016

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

As noted above, this Working Group is ready to issue their report to the C subcommittee very soon, so no meeting minutes are included.

### **C-18: Transmission to Generation Interconnection Protection Considerations**

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

*Write an IEEE Guide for Protection Systems of Transmission to Generation Interconnections.*

#### **Scope:**

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

#### **Purpose:**

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

Working group C18 met Wednesday, September 21, 2016, with 13 voting members, 1 corresponding member, and 16 guests present. The quorum was reached.

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

With the quorum achieved, the chair requested a motion to approve the following meeting minutes:

May 11, 2016, meeting minutes; May 26, 2016, webcast meeting minutes; June 9, 2016, webcast meeting minutes; June 23, 2016, webcast meeting minutes; August 4, 2016, webcast meeting minutes; August 18, 2016, webcast meeting minutes; September 1, 2016, webcast meeting minutes; and September 15, 2016, webcast meeting minutes. Motion: Jim O'Brien; Second: Jeff Barsch. Vote: Approved.

The WG chair stated that the WG balloted the Guide in July of 2016. Out of 24 voting members, 21 members approved it (several with comments), 1 member disapproved it with comments, and two members did not submit their votes. The needed 75% approval vote was reached opening the way to requesting a permission to go for the IEEE-SA ballot as soon as the WG ballot comments are resolved.

The WG chair then stated that a few by-weekly webcast meetings are scheduled, beginning on September 29, 2016, with the plan to finish addressing the Guide WG ballot comments by the end of October – beginning of November.

The working group then proceeded to resolving the outstanding WG ballot comments unresolved due to the quorum absence at the latest September 15<sup>th</sup> webcast meeting.

- A revision to definition 3.7 was approved as follows: **Generation facility relays:** the protection systems used to separate the generation facility from the transmission system for faults in the generation facility and in the transmission system.
- At the previous meeting, the WG decided to re-title clause 4.2 from *Information exchange* to *Interconnection topology and protection system characteristics* because a comment was made that some of the sub-clauses contain valuable information but other than information that needs to be exchanged.

However, the sub-clause re-titling appeared to create another issue of listing the information that may or may not be needed to be exchanged and, thus, creating uncertainty for which information was to be exchanged.

Therefore, the WG decided to re-title clause 4.2 again to retain “Information exchange” in it to *Information exchange and protection system characteristics* and add the following statement:

Some or all of the following information needs to be exchanged between transmission and generator owners.

- The WG reviewed a comment concerning a paragraph in sub-clause 4.2.2.1.6 *Wind and solar generation inverter data* describing the solar inverter controls. The commenter stated that this did not belong to the Guide as these inverter units are installed in distribution systems and are less than 10 MW. However, Mike Jensen stated that these units are also installed in transmission systems and may be as high as 500 MW so the paragraph should stay. Based on Mike’s input, the WG previously agreed to keep the paragraph intact in the Guide and asked the commenter, Dean Miller, if he was OK with it. Dean agreed.
- In sub-clause 4.2.2.1.7 *Collector system configuration and impedances for wind and solar power facilities*, the WG agreed to leave the term “completely feathered”, as related to the angle of the wind turbine blades, in the writing and include a parenthetical explanation of what exactly it means.
- There was a comment related to Figure 6c, d, e, and f showing the types of the interconnection configurations in sub-clause 5.1 *Considerations in choosing interconnection configuration*. These figures show the transmission system buses in dual breaker arrangement while they may be single breakers. A proposal was to add a statement to each remote bus on the figures stating “Dual breaker arrangement shown. A single breaker arrangement could be present instead.”

The WG agreed to add a statement to the Figure 6 caption.

Next meeting is webcast meeting on Thursday, September 29<sup>th</sup>.

Requirements for the next face-to-face meeting in January, 2017: Wednesday 9:30 am single session, meeting room for 30 people with a computer projector.

Please continue to attempt to schedule September 2016 C18 and C25 working group meetings in different time slots to avoid attendance conflicts.

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

**Chair:** Vasudev Gharpure

**Vice-chair:** Mital Kanabar

**Output:** IEEE Guide C37.246

**Draft:** 2.2

**Established:** September 2011

**Expected Completion Date:** December 2017

#### **Assignment:**

Develop a standard for Phasor Data Concentrators for power systems.

As noted above, WG C-19 did not meet in Cincinnati.

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

**Chair:** Joe Mooney

**Vice Chair:** Ian Tualla

**Output:** PSRC Report

**Draft:** 1

**Expected Completion Date:** May 2017

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

The Working Group met Tuesday afternoon with 25 attendees; 6 members and 19 guests.

The Working Group [WG] Vice Chair conducted the meeting. It was noted that two writing assignments remained outstanding [Brian Johnson and Norman Fischer] and that the Chair remained active seeking those assignments. The WG authors had a an assignment to update the figures for their individual writing assignments to promote consistency using templates of standard ANSI symbols (Microsoft VISIO) provided by Roger Hedding. It was noted that a few authors had some difficulty opening/using the templates. A request was made to have a single figure editor that could update all of the figures to optimize the level of consistency obtained. Mr. Harold Kirkham agreed to accept an Action Item to complete that assignment to harmonize the report figures. The WG is to review the current draft of the report for clarity and provide comments back to WG Chair/Vice Chair by the end of October 2016. One guest asked to receive a copy of the current report, and was willing to offer comments, as well. The WG briefly reviewed the current report outline. The Vice Chair stressed that our goal remains to have the WG report draft completed by the end of 2016.

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

Meeting adjourned @ 16:49.

## **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:** 0.11

**Established:** September 2013

**Completion:** December 2018

**Assignment:** Develop an IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

Working group C21 met on Tuesday, September 20, 2016 in Cincinnati, OH in a single session chaired by Yi Hu and Gene Henneberg with 9 members, and 5 guests. The meeting began with introductions and display of the IEEE Patent Policy slides to inform all attendees and the WG of any known potential patent issues (none were identified).

There was not a quorum to approve the May 2016 meeting minutes. These will be circulated for approval via email, with special effort to reach non-USA members.

The most recent draft 0.11 was distributed via email to WG members last week. This draft includes contributions for all proposed sections of the report as well as an edited version of section 5.2.3 "Selection of type of SIPS in accordance with target power system phenomena (The original section version is still part of the draft 0.11, highlighted in yellow.).

The WG schedule is to submit the complete guide for balloting after September 2017 meeting in order to complete the project before the PAR expires at the end of 2018. We expect to continue with single sessions during PSRC meetings.

The IEEE standards approval process now includes an opportunity for public comments (by non-IEEE SA members). Erin Spiewak of IEEE SA described the process to the WG at the meeting.

Since substantially all sections have now been contributed, the next major effort is editing the 100+ page document into something more manageable. Yi and Gene provided a short "editing guide" in the recent email. There were no additional comments on this document after the review and discussion.

We will organize a group of volunteer editors and meet electronically approximately monthly to make progress on the editing. Volunteers include Yi Hu, Gene Henneberg, Manish Patel, Dean Miller, Tony Johnson, Roger Whittaker, Tony Seegers, and Alla Deronja.

WG Chairs will send both May and September 2016 meeting minutes to WG members for electronic approval.

Requirements for January 2017 PSRC meeting in New Orleans in January – room for 20 people, single session, projector.

## **C-23: Coordination of Synchrophasor Related Activities**

**Chair:** Anthony Johnson (anthony.johnson@sce.com)

**Vice Chair:** Allen Goldstein

**Output:** Ongoing Liaison

**Completion:** Ongoing Liaison

**Assignment:**

The ongoing working group will provide three main functions:

- Liaison 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.

**September 20, 2016 Meeting Agenda**

1. Introductions
2. Meeting Minute Approval deferred to email Ballot.
3. NASPI Update
  - a. Next NASPI Meeting Seattle Oct. 18-20, please check [www.naspi.org](http://www.naspi.org) for information.
4. IEEE Workgroup Activity

	<b>Title</b>	<b>Status</b>
<b>PSRC C19</b>	Standard for Phasor Data Concentrators (PDC) for Power Systems	In Progress
<b>PSRC C28</b>	Guide for Synchronization, Calibration, Testing and Installation for PMUs	In Progress
<b>PSRC H11</b>	Revision of standard IEC60255-118-1	In Progress
<b>PSRC H21</b>	Development of standard Mapping between C37.118.2 and IEC61850	In Progress
<b>Substation C20</b>	Recommended Practice for Databases used in SAS	In Progress
<b>IEEE SCASC</b>	Synchrophasor Measurement Conformity Assessment Steering Committee	Standing
<b>IEEE SDCASC</b>	Synchrophasor Data Conformity Assessment Steering Committee	On Hold
<b>PSRC HTF36</b>	C37.118.2 Revision	In Progress

5. Old Business
6. New Business
  - a. Note C19 PDC and HTF36 Canceled will be meeting in January.
  - b. Review presentation for NASPI meeting
  - c. Ken Martin to discuss with IEEE SA the potential to supersede C37.118-2005 in total.
7. Adjourn

Attendance: 6 Members, 9 guests

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

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

**Chair:** Sukumar Brahma (New Mexico State University)

**Vice Chair:** Evangelos Farantatos (EPRI)

**Output:** PSRC Report

**Draft:** 0

**Established:** 2014

**Completion:** TBD

### **Scope:**

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

### **Agenda**

1. Introductions
2. Approval of minutes of the May 2016 meeting.
3. Discussion of WG survey and updates on responses
4. Discussion of updates on implementation of models in ASPEN and CAPE
5. Discussion of the report outline
6. Future course of action for the working group.
7. Adjourn

The meeting started with introductions, short description of the scope of the WG, and then the May 2016 minutes were approved.

It was announced that the material of the WG will be uploaded to the IEEE PSRC website.

Then the WG chair and vice-chair described to the attendees the updates with respect to the data obtained by manufacturers.

- GE communicated through email that they are still working on providing data to the WG, targeting for the end of 2016
- A new Vestas contact was identified and the WG chair and vice-chair will contact him
- A report was provided to the WG by Athula Rajapakse, (University of Manitoba), Dharshana Muthumuni and Ali Goharrizi (Manitoba HVDC Research Centre). The report includes PSCAD simulation results and populated tables as suggested by the WG survey, using black box manufacturer models of Type III and Type IV wind turbines. The content of the report was discussed during the meeting. The report will be further studied to understand the results. It was suggested by the attendees to request also simulation results of unbalanced faults.

Then Sherman Chan (ASPEN) presented the implementation of the Type IV wind turbine model using ASPEN OneLiner's voltage controlled current source model. The model is implemented as a table of V-I-pf values. The table can be populated either manually using data provided by manufacturers or using the EPRI proposed algorithms. The model is using an iterative solution. An aggregate model of the wind turbines and the collector system are suggested to be used. The model was demonstrated during the meeting.

Then Evangelos Farantatos (EPRI) provided an update on validation examples of generic EMTP solar and Type III wind turbine models. The generic EMTP solar model was validated using fault recorded measurements provided to EPRI by TVA under an EPRI-TVA project. The generic EMTP Type III wind

turbine model was validated using simulation results provided by a wind turbine manufacturer of their proprietary model.

Finally, a draft outline of the final report was discussed. It was decided to finalize the outline at the next WG meeting and assign contributors to each section.

There were total 31 attendees in the meeting, 10 members and 21 guests.

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

## **C-25: Protection of Wind Electric Plants**

***Chair:*** Martin Best

**Vice Chair:** Keith Houser

**Output:** PSRC Report

**Draft:** 2.2

**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 Cincinnati, OH on Wednesday, September 21, 2016 at 08:00 with 10 members and 4 guests. Copies of the agenda, May 11, 2016 meeting minutes and Draft 3.0 of the Report were reviewed by the Working Group guests.

After introductions, the May 11, 2016 meeting minutes were cited for comment, additions or corrections; none were made. The Chair called for a motion to approve the meeting minutes. Nuwan Perera of ERL Technologies made a motion to vote for approval of the minutes; Raluca Lascu provided a second to the motion. The WG approved the C25 Meeting Minutes from the May 11, 2016 meeting in Denver, CO.

The review of the document began with section 3.3 Bus Protection. Dean Miller provided an overview of his writing assignment. He discussed a few of the key points concerning Bus Protection; discussed the CT requirements in specific applications. For zone interlocked schemes, you want to avoid directionality for the sake of speed. Coordination before the Bus and the feeder relays is essential.

Dean proposed placing emphasis on the selection of the right scheme that will work well under the varied conditions of wind plant operation. The line/bus differential schemes work well for these types of conditions when communications is available. Note PRC004 now requires composite protection; with typical line protection, generation facilities' protection operation would need to be considered in this analysis. This might provide another reason for the application of a current differential.

Some types of typical pilot schemes utilize negative sequence for ground fault protection; some WTG units do not produce negative sequence, but balanced output. This presents a problem for the application of negative sequence relay sensing. The selection of the protection functions applied needs to be carefully considered. The current section 3.6.1 will likely need expansion.

Rene' Midence noted there is not much information on Sub Synchronous Resonance [SSR]. He noted series compensated lines and Type III WTGs are known to elevate the probability of SSR in some

configurations. He suggested adding material about this phenomenon which would point the reader to other reference materials which provide more detailed information on the subject. Rene' Midence and Nuwan Perera accepted assignment to author this work to be integrated into section 2.7 of the report. The idea is for the generation owner to recognize the problem and work with the transmission owner to find ways to mitigate the problem based upon the studies being made.

Section 3.1 needs expansion. Brian Boysen, who could not be at this meeting today, has volunteered to assist with this expansion.

The Vice-chair will re-examine writing assignments submitted and talk with Jacob Lein about the preparation of Section 3.1.3. - Arc Flash Protection.

Dale Frederickson has volunteered to take on the writing assignment for Section 3.1.2 – Voltage and Frequency Protection and Coordination.

Juan Gers has volunteered to take on the writing assignment for Section 3.5 – Capacitor and Harmonic Filtering.

A few additional volunteers will be required to complete the remaining section writing assignments. Please contact the Chair or Vice-chair for details

The group requests a single session, meeting room for 25-30 at the September 2016 meeting, and a computer projector. **It is requested that the meeting time for C25 avoid conflicts with the meeting times for the C18 and C24 working groups, if possible.**

Meeting Adjourned @ 09:18 EDT.

Respectively Submitted 9-21-2016,

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

**Chair:** Don Ware

**Vice Chair:** Matt Black

**Output:** IEEE Guide, C37.233

**Draft:** 0

**Established:** January 2016

**Completion:** November 2019

**Assignment:** Revise C37.233 Power System Protection Testing Guide

The C26 working group, chaired by Don Ware, met on Tuesday, Sept 20, 2016 with 17 members and 12 guests.

When attendance was taken at the beginning of the meeting quorum was not satisfied, Minutes from the May (Denver) meeting will be approved via e-mail after the September meeting.

In discussion from the follow-up to the May meeting minutes the issue of NERC-CIP requirements bearing on Power System Protection Testing was raised. After some discussion it was decided that the preference would be for NERC and other regulatory agencies to reference IEEE in their materials and not for us to name specific versions of NERC-CIP which may be antiquated in the near future. An informative reference may be made to the NERC-CIP requirement that most utilities are currently conforming to, but the majority of the discussion will be external to regulatory requirements.

Vahid Madani agreed to follow-up with the HTF37 Task force on “Extensions to Cybersecurity requirements for substation P&C systems” to determine if there needs to be any cross-exchange of information between the working group(s). Some discussion occurred regarding testing PC’s implementation of NERC-CIP v5. Vahid has also agreed to follow-up with the



different techniques that may be used in place by utilities now, as well as possibilities of how NERC-CIP v5 might be implemented.

Claire Patti educated our WG on iMeetCentral which is the new website that is to be used for modifying a Guide or Standard. Erin Spiewak is to be contacted by the Chair and Vice-Chair following the September meeting. Once WG C26's iMeetCentral site has been set-up the Vice-Chair is charged with populating the membership with the active members of the working group for further contributions to the guide.

Don reiterated that our revisions to C37.233 are to be minor. Our primary contribution will be that new technology that wasn't available in 2005 when the guide was originally written will be added. The bulk of the content should remain intact.

The changes received were reviewed by the working group. Sections that were modified were reviewed line-by-line. Some sections were re-written. Guillermo Weyer has agreed to review the rewrite of 6.3.2.

In the process of reviewing some of these contributions it became evident that not all submissions had been implemented into the latest draft. Don and Matt will correspond within the next two weeks and get the draft up to date with all relevant submissions implemented. The guide's latest draft will then be placed into iMeetCentral and subsequent revisions may be done by the individual users with the ability to make individual comments.

Wayne Stec and Mark Siira have been working on Sections 8 & 9. Time did not allow for Wayne to present his contribution to the guide, but he will be the first order of old business on the agenda for January's meeting in New Orleans.

Vahid Madani made statement to consider "make sure links have life".

New assignments to review document sections are as follows:

Don Ware to review commissioning  
Vahid Madani with Sungsoo Kim will review excitation testing  
James Ariza will review end-to-end testing

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

Request conflict avoidance with K16, I2, I25 & I29.

### **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:** ?  
**Completion:** November 2019  
**Established:** September 2015  
**Completion:** TBD

**Scope:**

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

- a) Test and calibration procedures for PMUs for laboratory and field applications. These procedures have been superseded by another IEEE document and will be revised or deleted as appropriate.
- b) Considerations for the installation of PMU devices based on application requirements and typical bus configurations. New lessons learned since the publication of this guide may be accounted for in a revision to the guide.
- c) Techniques focusing on the overall accuracy and availability of the time synchronization system. New technologies and further information about synchronization may be accounted for in a revision to the guide
- d) Communications testing for connecting PMUs to other devices including Phasor Data Concentrators (PDCs). Lessons learned from the field may be included in a revision of the guide.

Called to order at 8 am, 5 May 2016. 8 of 11 members in attendance, there was a quorum. 15 guests.

Introductions

Patent slides shown, no patents have been brought to our attention.

Minutes presented and approved unanimously.

Overview of the current status of the draft. Sections 5 and 7 have been significantly edited.

Discussion of document details beginning where we left off in January: Section 6.3. Some comments were added to the document which led to additional comments added to section 5.

A discussion of the document organization was held. The question is should the document organization be changed. The draft today is organized predominantly by activity or function topic:

- 4..Synchronization techniques accuracy and availability
5. Measurement accuracy characterization
6. Installation, commissioning, and maintenance
7. Test and calibration.

Question is should the document be re-organized to avoid the need for redundant information in each section. One point is that readers now will tend to focus only on the section related to their activity and miss important information in other sections. Also a total re-org would be very time consuming. In general, it was agreed that keeping the current overall organization but changing the titles of some of the section, then rather than repeating information, give a brief overview and a reference to other parts of the document where the details are spelled out would be preferred to a total reorganization.

Discussion of the focus on adding information about the needs of PMU applications that have been learned since the publication of the guide.

Call for new business: there is none.

Latest Draft will be distributed next week.

Adjourn.

Next meeting, single session, room for 30 and a projector.

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

**Chair:** Heather Malson

**Vice Chair:** Mike Kockott

**Output:** PSRC Report

**Draft:** 0

**Established:** January 2016

**Completion:** TBD

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

Working group C29 met on Tuesday, September 20, 2016, in Cincinnati, OH, in a single session chaired by Mike Kockott in place of Heather Malson, with 15 members (5 new) as well as 12 guests.

The WG reviewed the assignment and the draft report outline developed during the May 2016 meeting. At this stage there were no suggested modifications to the outline.

Mike Kockott reviewed the material which had originally been submitted as part of the J5 Working Group report, "Application of Out-of-Step Protection Schemes for Generators." This material had originally been intended as part of that report until the C29 Working Group was formed to address out of step relay testing for both generators and transmission lines. The draft J5 document that includes the discussion on testing and the most recent version of the D29 document will be distributed by Mike Kockott to the attendees.

Mike presented a general outline of the out of step testing process. Following discussion, the WG agreed that the Evaluation step is really the function that is produced as the output of Working Groups J5 and D29. The C29 report must focus on the testing task the site commissioning engineer faces to achieve his objective, and should cover not only the "what" but also the "how", as the WG assignment calls for the creation of a report on "test instructions/parameters".

Function	Environment	Activity
Evaluation	Lab or office	Setting calculations, documentation, study verification
Commissioning	Field	Verify setting Verify functionality Put into service Time pressures and deadlines Test process should be easy, simple, fast and efficient
Maintenance	Field	Reduced set of commissioning tests
Investigation	Lab and Field	Combination of original evaluation and commissioning tests as required to diagnose

No new items were brought forward for discussion.

Mike Kockott requested volunteers to draft the first three sections of the report with the following results:

- I. **Introduction** – Mike Kockott, Gene Henneberg
- II. **Test Equipment and Environment** - Rob Fowler, Benten Vandiver, Eugenio Carvalheira
- III. **Types of Tests** –Rob Fowler, Jun Verzosa, Jim Vandeligt

Last date for submission of writing assignments to the vice-chair is Wed 4 Jan 2017. In preparation for the January 2017 meeting, the vice-chair will send these to all WG members and guests by Fri 6 Jan 2017.

The next meeting in New Orleans in January will need a single session, computer projector, and room for 60.

### **C-30 Microgrid Protection Systems**

**Chair:** Michael Higginson

**Vice Chair:** Fred Friend

**Output:** PSRC Report

**Established:** January 2016

**Expected Completion Date:** December 2018

#### **Assignment**

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

The working group meeting was conducted on Wednesday morning at 8:00 am with 24 members and 17 guests, including 8 new members.

The Chair opened the meeting with introductions, reviewed the previous minutes, which were approved after a minor correction was made.

The outline was then reviewed with the following notes:

- Islanding operation: to be covered under modes of operation.
- Add new section under Challenges, impact of operating conditions on protection: microgrid controller and SCADA controller interaction (Krish Narendra)
- What is a considered protection function? Load shedding, control functions, and/or load management? Reference 2030.7 to avoid overlap.
- Add new section under Challenges: Interaction of protection and control (secondary and tertiary) functions within the microgrid and with the utility (Amin Zamani will coordinate w/ Alex Apostolov, Jonathan Sykes, and Mike Jensen)
- Impact of DER mixture is covered in fault current level challenges

The working group then reviewed one of the contributions received, covering the Definition of a Microgrid and the following items were also discussed:

- Is there a size limit? Stay away from capacity, focus on equipment capabilities. Added black start capability and removed reference to size.
- An additional writing assignment was added on Modes of operation: islanded, interconnected, and stand alone. The authors will tie this to the protection issues. (Wayne Hartman and Vahid Madani)

The Chair is working to prepare a Central Desktop site for collaboration with plans to hold a web meeting between now and the January meeting to review additional member contributions.

Vahid Madani received a request from the US DOE asking if the working group could generate a prioritized list of technical topics related to Microgrid protection for possible fast track development. There is potential DOE funding available to facilitate this effort. Please send your ideas to Vahid (VxM6@pge.com) and copy the working group officers.

The new writing assignments are due by end of November.

Next meeting: Computer projector and room for 60 attendees.

### **CTF-32 Proposal for Creation of Task Force/Working Group**

**Work Assignment:** The task force will meet to ascertain the interest in and need for a new working group. The anticipated work assignment would be to create a report on protection practices for the interconnection of solar generating facilities to utility transmission systems. At a minimum, the report will document current protection practices, protection challenges and solutions, and lessons learned.

**Background/Problem:** Solar generating facilities are connecting to the transmission systems of most major utilities. These facilities vary in size from 10 MW to 300MW. Many protection engineers do not understand the unique issues associated with solar interconnections and are not equipped to address these issues. This lack of experience may result in over or under application of protection schemes resulting in unnecessary expense, lack of appropriate protection at the point of interconnection, and poor performance of protection schemes applied on adjacent transmission elements. This report would document the experiences and best practices of protection engineers from various geographical regions and provide a resource of considerations for handling new projects for engineers at every level of experience.

**Proposal By:** James Deaton - Southern Company  
Keith Houser - Dominion Virginia Power  
Michael Jensen - Pacific Gas and Electric  
Manish Patel - Southern Company

### **D: LINE PROTECTION SUBCOMMITTEE**

**Chair: G.L. Kobet**

**Vice Chair: K.V. Zimmerman**

The Subcommittee meeting was called to order on Wednesday, September 21, 2016 with 26 members and 34 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (26 out of 41 members present).

Minutes from the May 2016 meeting in Denver were approved.

The Chair reviewed items of interest from the Advisory Committee.

Working groups gave reports on their activity.

### **Reports from the WG Chairs:**

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

**Chairman: Brian Boysen**

**Vice Chair: Claire Patti**

**Established: 2013**

**Output: C37.230 – Guide for Protective Relay Applications to Distribution Lines**

**Draft :1.13**

**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 in Cincinnati, OH on Tuesday, September 20, 2016, 1:30 pm EDT.

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

The patent slides were presented.

Mike Meisinger motioned to approve the May meeting minutes and Fred Friend seconded. Motion carried.

Working group reviewed the recently submitted assignments in the following sections:

- 7.2 – Mike Meisinger presented his contribution on methods of coordination. The WG determined that supporting figures are needed
- 8.4 – Bruce Mackie presented his section on undervoltage load shedding.
  - Working group members who have familiarity with UVLS are invited to review the section and provide feedback.
- 9 – Smart Grid and Distribution Automation section was discussed.
  - Working group members with an interest in this topic are invited to review the section and provide feedback.

**Assignments:**

The following new assignments were made:

- Mike Meisinger will develop two figures to go with his contribution to section 7.2 Coordination
- Don Lukach will review sections 4.1.2, 5.1.3, and 7.1.2 and attempt to add consistency regarding ground fault impedance.
- Ratan Das will provide reference for high impedance fault detection.

The following assignments are outstanding:

- David Aldrich will look at adding information on automatic restoration to 8.3 Underfrequency Load Shedding.
- Randy Crellin will review and revise section 8.7 Communications – missing figures
- Umer Usman, David Aldrich, and Craig Holt will review the entire document and review for consistency and flow. Umer will lead this group.

**Assignments are due November 1st. iMeet Central updates are preferred.**

<https://iee-SA.iMeetCentral.com/login>

**Old Business:**

It was decided that we will add a reference to PSRC report [Cold Load Pickup Issues](#) somewhere in section 7.

It has been noted that the existing guide is inconsistent in the use of terminology. It was pointed out that it uses both sense and detect. We will maintain a list these terminology issues and address them as we work through the guide.

- Sense vs. detect
- Line vs. phase, such as double-line and two-phase
- High side vs. high voltage
- Load capability vs. line rating
- Microprocessor vs. numerical relays

We will address the use of pulseclosing and pulsefinding throughout the document per the guidance provided by Mike Meisinger.

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

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

**Chair:** Normann Fischer

**Vice chair:** Kevin W. Jones

**Assignment:**

The tutorial will focus on methods of setting impedance-based power swing blocking and out-of-step tripping functions. Specific relay setting examples will be provided. Other methods of detecting an out-of-step condition do exist but will not be discussed.

#### ATTENDANCE

32 Total with 8 Members and 24 Guests.

#### GENERAL ITEMS

Introductions and approval of May 2016 meeting minutes.

Demetrios Tziouvaras provided a presentation describing the Swing Center Voltage method for PSB and OST. The PSB application method does not require any settings, while the OST application requires easily calculated blinder settings for the TOWO application with no stability modeling. The TOWI application requires limited stability modeling to verify the inner blinder settings.

Jörg Blumschein provided a presentation of the continuous impedance calculation method to detect the out of step condition. This detection method is also settingless.

The D-29 report will describe these methods more briefly than the rate of change methods that are the focus of the paper.

The meeting was adjourned.

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

**Chair: Karl Zimmerman**

**Vice-Chair: Ted Warren**

**Established: Jan 2014**

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

The working group met in Cincinnati on September 20, 2016 with 11 members and 22 guests.

After introductions, the WG Chair reviewed the minutes, and restated the working group assignment.

The WG reviewed the outline, which included several sections that have been submitted and incorporated into the document. A few sections are still outstanding. Two sections were removed from the tutorial – “Quadrilateral Overreach” was removed, as it falls under “Settings Considerations”. “Pole Scatter” was removed since it falls under “Single-pole tripping and open pole”. We also debated whether to include series-compensated lines and resistance grounded systems. After some discussion, the tutorial will include both topics.

All sections now have writer/owners and our goal is to receive all assignments prior to the January meeting, so we can begin the editing and review process.

The Chair will make the draft and selected presentations available to the WG members.

### **D32: Summary Paper and Presentation for C37.243 Guide for the Application of Digital Line Current Differential Protective Relays Using Digital Communications**

**Chair: Bruce Mackie**

**Vice Chair: Craig Palmer**

**Established: September 2015**

**Output: Report and Presentation**

**Assignment: To develop a summary paper and presentation describing C37.243 Guide for the Application of Digital Line Current Differential Protective Relays Using Digital Communications to be used at protective relaying conferences.**

**Expected Completion date: Dec 31, 2016**

**Draft: 3.0**

Working Group D32 met on Tuesday, May 10, 2016 at 3:00pm EDT in a single session with 6 members and 10 guests.

After introductions, the previous minutes were reviewed.

Since the last meeting the document was approved by the working group to submit to the sub-committee for vote. The sub-committee approved the document with 40 approvals and one disapproval.

The working group reviewed the comments from the one who disapproved as well as the five members who approved the document with comments. The document was edited with regards to the comments per the working group direction. No technical changes were made to the document.

Volunteers were requested and received for presenting at future conferences.

The document will be submitted to the PSRC officers for approval to publish. The working group does not anticipate meeting in January but will remain active in case additional actions are needed after PSRC officer review.

**DTF33: Coordination with CIGRE Working Group TOR-JWG C4\_B5.41 Challenges with series compensated applications in power system when overcompensating lines**

**TF Chair: Luis Polanco**

**Vice Chair: NA**

**Assignment:**

**Expected Completion Date:**

DTF33 did not meet in Cincinnati and has no minutes to report.

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

CHAIRMAN: Normann Fischer

VICE CHAIR: Joe Mooney

ASSIGNMENT:

Coordinate with IEC 60255-187-3 (functional specification on line current differential requirements) and provide feedback

MINUTES:

The working group meet with 6 members and 13 guests. We reviewed the comments made by the chair. Due to a family issue Mr. Lippert did not amend the present draft of the document and as such the document has not changed since the one sent out in May. Members were requested to review and comment on the May document and send these comments to the chair before the meeting in January.

The 60255-187-3 committee will not meet in October but will next meet in April 2017, but this WG will meet in January.

**DTF35 Investigate the Need for a WG to Evaluate Line Protection Schemes**

**Chair: Karl Zimmerman**

**Output: Recommendation for Assignment for Formation of New Working Group**

**Established: September 2016**

**Expected completion date: September 2016**

DTF35 met with 25 attendees to discuss the possibility of forming a new working group to evaluate transmission line pilot protection schemes.

After introductions, the Chair reviewed several IEEE PSRC documents, to determine whether the new working group was viable, and does not produce content that has already been produced. IEEE C37.113 Transmission Line Protection Guide has a section (6.2) that is dedicated to pilot protection schemes for transmission lines. However, most of the content discusses "how" a scheme works, and with a small amount of content on strengths and weakness, and comparison of schemes.



Next, the Chair showed a report which discusses the justification of pilot schemes. This document focuses on how faster protection improves stability, reduces equipment damage and other factors. Again, there is little content on comparison of schemes. Finally, the Chair showed a technical paper which compares schemes, in part, using fault tree analysis to measure relative dependability and security.

Several attendees shared their company's attempts to compare schemes (e.g. DCUB v DCB), and the value that a document may have.

After some discussion, the task force agreed on the following WG (D35) title and assignment:

Title: Evaluation of Transmission Line Pilot Protection Schemes

Assignment: Prepare a technical report to the line protection subcommittee to evaluate advantages and disadvantages of common transmission line pilot protection schemes, including step-distance, 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.

The Chair will recommend to the Subcommittee that we proceed with creating a working group. We have two potential candidates who have volunteered to be Chair and Vice-Chair and they both accepted. The Chair will be Rick Gamble and the Vice-Chair, Nathan Gulzcynski.

**D36: PC37.113, DRAFT Guide for Protective Relay Applications to Transmission Lines**

**Chair: Jeff Barsch**

**Vice Chair: Don Lukach**

**Scope:** Develop a summary paper and presentation for C37.113-2015, IEEE Guide for Protective Relay Applications to Transmission Lines.

The D36 working group met in a single session on Wednesday, September 21, with 9 of 22 members present. Also in attendance were 3 guests, 2 of whom became new members.

The WG discussed the initial contributions that had been made to the summary paper. The WG decided to pare down most of the writing sections that had been submitted. Figures will be used sparingly. The intention of the summary paper is to describe what has changed in the guide in an effort to encourage the reader to want to purchase the guide. The WG does not want to repeat too much text directly from the guide.

With this direction toward a more streamlined summary paper, the following WG members will revise and shorten the following sections. Writing assignments are requested to be completed by October 31, 2016.

- Communications – Umer Usman
- Redundancy and Backup Considerations – Jay Anderson
- Autoreclosing Methods – Rafael Garcia
- Sensitive Ground Overcurrent Fault Protection – Nestor Casilla
- Line Length Considerations and SIR – Jeff will contact Joe Mooney to see if he can revise
- Considerations for Line Distance Applications – Ian Tualla and Gustavo Brunello
- Considerations for Current Differential Applications – Jeff Barsch and Don Lukach
- Ground Path Configurations – Dominick Fontana
- Effects of High Grounding Resistance on the Operation of Line Protection Systems – Greg Ryan
- Transfer Bus and Stub Bus Configurations – Roger Whittaker
- Relay Elements in Step Distance Schemes – Gustavo Brunello
- Other Polarization Methods – Jeff Barsch
- Role of Directional Ground OC Protection Used in Conjunction with Ground Distance Relays – Jeff Barsch
- Single-phase Tripping and Reclosing – Jeff will contact Joe Mooney to see if he can revise
- Annex A – Jeff Barsch and Don Lukach

The abstract, introduction, and conclusion will be submitted by Jeff Barsch and Don Lukach.

The goal is to have a complete draft sent to the WG by Thanksgiving so they can review and provide comments prior to the January 2017 meeting in New Orleans.

## Coordination Reports

### T&D Committee / Distribution Subcommittee

The next T&D Committee / Distribution Subcommittee meeting will occur during the IEEE PES JTCM in New Orleans, LA, 9-11 January 2017.

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

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

Working Group on Smart Distribution <http://grouper.ieee.org/groups/td/dist/da/>  
Larry Clark, Chair                      Bob Uluski, Vice-Chair                      Fred Friend, Secretary

The working group is nearing completion of the Smart Distribution Application Guide, P1854  
Scope: This guide categorizes important smart distribution applications, develops descriptions of the critical functions involved, defines important components of these systems, and provides examples of the systems that can be considered as part of distribution management systems or other smart distribution systems.  
Balloting is anticipated early next year.

Volt-VAR Control Task Force  
Work continues on P1885 'Guide for Assessing, Measuring and Verifying Volt-Var Control Optimization (VVO) on Distribution Systems'. Balloting is expected to begin by the end of 2016.

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

Continued working on the "Guide for Reliability Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment", P1806.

Scope: This guide provides analytical techniques to assist in the placement of switching and overcurrent protection devices on medium voltage distribution circuits for reliability purposes.

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

### Old Business

As a follow up item from May, the Subcommittee discussed and agreed to create a task force to investigate the effect of series compensation on transmission line protection. The task force will be called DTF37, will meet in January 2017 and will be chaired by Mike Kockott.

### New Business

The working group discussed some possible new working groups. Now that the line protection guide is complete, there are certain sections of the guide that may spawn more in depth guidance. The subcommittee members were asked to consider possible working groups moving forward.

Also, Bruce Mackie has accepted the role of incoming Vice-Chair for the Line Protection Subcommittee, beginning in January 2017/.

### **General Discussion**

None

### **Line Protection operations of interest**

Gary Kobet delivered a short presentation on a line protection event.

The meeting adjourned.

### **H: RELAYING COMMUNICATIONS SUBCOMMITTEE**

**Chair: Eric Allen**

**Vice Chair: Galina Antonova**

The Subcommittee met on September 21 with 24 members of 39 total, comprising a quorum. 37 guests were also present. Minutes of the May 2016 meeting were approved without objection.

The Chair presented several announcements:

- Galina Antonova is the new Vice Chair of the H SC
- WG chairs are urged to take no more than one week to submit their WG minutes to the H vice chair, and not more than two weeks to the attendees and members of their WG's.

#### WG business:

WG H32 is changing its title to Performance requirements for teleprotection over Ethernet.  
4 WGs (H12, H21, H24(SubC7), H25) and 2 TFs (HTF36, HTF37) are moving to the newly formed Power Systems Communications and Cybersecurity (PSCC) Committee.  
3 WGs are moving to SC H from SubC0: C11 (H38), C15 (H39) and C20 (H40).

2 WGs (H11 and H23) asked SC H's permission to ask the PSRC Main Committee to form an IEEE Sponsor Ballot poll, pending completion of WG work. The H SC voted without objection to approve the submittal of the following motions to the Main Committee:

"Mr. Chair, the H subcommittee requests approval for transmittal of P60255-118-1 - Measuring relays and protection equipment - Part 118-1: Synchrophasor for power system - Measurements, 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 adoption as an American National Standard."

"Mr. Chair, the H subcommittee requests approval for transmittal of Guide for Common Format for Naming Intelligent Electronic Devices (COMDEV), C37.248, to the IEEE SA for balloting, conditioned on working group approval of a draft for transmittal. Provided the ballot is favorable, the proposal will be sent to the IEEE SA for approval and transmittal to ANSI for adoption as an American National Standard."

#### Old business:

None

New business:

3 new TFs were formed:

HTF41 Revision of IEEE 1646 Communication Delivery Time Performance Requirements (Chair: G. Preuss)

HTF42 Revision of C37.93 Relay Applications of Audio Tones over Voice Grade Channels (Chair: M. Benou)

HTF43 Revision of C37.239 Std for Common Format for Event Data Exchange (COMFEDE) (Chair: M. Adamiak)

## 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 9 members and 8 guests in attendance. We had a quorum, minutes of previous meetings were approved: Mark Adamiak moved acceptance, Benton Vandiver seconded, approved unanimously.

The patent policy slides were shown, and no issues were identified.

The standard completed sponsor ballot on May 16 with 80% return and 87% approval with 6 negative ballots with comments.

The session was dedicated to discussing the 97 comments received. Most of them are minor editorial fixes and non-controversial. We have made good progress, and will continue to work off line to resolve the remaining comments.

Discussions raised the possibility of adding a new annex to address some comments regarding time tag formats; a small group will look at that and the related comments. That along with continuing work on comment resolution and the lead time required for RevCom submission mean that we will not be finished in time for the Oct 17 deadline to complete our PAR by the end of the year. We will be asking the Standards Coordinator for an extension, probably one year.

For the next meeting: a single session jointly with SubC4, for 30 attendees. The existing slot (4:30 on Tuesday) continues to work well.

### **H6: IEC 61850 Application Testing**

**Chair: C. Sufana**

**Vice Chair: B. Vandiver**

**Output: Report**

**Established: 1999**

**Expected completion date: December 2014**

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

Introductions were done after a welcome by Chair Charlie Sufana. There were 15 members and 12 guests present for the Sept 20, 2016 meeting.

The minutes from the May 2016 meeting were reviewed and approved with no comments.

The Chair asked for an update on any 61850 activities. Christoph Brunner gave a quick overview of WG10 activities and WG17 is working on system management of 61850 systems, Alex Apostolov updated the status of functional testing work and control testing specifications, also CIGRE B5-53 report on testing of digital substations. Herb Falk cited work on 8-2 which is about to go out for ballot and work on RBA profiles. New work items include Power Quality definitions, Condition-Based testing, and in 2017 there will be a 61850 InterOp and BootCamp in New Orleans around Sept/Oct.

The Chair began with a review of the report's status. It has been edited for the last time and is in a final form. Final draft stands at version 3.4. The WG performed a final review and suggested minor editorial changes. The Chair will complete the noted changes and circulate it to the WG for a final vote / approval.

Therefore, the WG has completed its assignment and plans to submit its Report to H SC chairs for SC circulation and approval by the January meeting. Upon approval H6 will request to be disbanded.

In case there are SC changes we will request a room for 30 +projector for the January meeting.

**H11: C37.118.1 Standard for Synchrophasors for Power Systems**

**Chair: K. Martin**

**Vice Chair: A. Goldstein**

**Output: Standard**

**Established: 2006**

**Expected completion date: December 2017**

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

WG H11 met on Wednesday, Sept 21, 9:30 AM – 10:45 AM. There were 15 members and 8 guests which was not a quorum. The May minutes will be approved by Email. The meeting started with introductions and a review of the IEEE patent rules.

The current status was reviewed:

All comments from the CD circulation in March-May 2016 have been addressed, including those that were unofficially received. The WG worked on comment resolution in the May PSRC meeting and through 2 web meetings as well as by Email. The updated draft was approved by WG vote in August, with 19-Yes, 0-No, and 1-Abstain of 28 official voting members. A few minor changes were made based on WG comments during the voting and the final markup copy circulated.

The CD is now ready for IEEE ballot and a CD recirculation in the IEC. For the IEEE ballot, we have to receive sponsor permission to go to ballot. With this permission, we will first form a balloting body and then go to ballot once that is complete. For IEC ballot, we will do a CD circulation once we have the PSRC permission to go to ballot. If the IEEE ballot and the CD come back with compatible change requests, we will go to CDV with the IEC.

Discussed the next steps—

The subcommittee will be requested to ask PSRC to form a balloting body and go to ballot. Balloting body formulation takes 30 days (min). Once the group is formed, the IEEE ballot can be started. It will take 30 days (min). A 60 day public review can be started when the ballot starts.

The same draft should be IEC circulated as CD3. This can probably start when the balloting body formation is initiated as it should ends about the same time as the IEEE ballot ends. If either the IEEE or IEC come back with comments that require technical changes, those will need to be resolved before proceeding to the next stage. Once technical issues are resolved from both ballots, the CD can be changed into a CDV for the next stage of IEC circulation. At that stage, the IEEE process will have to wait until CDV circulation completes (5 months) to ensure and editorial changes are captured when it is IEEE finalized.

Murty (IEC) and Ken (WG) will discuss coordination details with Erin (IEEE).

The WG discussed having a WG meeting in Great Britain. The issue is having enough work planned to occupy 2-4 days. We could possibly have that much in trying to resolve comments from these 2 circulations. If the balloting is stretched out, it could finish in mid to late January, so a meeting mid Feb to mid March would be appropriate. There is an IEC meeting for early April planned, but it would be too late if the ballots completed in January. Of the H11 group, 6 people indicated they could attend a Feb/Mar meeting and 9 people could attend an April meeting. However if the balloting could be completed in December, the WG favored planning to resolve the comments at a 1 day meeting at the JCTM in January. We will see how the coordinating and process initiation is going in the next 2 months to make a decision.

Eric Udren invited H11 members to review IEC 61255-181 CD, which is looking at use of Frequency and ROCOF in protective relaying. Several agreed, and Eric will send them the CD to review.

For the next meeting, the WG requests a single session during the normal meeting schedule and a room for one full day at the beginning of JCTM. The rooms need space for 30 people and a CP.

**H12: Configuring Ethernet Communications Equipment for Substation Protection and Control Applications**

**Chair: E.A. Udren**

**Vice Chair: B. Vandiver**

**Output: Report**

**Established: 2008**

**Expected completion date: December 2014**

**Assignment:** Develop a report to assist protection engineers in configuring Ethernet LANs and networking equipment when the network traffic includes critical protection messaging such as IEC 61850 GOOSE messaging. Topics include switch and router configuration, VLANs, security, priority queuing, traffic monitoring and control, and topology choices and redundancy.

Introductions were completed after a welcome by Chair Eric Udren. There were 8 members and 12 guests present for the Sept 20, 2016 meeting.

The Chair requested any comments or feedback on the circulated final report and proceeded to make a quick review for those new attendees.

The Chair requested help and advice on presenting the report to the full committee. The Chair recommend a review of the report and not a tutorial for this purpose and maybe for regional conferences. However, he would support anyone wanting to do so.

The WG discussed proposals by Alex Apostolov on the potential uses of a tutorial, going beyond the normal succinct presentation of the WG report (30-40 minutes). CIGRE would want a tutorial. IEEE tutorials require 3 to 6 hours of material. The Chair suggested that tutorial development should be carried out in a follow-up of the present WG, whose assignment is essentially completed.

The Chair requested volunteers to create sections of the WG presentation – Alex Apostolov, Christoph Brunner, and Chris Chelmecki responded with support.

Moving to a topic of related interest, the Chair asked if anyone has developed a business case for IEC 61850 - SEL and ABB have published papers. There was a discussion on projects in progress utilizing different network approaches and how those generate wiring cost savings. Herb cited several network pitfalls and avoidance strategies which are highlighted in the report.

The next meeting will review WG voting responses.

For the next meeting a single session for 30 attendees is requested.

**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.

5 members and 8 guests were present.

After an introduction of the attendees, the WG discussed the current status of the document.

All missing contributions to be submitted by the end of November 2016, so the document can be revised by the members of the WG by the end of the year. The following assignments were made. 2.1 Alex and Christoph committed to do it; 2.3 Alex, 2.8 to be deleted due to lack of contributions. Additionally, chapter 3.7 to be deleted and Herb to be asked if there is a need for updating 4.1

In chapter 5, the corresponding data analysis of the remaining use cases needs to be done. Peter, Chan, Christoph and Dimitry will help with the data requirements analysis based on the latest version of the document that Christoph will e-mail.

Chapter 7 Migration to be removed and integrated in Chapter 8.

A room for 20 people and projector will be needed for the meeting in January 2017.

**H21: Information Mapping between IEEE C37.118.2 and IEC 61850-90-5 systems**

**Chair: Yi Hu**

**Vice Chair: A. Goldstein**

**Output: Report**

**Established: September 2012**

**Expected completion date: December 2016**

**Assignment:** Create an IEEE report documenting the mapping between IEEE C37.118 and IEC 61850-90-5 standards.

Working group H21 met on Wednesday, September 21, 2016 in single-session chaired by Yi Hu and Allen Goldstein with 17 people (9 members and 8 guests) attending.

The WG reviewed the current draft of the report. A few areas are noted for next revision of the report:

- Note on Figures 3 and 5: IID/SCD in these figures is not correct according to Herb. It is either a CID or an SCD but never an IID. The reading will be a CID and the output will be an IID.
- Globally change 61850-90-5 with R-SV (Routable Sampled Values). Also 61850-8-1 and R-GOOSE applies.
- For CFG-3 of IEEE C37.118.2, some of the fields would be new data objects to 61850.

After reviewing the progress made since May meeting, Herb presented a proposed approach to use an ICD file (in XML format) for use by the gateway function to implement the desired mapping. After some discussions of the proposed approach, WG members agreed this approach could be standardized for implementing the required mapping. Thus, the report should only describe this approach and make a recommendation for IEC/IEEE to initiate an effort to develop a standard (e.g. IEC 61850-80-x) based on this proposed approach without working out all the details in this report. Similar approach has been successfully adopted by mapping efforts between IEC 61850 and other standards (e.g. IEEE 1815.1 for mapping between DNP3 and IEC 61850).

Based on the discussion, the updated plan to complete the report by WG is as follows:

- The report will not attempt to work out all the details for this proposed mapping approach but make a recommendation to develop a standard based on this approach. The proposed approach and the example XML file will be included as an appendix of the report
- A task force will be formed to expedite the completion of the report based on this proposed approach. The task force will include Yi Hu, Allen Goldstein, Herb Falk, Mark Adamiak, Dean Quелlette, and Scott Short.
- The report is targeted to be completed by mid-October for submitting it for review by H subcommittee

For next meeting, WG H21 requests a single session, a room for 20 people and a PC projector

**H22: PC 37.249 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**

**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 11 guests present.

The Group began with a review of the submitted assignments lead by Hugo Monterrubio. The review quickly evolved into extensive discussions on how to best identify the proper level for each of the security assessment fields.



The Group concluded, without objection, that two new sections should be added to each file category to support the assigned security assessment levels. The first section to provide a clear description of the file contents, and the second section to provide an example of said contents.

The Chair accordingly requested from the member volunteers to add the two new sections to each of their assigned file type categories and to submit their completed assignments by December 31st, 2016.

Requirements for the next meeting: Single session, meeting room for 20 people, and a computer projector.

**H23: Guide for Naming Intelligent Electronic Devices (COMDEV)**

**Chair: R. Cornelison**

**Vice Chair: Eric Allen**

**Secretary: Amir Makki**

**Output: Guide**

**Established: January, 2013**

**Estimated Completion Date: January, 2017**

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

The Working Group met on Wednesday September 21, 2016 with 8 members and 2 guests. Draft 4.2 was sent to members prior to the meeting.

Prior to the meeting, WG members voted on draft 4.1 of the document. There were two negative ballots which were resolved prior to or at the meeting. The group reviewed the comments from the WG ballot. Following are some of the items discussed:

- Definitions: An existing definition of Virtual Device exists, but it says very little so the definition prepared by the WG will remain in the definitions section. All other definitions if needed will be moved to other sections with reference to the applicable standard.
- Line groups is a new concept that has not been completely defined and tested so all references to Line Groups will be removed from the document.
- Voltage Level: For transformers, if including multiple voltage levels is desired, the dash ('-') character should be used.
- Phase ID: For a Phase ID holder in the examples, the group agreed on 3I3V instead of 3I4V and multi which had been used.
- Each of the items in section 7 should include a reason why a naming convention is needed for that application.
- Other editing occurred during the meeting which will be reflected in draft 4.3.

Editing will continue with the chair soliciting help on the various subjects as needed. Web sessions will be used as needed.

Since the document is close to completion, the group agreed that a contingent request for SA balloting be made to the PSRC. A request to the H SC chair to ask the PSRC for permission to start the SA balloting process contingent upon approval of the document by the WG was made and approved at the H Subcommittee Meeting. The PSRC did approve this request at the main meeting Thursday. It is expected that the document will be ready for WG voting around the middle to end of October.

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

**H24: Revision of C37.238 (Joint Working Group Substations Committee C7 & PSRC H24)**

**Chair: G. Antonova**

**Chair SubC7: Tim Tibbals**

**Vice Chair: Bill Dickerson**

**Output: Standard**

**Established: January, 2013**

**Estimated Completion Date: May, 2014**

**Assignment:** Develop a revision of the IEEE Standard C37.238-2011 "IEEE Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications" based on the list of issues brought forth in close coordination with IEC TC57 WG10 and other technical committees with similar interests. The goal is to bring it to the IEEE Sponsor Ballot by January 2014.

Working Group H24/SubC7 met on September 21, 2016 in Cincinnati, OH, with 21 attendees (9 members, 12 guests). After introductions, Galina Antonova, the H24 co-chair, presented IEEE Patent policy slides and asked attendees to identify any potential patent issues related to this work. None were raised. Quorum was achieved. Minutes of January 2016 and May 2016 were approved.

Discussion on IEEE C37.238 Recirculation comment resolutions followed. The following items were discussed.

Comment #1 about Note 3 clause 6.2.2, same note is in Annex E (informative).

Following discussion by the group, it was agreed that changes to the note were not needed. Bill Dickerson made a motion to keep the note 'as is'. Mark Adamiak seconded the motion. There was no additional discussion. WG Member vote – 9 Approve, 0 Disapprove, 0 Abstain.

(One WG member left to catch his flight).

Comment # 2 relative to wording changes to Annex B (informative).

Discussion followed on changes to the text. Group discussion focused on what extent of change would require a recirculation. Group was against any changes that would require a recirculation. Sam Sciacca agreed to check with IEEE SA on this question. Christoph Brunner made a motion to accept the proposed text changes, conditional on the changes not requiring a recirculation of the document. If IEEE SA requires a recirculation for the proposed changes, these changes would be rejected. Tim Tibbals seconded the motion. No additional discussion on the topic. WG Member vote – 8 Approve, 0 Disapprove, 0 Abstain.

Comment #3 – Domain 238

Per IEEE SA, permission from 1588 WG is not needed for the use of reserved ranges in the 1588 standard. This is a WG H24/SubC7 decision. Sam Sciacca, senior director of IEEE/SA offered his opinion that reserved fields in standards are based on voluntary acceptance and use (where registration is required, this would not be permitted. Future registration of Domains will likely be required the 1588 revision.) Jay Murphy specifically asked if use of Domain 238 in this standard, which is a profile of the 1588 Standard, would preclude approval of the 238 Standard by SA or other IEEE authorities since use of this value is not permitted in 1588. Sam Sciacca's opinion was there is no problem. In fact, it was pointed out that IEC 9-3 claims it is conformant to 1588, but specifically allows the use of Domains above 127, that are not allowed in 1588. At the conclusion of this discussion Jay Murphy made a motion to keep Domain 238. Chis Huntley seconded the motion. There was no further discussion. WG Member vote – 8 Approve, 0 Disapprove, 0 Abstain.

WG requested the response from IEEE SA on the question of edits to the informative annex B and if these changes would require a recirculation. Based on the WG this feedback will determine if the proposed changes will be made or rejected. In either case, recirculation 3 comment resolution has now been completed, and only editorial changes have been made. Right after the meeting IEEE-SA staff advised that a recirculation for the changes in Annex B is not required.

Galina Antonova will provide an updated draft for approval at the next RevCom meeting in December 2016.

Requirements for the next meeting: single session, meeting room for 20 people with a computer projector.

**H25: Review of C37.94**

**Chair: M. Benou**

**PSCC Co-Chair: Roger Ray**

**Vice Chair: D. Jenkins**

**Output: Standard**

**Established: September 2013**

**Estimated Completion Date: December 2015**

**Assignment:** Revise IEEE Standard C37.94-2008, IEEE Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment.

H25 did not meet. The revision is currently in recirculation which will close Friday September 23, 2016.

We would like a room for the January meeting in case the WG needs to address any additional comments.

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

**Chair: C. Chelmecki**

**Vice Chair: Dylan Jenkins**

**Output: Standard**

**Established: September 2013**

**Estimated Completion Date: September 2017**

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

The working group met with 8 members and 6 guests in attendance.

Showed patent/copyright slides.

Joerg Blumschein presented the Siemens implementation of logical device hierarchy and settings storage in an IEC61850 SCL file.

The group discussed the use of inRef and blkRef in LN to model data flow between nodes and multiple refs to provide multiple inputs or backup functionality.

Alex informed the group that the IEC is working on a standard that uses IEC61131 programmable scheme logic to include more complex logic within the SCL file. Since the standard is not complete the group agreed that programmable scheme logic should be kept separate from the COMSET file for now.

Alex agreed to provide an example on how the settings group is implemented in the SCD. Active settings group switches were discussed and Alex noted that the change logic could be provided in a GAPC node.

The group agreed status should not be included in SCL for COMSET.

Data attributes for individual settings were further discussed. The following was agreed upon: mandatory items should be first, settings values should remain in primary as in IEC61850, units or enums are mandatory, description (what is this setting representing) is mandatory, settings group/ global is mandatory, minValue and maxValue are mandatory if import of COMSET is allowed. StepSize is optional if there is not restriction of stepSize in the unit. Settings range dependencies can be handled by providing the min/max values that allow a union of all possible settings sets based on other setting values. COMSET will add a comments attribute for history (why was this changed) of the setting.

Readable/Writeable/ Permissions – was discussed, IEC is working on a standardized RBAC system. Members noted that permissions are not currently stored within settings files, so could be external to this document.

Proprietary Binary Data was discussed and the standard will state that it should be kept in a separate file.

Status: Draft 0.2

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

**H30: IEC 61850 User Feedback**

**Chair: D. Maragal**

**Vice Chair:**

**Output: Recommendation on formation of a Working Group**

**Established: September, 2014**

**Estimated Completion Date: September, 2015**

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

The Subcommittee met on Sep 20 with 7 members and 16 Guests.  
Following items were discussed during the forum:

#### Naming conventions of IEC 61850

Drawbacks with existing IEC 61850 naming convention were highlighted. Member compared the limitations of IEC 61850 object reference to a point number in other protocols such as DNP3. The chair proposed the best practice for user oriented naming in IEC 61850 with an example. A user name can be created out of other elements in IEC 61850 - may need a guideline how user names can be created using various elements in the standard part 6 and part 7.

#### Order of attributes in SCL versus definition in part 7-3

The group discussed the issue related to order of attributes. WG10 chair mentioned - In Ed 1, an SCT can create different order of the DAs e.g. in a dataset. This should be fixed with Ed 2.1 that needs to be checked with tools

#### Version compatibility

User requirements for compatibility of IEC 61850 versions specifically to configuration tools and MMS client software was discussed. WG10 chair mentioned that User requirements have been defined by the TC57 TF user feedback with regard to compatibility of tools. H30 needs to check if they have additional requirements

#### Criticality of time synchronization for process bus

Chairperson discussed the criticality of time synchronization to process bus implementation. Reliability of the protection system depends on merging units and clocks in addition to the reliability of a relay. Several use cases were discussed highlighting the need for further clarification, testing and assessment on several topics. For ex: How time correction is made in clock when clock loses GPS signal and regains back the GPS sync. How the protection relay utilizing process bus data adopts when one of the merging units loses the time synchronization while all others stay synced.

#### **HTF31: 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 Subcommittee met on Sep 21 with 8 members and 11 Guests.

After introduction of attendees, chairperson presented a brief update on the modeling concepts in IEC 61850 Edition 2.1.

Model concept of a generic function was described. This included representing:

- Analog signals: CT & PT inputs/sample value streams
- Digital inputs: Blocking & Initiating signals
- Parameters and Status signals

The discussion then focused on a Siemens implementation of a Frequency protection function and the availability of global and LN specific data objects.

A group decided to focus on the hierarchical model of frequency and overcurrent protections.

Alex Apostolov will prepare a hierarchical model for both functions which will be sent to the members of the working group to check if it fits the implementations and what data objects/attributes might be added. This should be distributed to other manufacturers as well.

Room for 25 people and projector are needed for the January 2017 meeting

#### **H32: Performance requirements for Teleprotection over Ethernet**

**Chair: K. Fodero**

**Vice Chair: W. McCannon**

**Output: Recommendation on Formation of a Working Group**

**Established: September, 2014**  
**Estimated Completion Date: September, 2015**

The WG met on Tuesday, with 11 members and 6 guests in attendance. We reviewed the channel performance recommendations table and agreed to change this table to list the recommended performance stated in IEEE 1646 & IEC 61850-90-12. As this document is a working group report the group agreed that performance data should agree with existing standards. We reviewed the appendix and agreed to changes to this portion of the document. The changes agreed to at this meeting will be included in version 0.4 and the work assignment for the group is to review the entire document and recommend any changes. The compiled recommended changes will be reviewed at the next meeting.

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

**H35: XML Translation for COMTRADE**

**Chair: M. Adamiak**

**Vice Chair:**

**Output: Report**

**Established: May, 2015**

**Estimated Completion Date:**

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

The Working Group met on September 20, 2016 with the attendees noted above.

Several new concepts were presented and discussed, specifically:

- Synchro Samples: This is the concept of time tagging the samples per the IEEE COMTAG standard and the forthcoming Merging Unit standard which would compensate for internal delays in the processing of data. Adherence to this new proposal would allow the automatic alignment of COMTRADE records based on Time Stamps. Allen Goldstein indicated that he would take a first pass at a definition.
- Add a new optional section to COMTRADE called VIEWS. In this section, a VIEW can be defined which would be the desired Analog and Digital channels to include in a view
- Discussed the concept of Data Compression to address Sparse Data in a COMTRADE file. The recommendation was made to use a Time-Length-Value (TLV) format. It was noted that use cases were lacking. The chairman will solicit Use Cases from Vahid Madani and Amir Makki that can be used in the development of a solution
- It was noted that when a COMTRADE file is analyzed, the underlying structure of the power system is often unknown. The suggestion was made to add a Power System Structure section that would be based on the Common Information Model. When a CIM model is included in the COMTRADE file, it is possible that a "partial" view may only be available. In as much as The Chairman suggested that, in as much as CIM is XML based, this would only be included in the XML file structure.
- A table of SI units and their assigned number (as defined in the 61850 standard) was submitted and will be included in the revised document.
- In progress is a definition of the use of Unicode for the description fields of data elements. A future discussion item is whether to change the existing CFG file to also allow Unicode.

Draft: 0.1

Next meeting: 15 people; projector

**HTF36: Standard for Phasor Data Concentrators for Power Systems**

**Chair: V. Gharpure**

**Vice Chair:**

**Output:**

**Established:**

**Expected completion date:**

**Assignment:** To Assess Formation of a Working Group to revise the IEEE Standard C37.118.2-2011.

The group did not meet.

Requirements for the next meeting: a room for 25 people with a computer projector.

**HTF37: Extensions to Cyber Security requirements for substation P&C systems**

**Chair: S. Kunsman**

**Vice Chair: C. Wong**

**Output: Recommendation to form WG**

**Established:**

**Expected completion date:**

**Assignment:**

Summary Minutes for Subcommittee Report

The HTF37 meeting was held on Tuesday, Sept 20, 2016 with 29 attendees.

Purpose of HTF37:

To review the gaps in IEEE C37.240 "Cyber Security Requirements for Substation Automation, Protection and Control Systems" and decide if a WG should be formed to amend or revise the existing standard.

1. Bring the industry experts together with power system domain knowledge and involved in the development of cyber security standardization
2. Review the Jan 2015 published IEEE C37.240 standard related to areas not addressed:
  - Cyber security requirements for communications outside the control house but inside the substation fence
  - H22 Guide for Cyber Security for Protection Related Data Files
  - Cyber security for protection systems outside of the substation (Feeder automation/Wide area systems)
  - Application Whitelisting and usage of Digital Signatures
  - Cloud based application
  - C37.240 audit support documentation
  - Reference appendix to map the standard into NERC CIP applications

Request for Jan 2017 HTF37 meeting will be a single session for 50 people and a computer projector.

Meeting started with Taskforce Chair- Steve Kunsman introducing the purpose of trying to form a taskforce and follows up by introduction of audience in the room.

Scott Mix from NERC CIP was invited to present a brief overview of CIP v6 , definition and recommendation. Presentation title was "NERC CIP Implication of IEC 61850 in Transmission Station." During the discussion, members and guests – Craig Preuss, Alex Apostolov, Herb Falk, Tony Johnson, Tim Tibbals, Steve Kunsman had raised up questions, comments and suggestions including:

- Definition of GOOSE and SMV and the layers that each messages resides in and whether they are routable or not.
- External connectivity and internal connectivity definition
- 6 walls PSP is no longer applied
- Exclusion goes away if the TCP/IP port is managed /protected
- Categories of IEDs if the management port is separated from the communication port
- Firewall requirements for the facilities
- 15 minutes definition in the redundancy requirements
- Reliability and functionality function list

Suggestions and action items

Scott Mix suggested the IEC 61850 TC57 WG10 representative to provide him a document to define the data model and Design and Implementation of Time Synchronization Distribution Systems for Substation Automation the messages such as GOOSE, SMV, and MMS; define the routable profiles for NERC CIP. Action complete and the attached document on the comments to NERC were delivered by Herb Falk.

It was also suggested that the HTF37 remain a taskforce until Jan 2017 when PSCCC is officially launched. Then a workgroup request will be submitted to the PSCC for approval.

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

**Chair: J. Bougie**

**Vice Chair:**

**Output: Guide**

**Established:**

**Expected completion date:**

**Assignment:**

The group met as SubC11. Status: IEEE sponsor ballot comments resolutions.  
Requirements for the next meeting: a room for 20 people with a computer projector.

**H39: Implementing IEC 61850 Substation Automation Systems (P2030.100)**

**Chair: R. Liposchak**

**Vice Chair:**

**Output: Guide**

**Established:**

**Expected completion date:**

**Assignment:**

The group met as SubC15. Status: IEEE sponsor ballot comments resolutions.  
Requirements for the next meeting: a room for 20 people with a computer projector.

**H40: Databases used in SAS**

**Chair: J. Bougie**

**Vice Chair:**

**Output: Guide**

**Established:**

**Expected completion date:**

**Assignment:**

The group met as SubC20. Status: starting work on a draft.  
Requirements for the next meeting: a room for 20 people with a computer projector.

***Liaison Reports***

**PES Substations Committee**

**C. Preuss**

**C0: DATA ACQUISITION, PROCESSING, AND CONTROL SYSTEMS SUBCOMMITTEE**

**Chair: C. Preuss**

**Vice Chair: Vacant**

**Secretary: Vacant**

Craig thanked SC H of the support and accepted appreciation from SC H for running C0, that will no transition in to the new PSCC Committee.

**PES Communications Committee**

**D. Nordell**

No report

**IEC TC 57 WG 10, 17, 18, and 19 and related WGs**

**C. Brunner**

As a reminder, the next IEC 61850 IOP will be in October 2017 in New Orleans. We are looking for members from utilities that are willing to act as witness.

For a detailed roadmap of the IEC 61850 related work, please check the IEC document 57/1750/INF.

IEC TC57 / WG10 will meet in October in Glasgow, UK. WG10 has currently the following projects:

1. IEC 61850-9-3 Precision time protocol profile for power utility automation has been published as Dual Logo Standard end of May
2. Finalisation of Edition 2 of IEC 61850:  
All parts except part 2 (Glossary) have been published as second Edition. The work on part 2 has only started.
3. Preparation of an Edition 2.1 of IEC 61850 for some of the major parts  
The Amendments for parts 6, 7-2, 7-3 and 7-4 have been approved as CDV. Work on other parts requiring amendments is in preparation. FDIS for the amendment is expected for 2017. WG10 is as well working on a document describing how to handle mixed systems that use both Ed 1 and Ed 2 devices as well as how to handle mixed systems in the future.
4. Technical reports that are under preparation
  - A first draft of IEC 61850-90-14 – Using IEC 61850 for FACTS and power conversion data modelling is currently being circulated
  - Work on IEC 61850-90-11 – modelling of logics and IEC 61850-90-18 alarm handling is ongoing.
  - A technical report on functional testing is in preparation.
  - The report IEC 61850-7-500 about the usage of the Logical Nodes to model applications for substation automation is in final preparation as DTR. The work on the report IEC 61850-7-5 explaining the more generic concepts is in ongoing.
  - Work on new technical reports IEC 61850-90-19 (role based access control) and IEC 61850-90-20 (guideline to redundancy systems) has been started.
5. Work on technical specifications for mappings between IEC 61850 and Modbus data (TS IEC 61850-80-5) is ongoing.
6. A technical report IEC 61850-6, guideline for basic application profiles is in preparation as well as IEC 61850-600, guideline for function modelling in SCL for substation automation.
7. A schema for namespace definition files will be developed as technical specification IEC 61850-7-7. Based on that schema, IEC 61850 models will in the future be available electronically.

IEC TC57 / WG17 will meet in Paris, France in October and is working on the following topics:

1. Technical reports that are under preparation
  - IEC 61850-90-6 – use of IEC 61850 for distribution automation, IEC 61850-90-9 – Storage batteries and IEC 61850-90-15, Modelling a generic electrical view of DERs: First WG drafts are available.
  - IEC 61850-90-16 – use cases for system management
2. Mapping on web technologies  
The TF agreed on the approach to use MMS/XER over XMPP. Work on the part 61850-8-2 is in the finalisation stage.

IEC TC57 / WG18 is working on the following topics;

1. Update of IEC 61850.
2. Interoperability tests for hydro equipment based on IEC 61850 and Communication network structures in hydro power plants have been prepared as CD; harmonisation with other IEC 61850 standards has been requested
3. Communication network structures for hydro power plants



## I. RELAYING PRACTICES SUBCOMMITTEE

**Chair: B. Mugalian**  
**Vice-Chair: J. Long**

**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 relays and relay systems. Evaluate and report on pertinent aspects of protective relaying not addressed by other PSRC Subcommittees. Maintain applicable protective relaying standards.

The I Subcommittee met on Wednesday, September 21, 2016 with 20 members in attendance – a quorum was achieved.

- Minutes of the I Subcommittee held in Denver, CO on May 11, 2016 were approved. Motion to accept the minutes by Michael Meisinger and seconded by Fred Friend.
- Steve Turner and Jay Gosalia were nominated for I Subcommittee members.
- Coordination & Advisory Committee Meetings Items of Interest
- Future Meetings:
  - i. January 2017 – New Orleans LA
  - ii. May 2017 – Albuquerque NM
  - iii. September 2017 – Phoenix, AZ
- PSRC is looking for presentations for the January 2017 and May 2017 Main Committee meetings – please advise
- Also looking for reports that could be converted into **Transactions Papers**. Please advise as there are WGs close to completion. The Subcommittee will send members the definition and criteria for a transaction paper.
- Three working groups coming over from Substation Sub C0 starting in January 2017
  - i. WG I31 (Subs C2): Revision of IEEE 1613 – Standard for Environmental and Testing Requirements for Intelligent Electronic Devices (IEDs) Installed in Transmission and Distribution Facilities – Chair is John Tengdin, in progress
  - ii. WG I34 (Subs C3): Draft Standard for Input and Output Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs) – Chair/Vice-Chair unassigned Jay Gosalia has interest to Chair. Wants to see a copy.
  - iii. WG I35 (Subs C5): IEEE C37.2 – Standard for Electrical Power System Device Function Numbers, Acronyms, and Contact Designations – Chair is Mike Dood
  - iv. *In January 2017, I Subcommittee will have a total of 16 WGs and TFs*
- Administrative Items
  - WG/TF Agendas and Minutes: **“The 14-calendar-day rule”**
  - Email WG and TF Minutes *including membership list* to Brian Mugalian and Andre Uribe at: [bmugalian@sandc.com](mailto:bmugalian@sandc.com) and [auribe@powergridmail.com](mailto:auribe@powergridmail.com)
  - Updated PSRC Directory will be issued January 2017, so your rosters should be up to date and forwarded to Brian Mugalian and Andre Uribe at the September 2016 meeting – due date October 15!
  - PSRC Website – Email items to post on the I web pages to Brian Mugalian and Andre Uribe which will be reviewed and forwarded to: [webmaintenance@pes-psrc.org](mailto:webmaintenance@pes-psrc.org)
  - Working Group/Task Force Chairs and Vice-Chairs: please use the “documents” button on your web page to upload files, agendas, and minutes for use by others – this way we can include links in our correspondence
  - Working Group/Task Forces: please bring five paper copies of your work product. If a PAR controlled document, ask them to be returned at the end of your meeting – this is to help newcomers see what work is being done and see the stage in your assignment
  - I Meet Central – previously Central Desktop used for IEEE Guide/RP/Std. documents with a PAR

- Subcommittee Chair/Vice-Chair to hold progress report conference calls with each WG and TF Chair/Vice-Chair in late October 2016
- Task Force Proposal Submission Form – two received and will be reviewed at January and May 2017 meetings

## **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, September 21, 2016 with 8 members and 4 guests.

Quorum was achieved and minutes from the May meeting in Denver, CO were reviewed and approved.

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

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

The working group had much discussion on defining Digital Relay, Microprocessor Relay, Numerical Relay, Solid State Relay, and Static Relay for standardized PSRC use.

All working groups are reminded the database is available to them for use during their document development. All IEEE members have access to The *IEEE Standards Dictionary Online* using their IEEE account credentials (click on “Dictionary Database” from the dropdown menu on the IEEE SA eTools page).

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: M. Yalla**

**Output: IEC TC 95 USNC standards votes and PSRC status reports**

**Established: 1990**

**Expected completion date: Meetings are continuing**

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

The WG met on May 9, 2016 with 7 members & 1 guest to review TC 95 standards activities. Dr. Murty Yalla, IEC TC 95 Chair, and Eric Udren, Technical Advisor to USNC of IEC, updated the attendees on status of TC projects.

TC 95 has a new Assistant Secretary, Thierry Bardou of Schneider, a colleague of long-serving Secretary Serge Volut.

TC 95 will hold its Plenary Meeting in Paris on October 21; this will be preceded by co-located meetings of Maintenance Team MT4 October 17-20 to work on the standards projects listed here:

- 95/351/CD - IEC 60255-187-1 – Second draft - *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers*. We have received

MT4 resolutions for all comments that USNC and CNC submitted, put into this draft. PSRC K19 under Gustavo Brunello is reviewing. [K19 comments were received by the Chair after this WG meeting, and have been submitted for USNC comments. No big problems remain - a few formula issues in the Annex. These will be evaluated in the MT 4 meeting, October 17-20.]

- IEC 60255-187-3 - *Functional requirements for biased (percentage) differential relays for transmission lines* – supported by PSRC WG D34 under Normann Fischer. D34 has received an unofficial draft for review. This will not be addressed at upcoming MT4 meeting. Some issues are definition of standard tests considering the variety of product implementation, and what standards or tests to apply for communications issues.
- 95/347/CD – 60255-181 – First draft - *Functional requirements for frequency protection* – This was the major topic of discussion – it's a large document that deals with performance issues and measurement techniques for frequency and rate of change of frequency (ROCOF). Comments are due to USNC by the end of September so that MT4 can work with them at the October 17-20 Paris meeting. Several experts volunteered to review. [After the I4 meeting, the Chair presented this draft at the meeting of WG H11/IEC TC 95 JWG1 developing the new IEC-IEEE Synchrophasor Standard – several more experts offered to review. Pages of comments were compiled and submitted as official USNC comments.

TC 95 is revisiting several base requirements and type-testing standards to add requirements for smart grid protection or control devices (equipment on distribution circuits with distributed generation and inverters, or microgrids). We would still like to find US participants – always a challenge. Lacking this, the PSRC should set up WGs to support US input to these projects as drafts are developed.

- Update to IEC 60255-1 Ed. 1: *Measuring relays and protection equipment – Part 1: Common requirements*. The revision project asks if we test adequately for influences from Smart Grid devices (electronic power converters/ inverters/conditioners/controls). We are waiting for the first draft from UK Chair Allan Millard. The PSRC should create a WG, probably in SC I, to review and contribute.
- Update to IEC 60255-26 Ed. 3: *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*. As with Part 1, the revision addresses whether we test adequately for influences from Smart Grid devices (electronic power converters/ inverters/conditioners/controls). A new convenor is needed to continue the work – no progress planned at the Paris meeting.
- Update to IEC 60255-27 Ed. 2: *Measuring relays and protection equipment – Part 27: Product safety requirements*. Adapt the standard to meet the new requirements of the European Low Voltage Directive covering protection of people and animals from all risks; and internal production conformity control. In addition, revised base standard IEC 61010 now includes risk assessments and considers other aspects of safety not yet covered by IEC 60255-27 Ed.2. Work on the TC 95 revision has not yet begun, and will not be discussed in Paris.

Murty explained how TC 95 is obliged to handle interpretation requests – they handle these pragmatically. The WG discussed how PSRC WG KTF21 looking at IEEE C37.112 versus adoption of IEC 60255-151. The curves are the same. 151 has a lot of testing methodology that is not in C37.112. Can IEEE adopt as a dual logo and retire C37.112? Follow KTF21 minutes for the outcome.

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

**Chair:** Farnoosh Rahmatian

**Vice-Chair:** Bruce Pickett

**Established:** 2010

**Output:** Guide PAR PC37.241

**Expected Completion Date:** 2016

**Assignment:** Develop Guide for “Application of Optical Instrument Transformers for Protective Relaying”

I11 did not meet. The document is going to IEEE-SA sponsor balloting in October 2016. A PAR extension will be submitted before the next IEEE-SA Standards Board meeting.

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

**Chair:** Bruce Magruder

**Vice-Chair:** Will Knapek

**Output:** Revision of Guide for Field Testing of Relaying Current Transformers

**Established:** May 2013

## **Expected Completion Date: 2018**

### **Assignment: Revision of IEEE C57.13.1 to correct errors, and update with new test methods and equipment**

Working Group I23, Revision of C57.13.1 - Guide for Field Testing of Relaying Current Transformers, was held in the Tyler Davidson Room of the Westin, Cincinnati, OH, on September 21, 2016 at 8:00 am. 6 members and 3 guests were present and a quorum was not met. 15 members as of this meeting. Patent Conflict slides were shown.

- A phone conference was held on September 14 to discuss Draft 6.4. Members on call and others that reviewed approved the draft to move forward for ballot.
- Today's meeting was informative of this decision of attending members. Three more members approved the draft to go forward.

At the Relaying Practices Subcommittee meeting, Vice-Chair Will Knapek entered a motion to move to sponsor balloting, creating the invitation to join the balloting body. The motion was seconded by Amir Makki. The motion was approved by the I Subcommittee members.

At the PSRC Main Committee, Brian Mugalian requested approval from the Main Committee members.

Mr. Chair, the Relaying Practices Subcommittee requests approval for transmittal of Guide for Field Testing of Relaying Current Transformers PC 57.13.1 to IEEE-SA for creation of a ballot body and subsequent ballot. The motion was approved by the Main Committee.

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

**Chair: Jim Niemira**

**Vice-Chair: Open**

**Output: Develop a Report on the Use of Hall Effect Sensors for Protection and Monitoring Applications. The report will discuss the technology and compare with other sensing technologies.**

**Established: January 2013**

**Expected Completion Date: 2017**

The Working Group I-24 met on Tuesday, Sept 20, 2016, in Cincinnati in single session chaired by Jim Niemira with a total of **9 attendees** (3 members and 6 guests). Quorum was not met.

Meeting was brought to order at 1:30pm.

The Minutes from the May 2016 meeting will be balloted by e-mail.

The group reviewed the present Draft 9.0 of the report with all writing assignments now included. There is still some final editing and formatting that needs to be done to get the paper into final format.

The chairman will format the paper and distribute to the WG members for final review and approval. Once all final edits are completed, the paper will be submitted to the I Subcommittee for review and approval. We expect to complete submission of the paper to the I Subcommittee before the next PSRC meeting at JTCM in January 2017.

The WG expects to finish its work through e-mail correspondence and does not plan meet at the January 2017 PSRC meeting. The WG will plan to disband after the paper is completed.

Motion by Amir Makki to Adjourn; second by Jeff Burnworth; motion carried.  
The meeting adjourned at 2:10 pm.

### **I25: Commissioning of Substation Protection and Control Devices**

**Chair: Rafael Garcia**

**Vice Chair: Kevin Donahoe**

**Output: Report: Provide guidance in the commissioning of power system protection systems**

**Established: January 2014**

**Expected Completion Date:**

**Assignment:** Write a report to provide guidance in the commissioning of protection systems. This report will cover overall system testing procedures for generators, lines, line reactors, transformers, capacitors, and special protection schemes.

Working Group I-25 met on September 20, 2016, in Cincinnati, OH with 14 members and 7 guests.

The group went over assignments from the May meeting where a small group would review the entire document with the emphasis being to create a more consistent and concise document and improve the flow. The group went over proposed changes. The intent is to complete this review and then send out the document to the entire working group members for approval. Depending on the amount of comments we hope to send the approved document to the subcommittee for approval. The intent is for the working group vote on the document before October 31 so that any final edits can be completed and the report can be sent to the subcommittee for review and approval. Katherine Street, with NERC attended the meeting requested that once we are done with the document that we send it to NERC's System Protection and Control Subcommittee for their review and comments.

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

**Chair: Mike Meisinger**

**Vice Chair: Steve Turner**

**Output: Report: Revise Transactions Paper**

**Established: January 2014**

**Expected Completion Date: December 2018**

**Assignment:** Revise Mathematical Model of Instrument Transformers and expand IEEE Transaction papers and prepare IEEE Report.

Working Group I26 met on time with 14 members and guests present.

Steve Turner gave a presentation on a generator black start to show the distorted current waveforms due to GSU inrush. The excitation currents are available for the CTs. A simple ATP model will be developed to create the input currents. Action Item – Develop simple ATP model (generator and GSU) to simulate the event.

Steve Turner gave a presentation showing very small magnitude currents captured during protection operations such as directional power to protect generators from motoring.

Amir Makki gave a presentation on input currents created for a wide array of cases using an analog power system simulator. Action Item - Amir Makki and Steve Turner will convert the files for these cases to Comtrade.

**I27: Investigation of Protective Relay Self-Monitoring Capabilities**

**Chair: Roy Moxley**

**Vice Chair: Cathy Dalton**

**Established: 2014**

**Output: Report**

**Expected Completion Date: 2017**

**Assignment:** Prepare a technical report to the PSRC main committee on the enumeration, performance and efficacy of self-monitoring capabilities within protective relays in order to determine the extent and degree of self-monitoring.

I-27 met on Tuesday September 20 at 9:30am with 13 members and 13 guests.

Meeting Notes:

- Relay Figures (Figure 1): Consensus seems to be that the figure from Iliia has adequate level of details but needs to have some modification (see writing assignments below).
- Table X – Consensus to add the scrubbed raw data to an appendix.

- In the microprocessor test list.
  - #7 was noted to be moved to recommended practice list with expanded wording.
  - Added power supply.
  - Added user initiated tests.
  - Added processor capacity tests.
  - Added firmware integrity tests.
- Relay Self-Monitoring and Self-Monitoring Technology
  - Add back in what can go wrong turn section into a paragraph.

Document will have changes accepted and a draft will be sent to members and guests by the end of the week. Comments from the group to be returned by 10-31-16.

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

**Chair: Joseph Valenzuela**

**Vice Chair: Jeff Long**

**Output: Revision of the Guide**

**Established: September 2014**

**Expected Completion Date: January 2018**

The Working Group I-29 met on Tuesday, September 20, 2016 at Cincinnati, OH in a single session chaired by Joseph Valenzuela with a total of **21 attendees**, (9 members, 1 corresponding member, and 11 guests). Quorum was not met.

Because quorum was not met, the Working Group did not approve meeting minutes. We will pursue email approval of minutes.

- Michael Higginson is working with Erin Spiewak to get Central Desktop set up. Access will be for working group Members only.
- Michael will set up a WebEx on Fridays around lunch time (11-12 central) monthly recurring until January in order to progress with the document revisions.
- Michael will also upload a draft new appendix with microprocessor relay burden calculation examples.
- The group discussed the section 7.2.4.1. Jim Niemira will review and revise this section to improve readability and label breaker numbers, as well as refer to the Bus Protection standard to evaluate overlap.

Alla Deronja has prepared verbiage on impacts of CT saturation on microprocessor relays, as a proposed addition to section 6.0. Generator protection will need to be added.

The working group discussed the appropriate means for integrating microprocessor relay considerations to the guide. It is requested that all working group members consider these options and be prepared to vote at our first web meeting in October.

1. Section 6 would have a subsection added that is titled "Saturation effect on Microprocessor relays." In addition, Section 7 sub-sections 7.1-7.4 would be rewritten to incorporate new schemes with microprocessor specific applications as it applies with current transformers.
2. Reorganize sections 6 and 7 to have individual sections organized by relay type (i.e. electromechanical, static, microprocessor sections), and subsections organized by relay function that are inclusive of their saturation effects. This would facilitate straightforward location of relevant CT application and selection considerations for a reader.

Several documents discussed during this meeting are also included with these minutes.

All assignments are due in November 2016.

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

**Chair: Ljubomir Kojovic**

**Vice Chair: Robert Frye**

**Output: Revision of the Guide**

**Established: September 2014**

**Expected Completion Date: December 2018**

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

Working Group I30 held its meeting in a single session on Tuesday, September 20, 2016. There were 4 members and 4 guests.

Draft 0.1 of the document is completed and was discussed during the meeting. Mark Schroeder will complete Section 3 (Definitions) for the January 2017 meeting. Next step is distribution of the document for comments and additional contributions. Conclusion of the I30 group was that progress of the Guide revision is on track.

**I31/Subs C2: Environmental and Testing Requirements for Communications Networking Devices; IEEE 1613/1613.1**

**Chair: John Tengdin**

**Vice Chair: Brian Mugalian for PSRC**

**Output: Revision**

**Established: September 2014**

**Expected Completion Date: TBD**

Item no.	Notes	Action by
<b>CALL TO ORDER</b>	The meeting was called to order by the Secretary.	None
<b>AGENDA APPROVAL</b>	The agenda was shown to the attendees.	None
<b>CHAIR'S REMARKS</b>	The Secretary welcomed members and guest. The attendees introduced themselves.	None
<b>APPROVAL OF PREVIOUS MINUTES</b>	The Secretary noted that there was no quorum to approve the May PSRC meeting minutes.	Secretary to send out May PSRC 2016 meeting minutes for approval.
<b>Patent Slides</b>	The PAR patent slide was reviewed.	None
<b>Copyright Policy</b>	The IEEE copyright policy was reviewed.	None
<b>Presentations</b>	There were no presentations.	None
<b>Old business</b>	There was no old business.	None
<b>New Business</b>		
<b>Item #1</b>	The secretary reported that Jerry provided text regarding the history of the five added standards that has been placed into the informative annex and is still being edited.	Craig to work with Jerry to confirm content is acceptable.
<b>Item #2</b>	The secretary reported that work was completed on other clauses 4, 5, and 6 in draft 0.12 and that the latest working draft is 0.18.	None
<b>Item #3</b>	The chair did not receive an update from Mike and Ken on the high pot tests and whether they should be applied to communication ports or not. It has been noted that the 802.3 standard has a requirement in 802.3-2012, section 1, clause 12.10, page 363 of pdf.  There was discussion that the working group needs to be careful in what is cited and should understand the citation.	Mike and Ken will talk internally at SEL to see if someone there has a good understanding of the 802.3 testing requirements applicable to 1613.
<b>Item #4</b>	The chair reported no progress on an invitation from 60950 tests cited in 802.3.	Craig will work with Jerry to contact the colleague and set up a meeting with the working group.

Item no.	Notes	Action by
<b>Item #5</b>	The working group has not received a copy of IEC 61850-3 edition 2 and IEC 61000-6 of latest publication for their work. The Secretary reported that the IEEE SA is still working on it.	Craig to follow up with IEEE-SA to obtain standards for working group members.
<b>Item #6</b>	The secretary reported that the IEC normative references have not been reviewed for their use of “relay” in their text that would require language discussion inside the standard, similar to C37.90 series.	Technical editor to complete review of IEC normative references.
<b>Item #7</b>	There was discussion around the question of why generation is not in the title.	Secretary to investigate whether other IEEE technical committees or subcommittees would handle generation.
<b>Item #8</b>	There was discussion over the definition of environmental used in the title and how it might relate to the concept of MICE (mechanical, ingress, climatic, and electromagnetic). The draft was reorganized along these topics, with text also added to state how environmental is addressed by the standard.	None
<b>ITEMS REPORTED OUT OF EXECUTIVE SESSION</b>	No executive session was held.	None
<b>NEXT FACE TO FACE MEETINGS</b>	<ul style="list-style-type: none"> <li>• January 8-12, 2017 <ul style="list-style-type: none"> <li>– JTCM</li> <li>– New Orleans, LA</li> </ul> </li> <li>• May 8-11, 2017 <ul style="list-style-type: none"> <li>– PSRC Committee May meeting</li> <li>– Albuquerque, NM</li> </ul> </li> <li>• September Sept 11-14 <ul style="list-style-type: none"> <li>– PSRC Committee September meeting</li> <li>– Phoenix, AZ</li> </ul> </li> </ul>	None

**I32: Review Survey of Relaying Test Practices (2001 report)**

**Chair: Andre Uribe**

**Vice Chair: Nefty Torres**

**Output: Review**

**Established: January 2015**

**Expected Completion Date: January 2018**

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

The Working Group met Tuesday, September 20, 2016, Cincinnati, OH in a single session chaired by Andre Uribe with a total of **17 attendees**, 11 of which were members.

1. Introductions were held.
2. May meeting minutes were reviewed.
3. Working Group reviewed contributors changes
4. Two more tasks were assigned to address NERC and Human Performance.

- Working Group Meeting Minutes were reported
  - I23 Knapek motion to move to balloting. Second by Makki. Approved.
  - I31 (Subs C2) A request for meeting was made before Jan via phone conference to address questions around the devices that is included in the standard.
  - ITF33 is now working group I33

**Task Force Reports**



**ITF33: Review of Relay Testing Terms**  
**Chair: Jay Gosalia**  
**Vice Chair: Amir Makki**  
**Output: Report**  
**Established: May 2015**  
**Expected Completion Date: September 2017**  
**Draft: 1.0**

**Assignment:** Review definitions of relay test terms that are not uniformly used and mean different things to different organizations (users, manufacturers, regulators). Report to the I-Subcommittee on whether or not a new Working Group is needed to produce formal definitions in order to help eliminate any confusion. The definitions are to be submitted to working group C26 to be available for I2 for inclusion in the IEEE dictionary.

The Task Force (TF) met on time with 9 members and guests present. The TF discussed the effort of harmonizing definitions between IEEE, CIGRE, NERC, and IEC. The TF determined that such an effort is a massive undertaking and agreed to limit the scope and request forming of a new working group to address the limited scope. The TF assignment was accordingly revised.

The definitions compiled by the TF will be provided as a starting point for the new working group. The TF recommends that the new working group's focus should be on PSRCC standards only and that the resulting definitions should be based on a template format identifying the what, why, and how for each relay test term.

At this time the work of the Task Force is complete.

At the subcommittee meeting, the Chair reported on the discussions and recommendations of the TF and requested the formation of a new working group to define relay test terms used in PSRCC standards (guides, recommended practices, and full use standards). The new name for the group will be I33.

### **Liaison Reports**

Instrument Transformer Subcommittee submitted by Fred Friend

Next meeting is October 23 – 27 in Vancouver B.C. The minutes of the May 2016 meeting are in the May Subcommittee meeting minutes.

### **Old Business**

- Creation of new Task Forces for IEEE standards expiring in 2020
  - i. Request volunteers that participated in the existing revision
  - ii. The reviewing Task Force would start at the January 2017 JTCM/PSRCC
  - iii. Note that Task Force Chair does not need to become the Working Group Chair
- IEEE Std. C37.90.2 – IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
  - i. Task Force ITF36 Jeff Pond has volunteered to chair the task force
- IEEE Std. C37.105 – IEEE Standard for Qualifying Class 1E Protective Relays and Auxiliaries
  - i. No one volunteered. Brian will ask other members outside of the I Subcommittee. Amir Makki asked about the traffic seen for this standard. Brian Mugalian will contact Erin Spiewak how much traffic has this standard has seen in IEEE.

### **New Business**

- Brian will find out the history on C37.112 on why it's in K and not I.
- Mal Swanson explained the Mentor program he has started. If anyone wants to volunteer to be a mentor.
- Announcement – IEEE elections are going on.

## **J: ROTATING MACHINERY PROTECTION SUBCOMMITTEE**

**Chair: M. Reichard**

**Vice Chair: D. Finney**

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

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

Chair: Sudhir Thakur  
Vice Chair: Manish Das  
Output: Report to the Subcommittee  
Established: 2011  
Status: 11<sup>th</sup> 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 10 members and 10 guests present.

The outline of the latest report draft (Draft 12) was reviewed, which captured several completed assignments from the last meeting.

Murty Yalla presented an overview of NERC standard PRC-026 Relay Performance During Stable Power Swings, which has been FERC-approved and will be enforceable in 2018. PRC-026 applies to any protective functions which could trip instantaneously or with a delay of less than 15 cycles on load current, including Out-of-Step protection. Some concerns were raised regarding the 15 cycles delay stated in this standard being too small. It was determined that a discussion should be added in Section 9 NERC Technical Reference of the J5 report to acknowledge the existence of PRC-026 and its requirements. Gene Henneberg will draft some verbiage on this topic, and Phil Tatro and Murty Yalla will review prior to the next meeting.

Draft 13 will be updated to the J subcommittee webpage prior to the next meeting.

### **J6: Pumped Storage**

Chair: Joe Uchiyama  
Vice Chair: Dale Finney  
Working group has been disbanded

### **J7 Avoiding Unwanted Reclosing on Rotating Apparatus**

Chair: Mike Reichard  
Vice Chair: Steve Conrad  
Output: Report to the Rotating Machinery Protection Subcommittee of the PSRC  
Established: 2011  
Eleventh Meeting Expected Completion 2015  
Status Draft 6.0

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

WG Chairman Mike Reichard called the meeting of the working group to order. The working group met with 7 members and 15 Guests on September 21, 2016. The meeting focused on resolving/reviewing comments received from the SC. Next meeting requirements: Single meeting, room for 30, computer projector.  
Avoid conflicts with K16 and J7 – Steve is VC of both WG

## **J12: Improved Generator Ground Fault Protection Schemes**

Chair: Dale Finney

Vice Chair: Manish Das

Established: Jan 2013

Output: Report to subcommittee

Status: 10<sup>th</sup> Meeting

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

The group met on Wednesday 9/21/2016 in Cincinnati with 11 members and 9 guests in attendance. The minutes from the May meeting was approved.

The Chair presented the agenda and reviewed report draft R3.0.

Dale Frederickson discussed the assignment he completed showing proposed logic to accelerate 64G1 trips based on the sequence voltages as presented in the CFE paper. The Chair will revise the text where necessary to make the logic applicable to generic relays, with logic diagrams provided by Wayne Hartmann. It was suggested that only the third harmonic based schemes be included in the arcing detection logic, and not zero sequence voltage elements.

Nate Klingerman will revise his section on Sub harmonic injection schemes to include generic injection schemes and add his experience on interoperability of redundant sub-harmonic schemes from different relay OEMs.

It was agreed that the previously proposed discussion on GSU Neutral Current Variation is not really suitable in this paper and will be deleted.

It was asked whether this report will include example settings for each new methodologies. It was decided that some sections already had the settings shown to some extent, but no detailed additional settings will be developed in the interest of time.

The Chair stressed on the importance of this report and the need to get it completed quickly. He urged the members to turn in any pending assignments prior to the next meeting.

The working group will have its 11<sup>th</sup> meeting in January 2017, with the need for a single session, computer projector and seating for 35 people.

A single session with space for 50 people and a computer projector is requested for the January meeting.

## **J13 : Modeling of Generator Controls for Coordinating Generator Relays**

Chair: Juan Gers

Vice Chair: Phil Tatro

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

### **WG Report**

The working group met with 18 members and 19 guests present. A quorum was achieved (18 members present out of 32 total members).

The working group approved the minutes of the May 10, 2016 meeting.

Juan Gers reported that he, Charlie Henville, and Phil Tatro met with ESCS and PSDPC during the PES meeting in Boston. They presented a summary of our work and open issues related ESCS and PSDPC and requested assistance. Phil Tatro provided an overview of the issues discussed at each meeting.

Both groups were receptive to working with J13. Juan and Phil will schedule a joint WebEx meeting in October to continue discussions with ESCS and PSDPC.

Normann Fischer reviewed his draft of Chapter 6, "Coordination checks of the timing and sensitivity of protective elements with generator control characteristics." Normann discussed differences between cylindrical versus salient pole machines regarding end-core heating, derivation of the steady-state

stability limit (SSSL), and dependency on voltage when translating from the P-Q plane to the R-X plane. This chapter will also discuss why an exciter may need to transiently operate above the steady-state overexcitation limit, how traditional loss-of-field protection is set, and coordination with the SSSL and excitation limits.

Juan Gers reviewed recent additions and changes to the draft report. Support is needed for the chapter regarding governor control systems and relationship with generator protective systems.

Michael Basler will review chapters 4 and 5 and attempt to streamline the presentation and move supporting material to an appendix.

The working group discussed including V/Hz protection with respect to the correct voltage on which to base the setting and coordination with the overexcitation protection. The working group also discussed relevance of certain NERC Reliability Standards.

Mike Reichard suggested to include in the paper some reference to NERC PRC 025 and 026 but cautioned that the working group should focus on aspects related to its assignment; i.e., focus on protection functions for which power flow or transient and stability simulations, and therefore generating unit modeling, is required to achieve coordinated settings.

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

#### **J14: Plant Protection Issues Associated with Black Starting of Generators**

Chair: Chris Ruckman

V Chair: Zeeky Bukhala

Established: May 2014

Output: Report to Subcommittee

Expected Completion: January 2017

Status: 7th Meeting

The working group held its seventh meeting on Tuesday, September 20th, 2016 with 11 members and 9 guests in attendance.

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

I. Chair kicked off the meeting with introductions.

II. Minutes from the May 2016 meeting circulated and approved without comment.

III. Chair presented the status of the writing and review assignments as indicated in the status table in the agenda. The only remaining section is a write up on Pumped Storage.

a. Dale Finney completed the section on synchronization.

b. Derrick Haas complete the Negative Sequence section.

c. Ryan Carlson completed the section on Inadvertent Energization.

d. Pumped storage discussion. There was a discussion on whether this section was needed or a simple summary would suffice. It was agreed that since pumped storage works like a hydro facility during black start operation, it would be grouped with hydro.

e. Out of Step Review. Will English had reviewed the section and didn't have any technical comments. He noted that it didn't seem to flow within the overall paper framework and some editing would be required for continuity.

f. Frequency protection review. Joe Uchiyama reported that they disable frequency protection on house supply and generation units during plant black start. Joe will continue reviewing the section and return comments to the Chair.

g. Other discussion i. A question was asked about application of battery storage to black start. It was determined that since this was not a widespread practice, it would be considered out of scope for this paper. This application will be mentioned in the report as outside the scope.

IV. Next Steps and Assignments a. Synchronization. Nate Klingerman volunteered to review the section

b. Negative Sequence. Haisnan Ashrafi volunteered to review the section.

c. Inadvertent Energization. Wayne Hartmann volunteered to review the section.

d. Excitation. Dale Fredrickson will review the section.

e. Chair asked reviewers to return their comments as soon as possible so that he can begin the stylistic editing of the paper for final review by the next Working Group meeting (January 2017, New Orleans)

V. Adjourn – Meeting adjourned at 2:04pm.

#### **J-15: Investigation of the Criteria for the Transfer of Motor Buses**

Chair: Wayne Hartmann

Vice Chair: Joseph Valenzuela  
Established: 2015 (1/15)  
Output: Report  
Status: 6th Meeting (160920)

*Assignment:*

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

*Activity:*

1. The WG met September 15, 2015 with 12 members and 11 guests.
2. Chair reviewed history and purpose of WG, including the focus of reviews, presentations and questions to effect the assignment. Also reviewed were new protocols for meeting order and etiquette.
3. Nate Klingerman reviewed "Handbook of Electrical Motors" and provided a report on the origins of 1.33 V/Hz as a metric.
4. Derek Haas reviewed "The Effects of Reclosing on Industrial Plants". It uses torque to look at the transfer using assumed shaft/coupling criteria to obtain airgap torque. Airgap torque of less than 6 times of the nominal rating (torque ratio of 6) should qualify as successful transfer criteria.
5. Dr. Murty Yalla to present derivation of the torque ratio metric and 36 additional live field results of motor bus transfers and use of the torque ratio metric. This is the subject of a peer reviewed future IEEE PCIC paper.

*Assignments:*

1. Derek Haas to write a summary of his review of "The Effects of Reclosing on Industrial Plants" for the Report.
2. Nate Klingerman to write a summary of his review of "Handbook of Electrical Motors" for the Report.
3. Dale Finney to engage in single motor MBT modeling of:
  - a. Residual Transfers using IEEE 2012 inertial brackets and phase angles of 0, 30, 60.....330 degrees to see airgap torque ratio trends (assume motor loaded to nameplate). Intent is to see how observations from live transfers and modeling correlate.
  - b. Fast and In-Phase Transfers using IEEE 2012 inertial brackets, phase angles of 0, 30, 60.....-330 degrees and loadings of 1.0, 0.75, 0.5, 0.25 and 0 pu to see airgap torque ratio trends. Intent is to see how observations of the airgap torque ratio live from transfers and modeling correlate.
4. Chair to start integration of accomplished literature review assignments and field result observations into a first draft of Report.
5. Chair to contact Dennis Tierney about monitoring one of his powerplants for the WG's analysis of synchronous and residual transfers.
6. Assignments 1-3 are to be reported to the Chair by December 15, 2016, for exploration at the January 2017 Meeting.

*Next Meeting:*

Single session; projector, 30 people

**JTF1: Impact of Renewables on Synchronous Generators**

**CHAIR:** Normann Fischer

**VICE CHAIR:** (*Acting Dale Finney*)

**SCOPE OF THE TASK FORCE:**

Penetration of renewable energy *resource* and the impact on synchronous generator protection (*Scope is still pending*)

**OVERVIEW:**

The meeting was attended by 12 members and 31 guests:

The emphasis of the meeting was to define the exact scope of the working group. The group agreed that Mike Jensen (PG&E) and Keith Houser (Dominion) would put together a list of issues that are pertinent to them and their utility and forward these to the chair and from these and input from other members the scope of the working group will be drafted by the chairman and presented to the members of the WG for approval at the next meeting!

**REQUIREMENTS FOR NEXT MEETING:**

Room for approximately 50 people and a projector

**JTF2: Assessing Generator Voltage Protection for NERC PRC-024 Attachment 2**

Chair: Manish Das

The JTF2: Assessing Generator Voltage Protection for NERC PRC-024 Attachment 2 task force met for the third time on Tuesday with 35 participants.

The Chair presented the responses obtained from NERC's Rich Bauer on the specific questions on Attachment 2 evaluations that the task force had created after the May meeting in Denver. Several follow-up questions and discussions took place. Rich emphasized that any active protection should be set primarily to protect the generator based on its capability and if this results in the Voltage and Frequency setting falling within the no-trip zone, then this is acceptable with adequate documentation of equipment limitations, as stated in the standard.

Rich has offered to get the NERC PRC-024 Audit Worksheet (RSAW) updated by January 1, 2017 to include specific items discussed in this meeting to assist the Auditors. These include Notating specifically that the timeline of the Attachment 2 curve ends at 4 seconds.

An example evaluation showing how to translate the POI voltages to the generator terminal voltage, using the 0.95 power factor (same as what's used in the PRC-024 clarification section).

Specific nature and format of the documentation (including settings sheet, capability curves) expected to be provided by the owners during Audit

In addition, Rich has offered to set up trainings for NERC Auditors on what to look for when conducting a PRC-024 Audit, as well as scheduling compliance webinars to tell the industry what the Auditors will be looking for.

Rich briefly explained the process of PRC standard revision. A Standard Authorization Request (SAR) is created if recommended after a periodic review every 5 years or sooner if necessary.

It was decided to continue to the ongoing effort from PSRC with the objective to providing input to NERC to trigger the SAR process for revising PRC-024 to add the items of clarification from this task force, to eliminate or clarify verbiages that appear to be contradictory, as well as add an example evaluation.

The next meeting will be in January, for which a single session with space for 40 people and a computer projector is requested.

Liason Reports: J needs a liason for IAS I&CPS motor protection issues

New Business:

Nate Klingerman and Will English are J SC members

WG16 – PC37.101 Guide for Generator Ground Protection revision. WG Chair Klingerman, VC Thakur

WG17 – PC37.102 Guide for AC Generator Protection revision. WG Chair Das, VC Kobet

Discussions on a JTF for C37.106 and Motor Protection Tutorial will be continued in January

JTF2 Assessing Generator Voltage Protection for PRC-024 Attachment 2 is disbanded

J6 Protection Issues Related to Pumped Storage Generation is disbanded.

**K: SUBSTATION PROTECTION SUBCOMMITTEE**

**Chair: Don Lukach**

**Vice Chair: Bruce Pickett**

**Scope: Evaluate and report on methods used in protective relaying of substations and the consumer or independent power producer, associated equipment and performance of these protective systems. Develop and maintain relaying standards which relate to this equipment and the utility-consumer interface.**

The K-Subcommittee met on Sept 21, 2016 in Cincinnati, OH, with 20 of 28 members and 28 guests in attendance. A quorum was achieved. Don Lukach requested a motion to approve the May 2016 subcommittee meeting minutes. Steve Conrad made the motion, Adi Mulwarman seconded. Vote was unanimous to approve. Don indicated that the previous working group chairman assignments to update their PES rosters was completed on time.

**Reports from the WG Chairs**

**K1 PC 37.245 GUIDE FOR THE APPLICATION OF PROTECTIVE RELAYING FOR PHASE SHIFTING TRANSFORMERS.**

**Chair: Lubomir Sevov**

**Vice Chair: Brandon Davies**

**Established: Jan. 2012**

**Output: PC37.245 Guide for the Application of Protective Relaying for Phase Shifting Transformers**

**Draft 6.2a**

**Expected Completion Date: Dec.2018**

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

The K1 working group met in a single session. 10 members and 5 guests were present. After the introduction, a call for quorum was made, quorum was achieved. A motion was made by Mike Thompson and seconded by Randy Crellin to approve the minutes of the last meeting, and the motion was approved.

Current draft of the document is 6.2a The draft for the next meeting will be 6.3a.

The IEEE Patent disclosure slides were presented. One letter of assurance has previously been received from a patent holder. This letter has been transmitted to IEEE.

The following was discussed:

- The need for more detail on hot spot temperature monitoring was discussed. Location of the currents used for conventional hot spot and the use of fiber optic winding temperature sensors was reviewed. The group also discussed what to do with the hot spot information, alarm, monitor, adjust taps? Steve Conrad will reach out to Gary Hoffman regarding hot spot monitoring of PSTs to review section 11.4.
- Demetrios Tziouvaras reviewed slides for his ongoing work on his contribution for distance protection of PSTs.
- The group discussed the contribution from Zoran Gajic regarding the use of reversing switch on the delta winding. The group agreed the guide should focus on the more typical arrangements and refer to Zoran's paper if needed.

**New Assignments:**

- Mike Thompson to review the inconsistencies in the formulas for Equivalent MVA from section 7 and the one in section 11.5.2.2.3.

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

Conflict Avoidance: none noted

## **K5     C37.119 IEEE Guide for Breaker Failure Protection of Power Circuit Breakers**

**Chairman: Roger Whittaker**

**Vice Chair: Adi Mulawarman**

**Established: 2011**

**Output: Revised C37.119-2005 – IEEE Guide for Breaker Failure Protection of Power Circuit Breakers**

**Approved and published as C37.119-2016**

Workgroup Assignment: To start on summary paper.

1. Introductions/ Sign up sheet/Patent slides/ Quorum

WG is actually done. So patent slide and quorum no longer needed for K5. This is the last WG K5 meeting.

Roger will ask K5 to be disbanded at the sub comm meeting and a new K23 to be formed to complete the summary paper.

22 people attended the meeting. (if K5 member count needed, it will be on the attendance list).

Roger acknowledged and obtained a certificate of appreciation for Mike J Thompson for his outstanding contributions to the WG

Don L. explained for paper before presented we need WG to approve, then SubComm K need to approve.

2. Approve Denver minutes

Not done.

3. C37.119-2016 is published.

4. Discuss summary paper progress

- Abstract and Overview: Roger Whittaker (we worked on this at this meeting)
- Tutorial of Remote backup and basic BFR scheme: Adi Mulawarman (submitted)
- Control circuit separation: Roger Whittaker
- Retrip and false initiation avoidance: Jeff Barsch (submitted)
- Minimum current scheme: Claire Patti
- Generator breaker failure: Michael Thompson
- Breaker failure to close: Rich Young (submitted)
- Column Ground, breaker differential, and tandem breaker scheme: Phil Tatro (submitted)
- Communications, settings, testing: Alla Deronja (submitted)

5. Discuss conference paper procedures/schedules

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

6. Other discussions :

Format of paper. Someone suggested TX A&M Relay conference has guideline but not mandating IEEE Paper format.

Roger will look for IEEE Paper format and that is how this WG will proceed.

We discussed the abstract and overview, and contributions.

Single Session, room for 25

Conflict Avoidance: none noted

## **K10:   SCC21 DISTRIBUTED RESOURCES STANDARD COORDINATION**

**Chair: R. Ben Kazimier**

**Vice Chair: TBA**

**Established, 1999**

**Output: Standard through the SCC 21**

**Assignment: To interface with SCC21/P1547 in order to reduce unnecessary delays by getting PSRC input into the process without having to wait for after-the-fact coordination.**

K10 met on Tuesday 9-20-16. There were 4 members and 6 guests present.

The working group reviewed the current 1547 timeline and draft release schedule. The current 1547 goal is to start the balloting process by Dec. 2016. Draft 6 which is anticipated to be the final draft prior to having a ballot ready draft, is scheduled to be ready for review and comments by the middle of October.



We covered the topic of how to get K10 input back to the 1547 leadership and if it was acceptable to release draft documents to K10. Directly after the meeting Mark confirmed that draft 6 will be sent to the K10 membership for review and comments with the endorsement of the 1547 leadership. It was previously agreed that Ben and Mark would take comments from the K10 membership and submit them as necessary to the 1547 group.

The next 1547 meeting will be hosted by ComEd, Oct. 25-28 in Oakbrook, IL. Registration for the meeting is located at the following address: <http://www.cvent.com/d/pvqkcm>.

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

Conflict Avoidance: We request that conflicts be avoided between K10, I27, and I25 working groups.

#### **K11: Open Phase Detection for Nuclear Generating Stations**

**Chair: Charlie Sufana**

**Vice Chair: M. Urbina**

**Output: Report**

**Draft 6.4**

*Assignment:* Write a report to the K Subcommittee entitled Methods for Analyzing and Detecting an Open Phase Condition of a Power Circuit to a Nuclear Plant Station Service or Startup Transformer. Introductions were done after a welcome by Chairman Charlie Sufana. There were 9 members and 17 guests in attendance for the September 20, 2016 meeting. Quorum was met.

The minutes from the May 10, 2016 K11 meeting were read and approved.

Mike Urbina provided a brief update on NEI. NEI is going to have a meeting the first week of October in Washington, DC that will include a webinar.

Charlie very briefly discussed the report and discussed some of the email traffic.

The working group then listened to Mike Mustafa of Entergy and Mike McAnelly of PCS2000 give a presentation on a system that PCS2000 has installed at various Entergy stations. Mike Mustafa led off with a review of a paper he wrote reviewing various open phase condition detection options and briefly discussed the PCS2000 method. Mike McAnelly then gave a more in-depth introduction to the PCS2000 system. The PCS2000 Solutions OPD system monitors transformer primary current on each phase and neutral bushing from as low as 10% of no load excitation current up to full load current and fault conditions. The setup uses conventional looking CTs that use a different core type to allow for lower current levels to be detected. Mike and Mike indicated that they will provide a section that can be added to the report.

The working group then reviewed some of Wayne Johnson's comments. Wayne questioned whether a paragraph at the end of clause 3 (1.4 in Wayne's reorganized version) Security and Dependability Concerns was needed. The working group decided it could be removed.

Wayne had also suggested reorganizing parts of the report to provide for a better flow. The working group decided that it was acceptable. Charlie indicated that he will clean up Wayne's latest version and add in what Mike Mustafa and Mike McAnelly are going to send.

An editorial group consisting of Mike Urbana, Mark Schroeder, and Matt Black will do a review of the document before the final working group vote. Once the working group has voted and any issues cleaned up, then the report will be sent to the K Subcommittee by December 1, 2016, for their consideration to allow the report to be posted to the PSRC webpage.

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

Conflict Avoidance- none noted

#### **K12 P1032 Guide for Protecting Transmission Static Var Compensators.**

**Chair: Satish Samineni**

**Vice Chair: Martin Best**

**Established: May 2013**

**Output: Guide for Protecting Transmission Static Var Compensators**

**Expected Completion Date: December 2016**

**Draft 13.0**

**Assignment: To work jointly with Substations WG I9 to write a guide for protecting transmission static var compensators. PSRC WG K12 will provide guidance and review on topics that are already covered in other IEEE guides to prevent overlap and identify areas where interpretation of existing guides is necessary to meet the specific application challenges unique to transmissions static var compensators.**

PSRC K12 had a meeting on Tuesday, September 20, 2016. Martin Best chaired the meeting in Satish's absence. K12 had 3 members and 3 guests present. A quorum was not met, so the May meeting minutes will be approved via e-mail.

Section 7.2 on high voltage bus protection as edited by the I9 working group was reviewed, as well as Section 7.4 on medium voltage bus protection.

The I9 working group is up to Draft 13.0 of the Guide. The following sections are still outstanding:

Section 7.1 to Roger Whittaker

Section 7.3 to Mike Thompson

Outstanding assignments are needed by the end of October.

A general discussion ensued on PSRC rules governing joint work between PSRC working groups and other working groups in PES. Don Lukach will check on the issue.

Martin and Satish will reach out to Joe Warner of Substation WG I9 to identify any additional information outstanding and to establish a time table for submitting it.

The next K12 meeting will be in January, 2017 and will be held jointly with Substation WG I9. This is typically an all-day session.

Minutes by Martin Best

Single Session for 30, PC Projector.

Conflict Avoidance: none noted

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

**Chair: Ilia Voloh**

**Vice Chair: Luis Polanco**

**Established: September 2013**

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

**Draft 1.8**

1. WG met on Tuesday, September 20<sup>th</sup>, 2016 with 3 members and 9 guests.
2. WG Vice-Chair Luis Polanco was not able to attend.
3. IEEE Patent slides were introduced.
4. We didn't have quorum to approve September Meeting Minutes. Will be done via e-mail
5. Review of Prior Assignments:
  - o Ilia Voloh had an action item to contact bank manufacturers to learn standard practice to set unbalance protection setting. He got partial response from ABB and waiting for response from GE
  - o Luis Polanco was not able to complete section about impact of the SCB on the line protection-Luis to provide his contribution within 1 month.
  - o Discussion on the unbalance protection section-Dean recommended to clearly indicate ratio Iunb/Iload in the text.
  - o Discussion on the 4.2.3 Impact of harmonics-group agreed that needs to be reviewed.
  - o Section 5.2.2.1 to be reviewed.
  - o Section 6.3 – inquire manufacturer about applicability
6. New Assignments
  - o Krish and Deepak will review section 4.2.3.
  - o Ilia Voloh will follow up on task to find from SCB manufacture about typical practice for unbalance protection levels.
  - o Luis will continue his write-up on impact of the SCB to the line protection
  - o Deepak to review and improve some parts of the section 5.3 to re-phrase and provide input comments, especially concerning "electrically isolated".
  - o Request PAR extension for another 2 years-Ilia
  - o Submit definitions to Mal Swanson-Ilia
  - o Don suggested to review guide to eliminate "shall", "suggests", "recommends" words
7. Current draft is 1.8.

Single session, room for 25 persons, PC Projector.

Conflict Avoidance: none noted

## **K15: Centralized Substation Protection and Control**

**Chair: Ratan Das**

**Vice-Chair: Mital Kanabar**

**Assignment: Write a PSRC report describing and analyzing existing and emerging technologies for centralized protection and control within a substation. Additional assignments: writing IEEE Transactions paper and a summary paper for conferences.**

The final report, summary report, and Transactions Paper have been published.

The WG did not meet at the Sept 2016 meeting. The following are updates of activities of the working group since last meeting.

1. Ratan Das and Sakis Meliopoulos presented at i-PCGRID 2016 based on the summary conference paper. Presentation was well received.
2. Ratan Das and Sakis Meliopoulos presented at the 70th Annual Georgia Tech Protective Relaying Conference based on the summary conference paper submitted. Presentation was well received.
3. Ratan Das and Mital Kanabar presented at the K-Subcommittee meeting at Denver in May.
- 4 Ratan Das presented at the IEEE PES Lehigh Valley Section meeting at Allentown in May.
5. Alex Apostolov presented at the PAC World International Conference at Ljubljana, Slovenia, in June.
6. IEEE PWRD Transactions paper has been published in the Aug 2016 issue of IEEE Transactions on Power Delivery in the special section "Frontiers of Power System Protection" as previously informed.
7. Rich Hunt presented at the PAC World Americas Conference at Raleigh in August.
8. Volunteers have submitted paper for various conferences and have been invited to present IEEE-PES meetings.
9. K15 presentation was scheduled for the January 2017 meeting - it is now moved to May 2017 meeting.
10. We will meet at the May 2017 meeting to discuss feedbacks from various presentations and on the report and, discuss the future plan.

Meeting requirements are for 25 people  
No Conflict Avoidance request.

## **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: 6**

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

The working group met with 18 members and 16 Guests on 21 September 2016, 2016, at Westin Hotel, Cincinnati Ohio. Quorum was not achieved during the meeting.

The chair displayed and reviewed the required patent information slides related to PAR activity of the WG, and provided opportunity for participants to identify patent claims.

The assignment of the WG was also reviewed / discussed.

As a requirement of standards development work all participants are required to indicate both their Company and Affiliation on the attendance sheet.

The attendance sheet was circulated to collect the required information of each participant.

Terminology review- Mark Schroeder commented on the review of terms used in the Guide. Discussion focused on the term Restricted Earth Fault. Further definition refinements will be reviewed by Claire Patti and Mark Schroeder.

Annex – Through fault duration comments from Russ Patterson were reviewed and clarifications offered. Will English will communicate with the chair of the Transformers Committee C57.109 working group to obtain additional clarification.

The chairman led discussions on submitted assignments. Discussion focused on submitted revisions/comment incorporated in Draft 5. Assignments to review selected clauses were made as listed below:

Clause 7.4.2 Magnetic inrush clause was reviewed, item b) to be removed.

Clause 7.4.3 clarifications made to heating affects.

Clause 8.2.3.3 Mike Thompson to rewrite.

Clause 8.2.9 Don Ware to review.

Clauses 8.3.2, and 8.4.3 Bruce Pickett to review.

Clause 8.4.2, Equation 16 to be reviewed by Guillermo Weyer

Reviews and assignments to be returned to chair by October 31, 2016 Meeting adjourned.

Next meeting requirements: Single session, room for 50, PC projector.

Conflict Avoidance: Avoid WG conflicts with K16 and J7

## **K17 Geomagnetic Disturbances (GMD)**

**Chair: Qun Qiu**

**Vice-Chair: Luis Polanco**

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

**Draft: 2**

1. K17 met on Tuesday September 20<sup>th</sup> with 27 participants (14 guests and 13 signed members).
2. Meeting minutes of the K17 last meeting from May 2016 in Denver, CO, was previously approved via email.
3. Chair went over previously assigned action Items (Assignments) list and also presented unassigned sections that we needed volunteers to sign in to provide contributions.
  - Review of Section 2.3.1 – M. Hilaly
  - Section 2.4.1 Electromechanical Relays – L. Polanco
  - Section 2.4.2 Static Relays – L. Polanco
  - Section 2.4.3 Micro-processor Relays – N. Fischer
  - Section 3.1 Review Susceptible Protection – Adi
  - Section 3.2 Review Settings to Prevent Misoperations – Adi
  - Section 3.3 Modify/Harden Protection System/Scheme –
  - Section 3.4 Relay Replacement –
  - Section 3.5 GIC Blocking Device Impacts on P&C – B. Davies
4. Group discussions on received contributions from members on their assignments (listed below), and some additional inputs were incorporated on their drafts at the meeting.
  - Section 1.4.2 Cap Bank Tripping
  - Section 2.2.1 Capacitor Bank Protection
  - Section 1.4.3 Transformer Protection Impacts
  - Section 2.3.2 PLC
  - Section 2.3.3 Microwave
5. Chair/vice-chair will follow up with pending assignments to make sure all previous and new assignments to be completed before the end of 2016 meeting.

For next meeting: Single session, for 30 persons, with PC Projector

Conflict Avoidance: none noted

## **K18 PC37.108, Guide for Protection of Network Transformers**

**Chair: Adi Mulawarman**

**Vice Chair: Surarat Pavavicharn**

**Established: May 2015**

**PAR Expires : December 2019**

**Draft: 2**

**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?

10 Members out of 17 members attended (no Quorum); 10 guests; total of 20 attendees

2. Approve last meeting minutes: Charlie S. – motioned, Poom - seconded

3. Status on PAR process/submittal/schedule

PAR Submitted for Approval : October 7<sup>th</sup> 2015

PAR Approved by RevCom : December 5<sup>th</sup> 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 31<sup>st</sup> 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

- The comments received from previous reaffirmation process have been separated into different Excel files and have been uploaded to the working group folder. Please go into these files and incorporate them in your review or revision.

<https://ieee-sa.imeetcentral.com/psrcktf18/folder/5770883/#folder:6721181>

- Roger Whittaker has provided us verification of the definitions in section 3 and found no issues.
- Bruce Mackie has submitted his additional updates for section 5. File uploaded to Central Desktop site.
- Ed has also asked to add microprocessor into the definition section. Roger confirmed that IEEE dictionary has no definition yet for microprocessor relay.
- Raluca sent in her assignment. Her update is also in the website.
- Poom went over her section 8 review.

6. Presentations if any if not we will have open discussions from folks that have reviewed the guide or related guide.

7. Other update : (NEW ASSIGNMENTS)

PLEASE DOWNLOAD LATEST DRAFT 2 FROM THIS LINK BELOW

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

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

- Charlie Sufana will give presentation on Annex A's (Response of network relays to system faults.)
- Adi will help Joe review Annex B
- Don L. will review section 4.
- Mike T. will review section 1
- Reminder to Charlie S. to finish review of section 10
- And to Kevin D. to finish review of section 6.
- Lubo to finish review of section 9.
- All assignments to be submitted to Chair/V-Chair by Dec. 1, 2016.
- Adi and Poom will put all the latest submission into 1 document, we will call it draft 2.
- Avoid H6, K11, K16

Adi's note to edit in the main document in section 8.

Network protectors are available in submersible enclosures for installation in underground vaults or in nonsubmersible enclosures where no possibility of flooding occurs. They are available in continuous current ratings for use with network transformers ranging from 225 kVA to 2500 kVA and for network voltages of 208Y/120 V, 480Y/277 V, or 600Y/347 V. Network protectors are designed to interrupt fault current flow to a feeder fault from the low-voltage network rated to interrupt low-voltage fault current and are designed and manufactured according to IEEE Std C57.12.44-2000.

Single Session, for 20 people, and PC Projector;

Conflict Avoidance: Request First day afternoon meeting and no conflict with K23, K16 ,K11, H6

**K19 Advisory to IEC 60255 -187-1 Functional requirement for restrained and unrestrained differential protection of motors, generators and transformers.**

**Chair: Gustavo Brunello**

**Vice Chair: Abu Bapary**

**Established: May 2015**

**Assignment: To provide an advisory function to the IEC working group**

**Meeting:** September 20<sup>th</sup>, Cincinnati, OH

The working group met with 6 members and 2 guests.

The WG reviewed the new Std draft and verified that almost all comments to the previous draft, from this WG, were addressed. Some members have additional comments to the latest draft that will be submitted to the IEC through the US National Committee and Canada. Deadline to submit comments is September 30<sup>th</sup>.

For next meeting we need a room for 20 people plus PC screen projector. Meeting may be cancelled if not new document has been circulated by the IEC.

Conflict Avoidance- none noted

**K20 Review and comment on C57.21 and C57.109**

**Chair: Jim Niemira**

**Vice Chair: Brian Boysen**

**Established: Jan, 2016**

**Expected Completion Date: May, 2016**

**Assignment: To review and provide comments on IEEE C57.21 to the IEEE C57.21 Chair.**

The working group met in Cincinnati, OH on Tuesday, September 20, 2016, 9:30 pm EDT.

There were 8 members and 1 guest. Quorum was met.

The group reviewed and discussed the comments on C57.21 and C37.109 that WG members had sent in prior to the meeting. There were only a few minor comments and these will be communicated to the C57.21 WG and to the PSRC K Subcommittee.

The group discussed and confirmed that a letter will be sent from the Chair of the K20 WG to the IEEE C57.21 WG Chair and the PSRC K Subcommittee Chair detailing the review comments from this working group. This letter will identify review comments that are applicable to IEEE C57.21. The group also provided comments to IEEE C37.109 which will also be included in this letter so that they will be documented for consideration when that standard is next up for revision.

During the meeting review comments were reviewed and accepted by the group. This included identifying which comments apply to IEEE C57.21 and which apply to IEEE C37.109.

K20 WG Chair Jim Niemira will compose a letter to document and communicate the review comments to the necessary parties. He will send the draft letter to all working group members for their approval. Once the letter approved by working group members, it will be sent to the IEEE C57.21 Chair and PSRC K Subcommittee Chair with copy to the PSRC K Subcommittee Vice Chair. This will be done by e-mail correspondence and should be completed prior to the next PSRC meeting in January 2017 JTCM. The letter may be posted to the PSRC website by the K Subcommittee for future reference.

The Working Group approved a motion submitted by Mike Higginson and seconded by Brian Boysen that the Working Group does not need to meet again because the remaining work will be completed by correspondence and recommending that the WG be disbanded once the work is completed.

**Assignments:**

Jim Niemira will compose a letter to compile the C57.21 and C37.109 review comments and send the letter to the K20 WG members for their review and approval prior to sending to the C57.21 WG Chair and PSRC K Subcommittee Chair and Vice Chair.

**Members present:**

Jim Niemira (Chair)	S&C Electric Co.
Brian Boysen (Vice Chair)	WE-Energies
Bruce Pickett	ECF Consultants
Hillman Ladner	Southern Company
Jim van de Ligt	CANA High Voltage
Michael Higginson	S&C Electric Co.
Pat Carroll	WE-Energies
Steve Conrad	PNM

Minutes by Brian Boysen and Jim Niemira – 9/21/2016  
 Single Session, room for 15, Computer Projection  
 Conflict Avoidance- none noted

**KTF21 C37.112 Standard Inverse-Time Characteristic Equations for Overcurrent Relays.**

**Chair: Randy Crellin**

**Vice Chair: Michael Thompson**

**Established: May, 2016**

**Output: Recommendation to K subcommittee**

**Draft NA**

**Expected Completion Date: September, 2016**

**Assignment: To investigate options for the future of IEEE Standard C37.112 which is due to expire in 2018 and make a recommendation to the K subcommittee.**

The K Task Force 21 met for the first time on May 11, 2016. 10 attendees agreed to become members and 3 were guests. The chair opened the meeting with a discussion of the task force assignment. Introductions were made.

This standard is due to expire in 2018. It was originally written in 1996 and reaffirmed in 2008. This standard is fairly popular with hundreds of downloads. The choices presented to the task force were as follows:

1. Let the standard expire.
2. Form a balloting body with no or minor edits and ballot and recirculate to renew the standard.
3. Contact IEC and suggest joint development of a dual logo standard.
4. Adopt the existing IEC 60255-151 standard as an IEEE standard.

Eric Udren and Murty Yalla represented IEC to the task force. They indicated that the IEC had included the standard curves when they created their standard. So, if we let the IEEE standard expire, the information would live on. But, IEEE would not be able to maintain it.

The two options for working with the IEC are summarized as follows:

Joint development of a dual logo standard would require IEC and IEEE to form working groups and work in a coordinated fashion to develop and maintain the standard. The existing IEC standard has a much broader scope and is about 4 times larger than the IEEE standard.

If IEEE were to adopt the IEC standard, they would be able to sell it and use it. They would be able to add an informative annex or introduction to the IEEE version. If the IEC updates the standard, the IEEE would have to readopt the new version. They would have no role in maintenance of the standard. The process would require a PAR and a ballot to approve adoption.

After discussion, the chair proposed adoption as the path to investigate. To that end, several members of the task force agreed to review the IEC standard and make sure that it adequately covers what is in the

existing C37.112 standard and prepare a summary for discussion and decision by the task force in September. Erin Spiewak of IEEE SA will request the IEC document for use by the task force.  
Room request for 20 people  
Conflict Avoidance- none indicated

**KTF22 C37.234 IEEE Guide for Protective Relay Applications to Power System Buses.**

**Chair: Abu Bapary**

**Vice Chair: Michael Thompson**

**Established: September, 2016**

**Output: Recommendation to K subcommittee**

**Draft NA**

**Expected Completion Date: September, 2016**

**Assignment: To investigate options for the future of IEEE Standard C37.234 which is due to expire in 2019 and make a recommendation to the K subcommittee.**

The K Task Force 22 met with 22 members and 6 guests. The chair opened the meeting with a discussion of the task force assignment. This standard is due to expire in 2019. It was originally written in 2009.

Introductions were made.

The vice chair described some of the history of the document and outlined the options open to the task force for discussion.

1. Let the standard expire.
2. Form a balloting body with no or minor edits and ballot to renew the standard.
3. Form a working group to update the standard and then form a balloting body to approve a revised standard.

There was much open discussion. The point was made that the standard won a PES award when it was published. The consensus is that the existing document is largely still current and up to date with technology and practices. There are a few sections that could be improved with new information available to the industry.

Bob Dempsey made a motion to request of the K subcommittee to form a working group to review and revise as necessary the current guide with the goal of completing our work and publishing a new guide before the current guide expires. Jay Anderson seconded the motion. The task force voted to approve this action.

The chair and vice chair will draft a PAR for discussion at the next meeting. They will also request source documents and set up a central desktop work area for the working group to use prior to the next meeting.

Subsequently, the K subcommittee voted to form a working group to be designated K22 with Abu Bapary serving as chair and Michael Thompson serving as Vice-Chair. All members of the KTF22 have been automatically enrolled in the roster for WG K22. The membership of the working group will be confirmed in the initial meetings.

We request a single meeting with room for 30 and a computer projector for January 2017.

Avoidance- None

**Liaison Reports:**

No liaison 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/>

**IAS Arc Flash**

**Suparat Pavavicharn**



Arc Flash reports will now be given at the Main Committee meeting. Any other IAS information pertinent to the K Subcommittee will be directed to the chairman going forward.

**Old Business:**

No Old Business was discussed.

**New Business:**

Roger Whittaker motioned to disband working group K5 and form a working group with the assignment of writing a summary paper for C37.119-2016. Motion was seconded by Don Lukach and carried unanimously. Working group is K23 with the same chairman and vice-chairman as the task force.

Randy Crellin motioned to form a working group from KTF21 with the assignment to address the revision of C37.112. Motion was seconded by Don Lukach and carried unanimously. Working group is K21 with the same chairman and vice-chairman as the task force.

Abu Bapary motioned to form a working group from KTF22 with the assignment to address the revision of C37.234. Motion was seconded by Don Lukach and carried unanimously. Working group is K22 with the same chairman and vice-chairman as the task force.

Discussion on Resiliency of Power System – Don introduced then followed by Pat Carroll. Steve Conrad suggested contacting Sandia National Laboratories in Albuquerque, NM to discuss at the May 2017 meeting.

Motion to adjourn made by Don Lukach and seconded by Roger Hedding. Motion passed unanimously.