



**POWER SYSTEM RELAYING AND CONTROL COMMITTEE  
OF THE IEEE POWER AND ENERGY SOCIETY  
MINUTES OF THE MEETING  
Jan 9-12, 2017  
New Orleans, LA  
(DRAFT 2)**

**I. Call to order/ Introductions     Prapat Mysore**

Chairman Prapat Mysore called the meeting to order at 1:30 pm

All attendees introduced themselves. A quorum check was delayed until more members joined the meeting and it was verified that the quorum was met. Main Committee Attendance sheet was routed.

**II. Approval of Minutes & Financial Report     Murty Yalla**

Motion to approve Minutes of the Sept 2016 meeting in Cincinnati, OH was moved by Fred Friend, seconded by Phil Winston and the motion was approved unanimously.

The financial status of PSRC is in good standing.

**III. Chairman's Report     Prapat Mysore**  
No report.

**IV. Reports of Interest**

**A. Report from the Vice- Chair – Russ Patterson**

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

2017 PES general meeting: There were 66 conference papers and 19 transactions papers received. Conference papers are under review.

**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.
- January 2018 JTCM meeting will be in Jacksonville, FL and the January 2019 JTCM meeting will be in Garden Grove, CA.  
Details are posted on the PSRC website

## B. CIGRE B5 Activities Report – Rich Hunt

The next B5 Colloquium will be held in Auckland, New Zealand September 11<sup>th</sup>-14<sup>th</sup>, 2017.

Conference details: <http://cigreaukland2017.org.nz/>

The preferential topics for the Colloquium are:

PS1 - Challenges of design and maintenance of IEC 61850 based systems

- Interoperability on PACS level for IED, Merging Units, time synchronisation and communication networks
- Requirements facilitating IED replacements and PACS extensions
- PACS configuration management including SCL handling and IED- and switch configuration

PS2 - Protection issues in modern power systems with renewable generation and storage

- Modeling of inverter-based sources for protection and automation
- Recommendations for the short circuit response of inverter-based sources.
- Protection challenges and solutions for applications near non-conventional sources.

PS3 - The Impact on Protection and Control from Working Existing Assets Harder

- Refurbishment strategies of PAC Systems
- Series compensation
- Dynamic/flexible line rating & climatic conditions Working Groups

WG B5.14 Wide Area Protection & Control Technologies, V. Terzija, Convener, has finished its assignment, and been disbanded. The Technical Brochure has been published as TB 664, on [www.e-cigre.org](http://www.e-cigre.org).

CIGRE Grid of the Future Symposium

The Grid of the Future Symposium, sponsored by the CIGRE US National Committee (USNC) and the Electric Power Research Institute (EPRI), will be held October 22-24, 2017 in Cleveland, OH. The Call for Papers will come out in January 2017.

CIGRE 2018 General Session

The 47<sup>th</sup> CIGRE General Session will be held in Paris, France from August 26<sup>th</sup> through 31<sup>st</sup>, 2018.

The Call for Papers is already released at:

<http://www.cigre.org/content/download/70768/3250533/version/1/file/CIG-S47-CfPapers-WEB-040117.pdf>

Synopses are due June 30<sup>th</sup>, 2017.

Study Committee B5 has identified 2 Preferential Subjects for the 2018 General Session:

PS 1 / Protection under system emergency conditions

- Emergency loading, load shedding and islanding practices and experiences.
- System oscillation detection and out of step / pole slipping techniques.
- Thermal protection.

PS 2 / User experience and current practice with IEC61850 process bus

- Interoperability between merging units, stand alone and associated to NCIT, and Protection functions.
- Experience from FAT, SAT, commissioning and maintenance of process bus based equipment and functions.
- Use of process bus for metering and monitoring of HV equipment

[rich.hunt@ieee.org](mailto:rich.hunt@ieee.org)

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

**IAS October 2016 Report**

**Arc Flash – 3007.3:**

Recommended Practice for Electrical Safety in Industrial and Commercial Power Systems is being reviewed to incorporate what's new on OSHA, NFPA 70E, and international standards inputs. This will include verbiage to clarify recommendation for PPE for each arc flash classes, dc system arc flash, electrical safety management, and other recommendations aside from NFPA 70E. Completion is expected for 2018.

**Buff Book (Protection and Coordination of Industrial and Commercial Power Systems)**

The Buff Books progress is as follow:

<b>PAR</b>	<b>Proposed New Name</b>	<b>Status</b>
3004.1	Recommended Practice for the Application of Instrument Transformers in Industrial and Commercial Power Systems	Published
3004.2	Recommended Practice for the Application of Protective Relays in Industrial and Commercial Power Systems	No PAR yet but will be required. WG is being formed and will need different relay manufacturers to review the Std.
3004.3	Recommended Practice for the Application of Low-Voltage Fuses in Industrial and Commercial Power Systems	PAR extension and balloted
3004.4	Recommended Practice for the Application of Medium-Voltage Fuses in Industrial and Commercial Power Systems	Draft being reviewed and is due 2017
3004.5	Recommended Practice for the Application of Low-Voltage Circuit Breakers in Industrial and Commercial Power Systems	Published
3004.6	Recommended Practice for the Application of Ground-Fault Protection in Industrial and Commercial Power Systems	Draft being reviewed. No PAR yet but will be required.
3004.7	Recommended Practice for Conductor Protection in Industrial and Commercial Power Systems	Draft is in progress and is due 2017
3004.8	Recommended Practice for Motor Protection in Industrial and Commercial Power Systems	PAR extension and balloted.

3004.9	Recommended Practice Transformer Protection in Industrial and Commercial Power Systems	Draft is in progress and is due 2017
3004.10	Recommended Practice for Generator Protection in Industrial and Commercial Power Systems	PAR extension. Draft being reviewed by WG
3004.11	Recommended Practice for Bus and Switchgear Protection in Industrial and Commercial Power Systems	PAR extension. Draft is near complete
3004.12	Recommended Practice for Service Supply Line Protection in Industrial and Commercial Power Systems	No PAR yet but will be required.
3004.13	Recommended Practice for Overcurrent Coordination in Industrial and Commercial Power Systems	Being reviewed and is due 2017.

### Grounding & Ground fault Protection of MV Generators

WG is continuing to work on the paper “Optimum Neutral Grounding of MV Industrial/Commercial Systems with Multiple Ground Sources”. The report will be fed to the “dot” standard.

#### D. IEC Report - Eric Udren

##### IEC REPORT

E.A. Udren

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

TC 95 drives IEC protection system standards – electrical and physical environment type testing, design, safety, and functional behavior. Technical work is carried out by Maintenance Teams (MTs) and by Working Groups led by Convenors. Dr. Murty Yalla of PSRC is Chair of TC 95 (internationally). TC 95 has a new Secretary, Thierry Bardou of France (Schneider), a colleague of long-serving Secretary Serge Volut who is retiring.

TC 95 held its Plenary Meeting in Paris on October 21, 2016; this was preceded by co-located meetings of Maintenance Team MT4 October 17-20 to work on the standards projects whose status is updated below.

- IEC 60255-181: *Functional requirements for frequency protection* – Comments from US & others on CD1 were used to develop CD2, expected shortly.
- IEC 60255-187-1: *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – 2<sup>nd</sup> CD is in preparation.
- IEC 60255-187-2: *Functional requirements for busbar differential protection* – First WG meeting will be in early 2017. PSRCC support WG should be planned in SC K.
- IEC 60255-187-3: *Functional requirements for biased (percentage) differential relays for transmission lines* – new convener will start work in 2017. PSRCC WG D34 had met to discuss unofficial draft in September 2016.
- IEC 60255-1 Ed. 1: A draft of CD is nearing completion. The existing document and new drafts should be reviewed at PSRCC, in SC I, to identify gaps. The revision project asks if we test adequately for influences from Smart Grid devices (electronic power converters/inverters/conditioners/controls).

- A new TC 95 AHWG convened by Mr. Lietoff of France will document how sampled values per TC 38 IEC 61869-9 impact functional standards of MT 4. System behavior under various failure and problem scenarios will likely require standardization.

Next TC 95 MT meetings are planned in Tokyo, April 2-7. MT 4 will be meeting during April 5-7, MT1, MT2, MT3 will meet April 2-3 at the same venue.

TC 95 is revisiting other base requirements that PSRCC should monitor to provide US input as drafts are developed. Nothing is available yet on which to comment:

- 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 requirements of the European Low Voltage Directive on protection of people and animals from all risks.

### **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**

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

RevCom = Revision of existing standard

NesCom = New Standard

### **Revision to Existing Standards Completed**

- none

### **PAR for revising existing standards or creation of new standards Approved**

- none

### **Standards due for 10 year review**

#### **Ballot Activity:**

See the spreadsheet below.

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

- P60255-181-1
- PC37.237
- PC37.241
- PC37.246
- PC37.248

### **PARS expiring at the end of 2016**

PC37.237	Extension filed. Approved. New PAR expire 2017. In Comment resolution.
PC37.241	Extension filed. Approved. N PAR expire 2017. In Ballot.

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

**Red** may require extension because it will expire this year.

Yellow will expire at the end of the following year.

PAR No.	Pr	Title	Approval Date	PAR Expiration	Invitation	Ballot Close	Status
P60255-11	Revi	PE/ Measuring relays and protection equipment - This s	14-Jun-13	12/31/2017	10/28/2016	12/2/2016	Sponsor Ballot: Comment Resolution
PC37.237	New PE/	Standard Requirements for Time Tags Creat	5-Dec-2012	12/31/2017	2/20/2016	5/16/2016	Sponsor Ballot: Comment Resolution
PC37.238	Revi: PE/	Standard Profile for Use of IEEE 1588 Precisor	5-Dec-2015	12/31/2017	7/2/2014	8/18/2016	RevCom Agenda 06-Dec-2016
PC37.241	New PE/	Guide for Application of Optical Instrument T	25-Mar-10	12/31/2017	10/27/2016	1/15/2017	Sponsor Ballot: Ballot
PC37.246	New PE/	Guide for Protection Systems of Transmission	10-May-13	12/31/2017	1/5/2017		Sponsor Ballot: PreBallot
PC37.247	New PE/	Standard for Phasor Data Concentrators for P	23-Aug-13	12/31/2017			WG Draft Development
PC37.248	New PE/	Guide for Common Format for Naming Intellig	3-Sep-2015	12/31/2017	2/4/2017		Sponsor Ballot: Invitation
PC57.13.1	Revi: PE/	Guide for Field Testing of Relaying Current	11-Dec-13	12/31/2017			WG Draft Development
PC37.230	Revi: PE/	Guide for Protective Relay Applications to Dis	27-Mar-14	12/31/2018			WG Draft Development
PC37.245	New PE/	Guide for the Application of Protective Relays	8-Jun-2012	12/31/2018			WG Draft Development
PC37.249	New PE/	Guide for Categorizing Security Needs for Pro	24-Jun-14	12/31/2018			WG Draft Development
PC37.250	New PE/	Guide for Engineering, Implementation, and I	27-Mar-14	12/31/2018			WG Draft Development
PC37.91	Revi: PE/	Guide for Protecting Power Transformers	27-Mar-14	12/31/2018			WG Draft Development
PC37.94	Revi: PE/	Standard for N Times 64 Kilobit Per Second O	12-Jun-14	12/31/2018			RevCom Agenda 22-Mar-2017
PC37.108	Revi: PE/	Guide for the Protection of Secondary Netwo	5-Dec-2015	12/31/2019			WG Draft Development
PC37.110	Revi: PE/	Guide for the Application of Current Transfor	11-Jun-15	12/31/2019			WG Draft Development
PC37.116	Revi: PE/	Guide for Protective Relay Application to Trar	11-Dec-13	12/31/2019			WG Draft Development
PC37.233	Revi: PE/	Guide for Power System Protection Testing	5-Dec-2015	12/31/2019			WG Draft Development
PC37.235	Revi: PE/	Guide for the Application of Rogowski Coils	11-Jun-15	12/31/2019			WG Draft Development
PC37.242	Revi: PE/	Guide for Synchronization, Calibration, Testin	26-Oct-15	12/31/2019			WG Draft Development

### **PARS expiring beyond 2018**

*See the above spreadsheet*

Additional notes (same from fall 2016 report):

Three standards are coming under PSRC. All are going under Subcommittee H.

1. IEEE 1646, no active PAR, the std expires in 2018. Subcommittee H has started a Task Force to work on this new standard.
2. P2030.100, active PAR exp 2017, comment resolution.
3. P2030.101, active PAR exp 2016 but has submitted PAR extension for 1 year, comment resolution.

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

Meeting schedule

- Jan 30, 2017
- May 4, 2017
- Sep 7, 2017

Deadlines for submittal to RevCom or NesCom

- Feb 10, 2017
- March 24, 2017
- May 5, 2017
- July 28, 2017
- Oct 16, 2017

### **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**

### **1. NERC and IEEE have signed a Memorandum of Understanding to:**

- Encourage communication between the two organizations;
- Promote shared knowledge of the standards development activities of each organization; and
- Facilitate liaisons between each other's technical groups and other cooperation where possible

Joint Operating Committee – Kickoff meeting on January 20, 2017.

New pre-qualifying process for organizations to provide or assist in development of Compliance Guidance for NERC Standards. PES or possibly Committees such as PSRC could become qualified Structure under discussion.

### **2. Single Point of Failure (FERC Order 754)**

- Moved into Standards development
- Modifications to be made to Standard TPL-001-4
- SAR finalized 6/30/2016
- Drafting team nominations closed 8/5/2016
- First drafting team meeting held December 6-8, 2016 at NERC HQ
- Finalized Standards Authorization Request (SAR)
- Discussed proposed revisions to TPL-001
- Scheduled next meeting for February 21-24, 2017 at Arizona Public Service Company

### **3. System Protection Coordination (Phase 1)**

- PRC-027-1 – Coordination of Protection Systems for Performance During Faults
- Replaces R3 and R4 from PRC-001-1.1(ii) concerning coordination of Protection Systems
- Approved by NERC BOT November 2015
- Filed with FERC on 9/2/2016
- System Protection Coordination (Phase 2)
- Addressing Requirements R1, R2, R5, R6 of PRC-001-1.1(ii)
- PER-006-1 – Specific Training for Personnel
- Filed with FERC 9/2/2016
- FERC-approval of PRC-027 and PER-006 retires PRC-001-1.1(ii)

### **4. Protection Systems Phase 3: Remedial Action Schemes (RAS)**

- Replacing existing RAS-related standards - PRC-012, PRC-
- 013, PRC-014, PRC-015, PRC-016 and revises SPS definition
- PRC 012-2 – Remedial Action Schemes

- Stakeholders approved PRC-012-2 and revised definition of SPS
- Posted for final ballot in late April 2016
- Approved the NERC Board of Trustees May 5, 2016
- Filed with FERC on 8/5/2016

#### **5. Standards Applicability for Dispersed Power Producing Resources**

- Collaborating with IEEE PSRC Standard 1547 Distributed Generation (resources) – Generally connected at distribution level voltages
- Dispersed Power Producing Resources – aggregated small-scale resource technologies such as: wind, solar, fuel cells, flywheels, geothermal, energy storage, & micro-turbines
- Launched a Distributed Energy Resources Task Force (DERTF) in association with the activity on Essential Reliability Services
- Atlanta workshop August 2-3, 2016

#### **6. Modification of PRC-025-1 Generator Relay Loadability**

- SAR comment period 9/16/2016 – 10/18/2016
- Additional SAR drafting team members solicited 12/6/2016 – 12/19/2016
- Standards Committee will appoint new members in early 2017

#### **7. 61850 Emerging Technology Round Table**

- November 15, 2016 8:30am -4:30pm
- Overview of IEC 61850
- Building the business case for automation
- Describing the Architecture of IEC 61850 and Generic Object
- Oriented Substation Event (Goose) Messaging
- Security and CIP compliance considerations during deployment
- Roundtable discussion, Industry and Vendor Experiences
- Closing and Next Steps

### **V. ADVISORY COMMITTEE REPORTS**

**Chair: Pratap Mysore**

**Vice Chair: Russ Patterson**

#### **B1: Awards and Technical Paper Recognition**

#### **B1 WG Awards and Technical Paper Recognition Working Group**

**Chair: Hugo Monterrubio**

**Vice Chair: Mal Swanson**

#### **September 2016 Meeting Minutes:**

The B1 Working Group met on Monday January 9, 2017 in New Orleans with 5 members and 2 guests. The group approved the May 2016 meeting minutes.



The following items were discussed during this meeting:

- The working group welcomed two new members Bruce Mackie Vice Chair of the (D) Line Protection SC and Bruce Pickett Vice Chair of the (K) Substation Protection SC.
- In benefit of the new members the group reviewed the different types of PSRC, PES, SA and IEEE awards and recognitions that we seek to nominate PSRC members for throughout the year. We also discussed the operational calendar which will allow the group to focus each meeting to discuss the specific types of awards to meet the corresponding nomination deadlines.
- The WG would like to expand the reach of our PSRC individual awards and recognitions beyond the ones given to chairs and VC's to include other active PSRC members that consistently go above and beyond in their contributions for the PSRC and our Industry. For this purpose the WG would be requesting the PSRC officers and SC Chairs to request and forward nominations for individuals with a brief description of the member contributions so the WG can discuss and if approved issue the corresponding PSRC award or recognition.
- The IEEE PES Awards Chair Vahid Madani was present at our meeting and gave a short presentation about the different IEEE PES level awards some of which closely apply to the work produced by the PSRC. He would like to see a more active PSRC nomination activity towards those awards. The WG will work to promote and request candidates in an effort to nominate individual PSRC members for some of these PES General Awards. A short presentation will be made during the MCM to share this information with the main committee and request nominations.

The WG discussed and selected nominees for the following individual awards and recognitions.

These awards will be issued in the May main committee meeting in Albuquerque:

- a. PSRC Career Service Award
- b. PSRC Distinguished Service Award

The following awards were announced/issued during the January PSRC Main Committee Meeting on 1/12/17

- a. 2017 IEEE Herman Halperin Electric Transmission and Distribution Award (Awarded Monday 1/9/17 by the IEEE during the opening reception of the JTCM Meeting)
  - George Dorwart Rockefeller
- b. IEEE Fellows Class of 2017 (Announcement only)
  - William Dickerson - For leadership in precision clock and synchrophasor technologies
  - Xinzhou Dong - For contributions to traveling wave-based transmission line protection and fault location
  - Veselin Skendzic - For contributions to technologies and standardization in power system protection
- c. PSRC 2016 Outstanding Technical Report
  - WG I12 Quality Assurance for Protection and Control Design
  - Andre Uribe (Chair), Malcolm J. Swanson (Vice Chair)
  - Members:

Brian Boysen Catherine Dalton Don Ware Duane Buchanan, PE Ed McHale Eddie Powell	George Moskos Glenn Durie, PE Hugo Monterrubio Jose Rodriguez Kevin Donahoe, PE Michael J.Wright, PE Phil Zinck, P.Eng	Ray Young Vajira Pathirana, PE, PHD Wayne Hartmann Gordie Halt Nathan Klingerman Eric Monson
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d. PSRC 2016 Outstanding Standard or Guide

- WG D27 Guide for the Application of Digital Line Current Differential Protective Relays Using Digital Communications C37.243

Solveig Ward (Chair), Bruce Mackie (Vice Chair)

- Members:

Philip Beaumont Fernando Calero Randall Crellin Alla Deronja Bill Higinbotham Robert Ince Ilija Jankovic Ljubomir Kojovic Alex Lee	Don Lukach Aaron Martin Roy Moxley Nagpal Mukesh Craig Palmer Vajira Pathirana Joe Perez David Purpura Ryland Revelle	Sam Sambasivan Mark Schroeder Mike Stojak Ian Tualla Demetrios Tziouvaras Joe Uchiyama Jun Verzosa Ilija Voloh Don Ware
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e. PSRC 2016 Prize Paper Award

- WG K15 Centralized Substation Protection and Control

Ratan Das (Chair), Mital Kanabar (Vice Chair)

Members:

Mark Adamiak Alex Apostolov Galina Antonova Sukumar Brahma Mohammad Dadash Zadeh Rich Hunt Jack Jester Mladen Kezunovic	Mike Kockott Ljubomir Kojovic Raluca Lascu Yuan Liao Yuri Luskind Vahid Madani A.P. (Sakis) Meliopoulos Rene Midence	Paul Myrda Anderson Oliveira Joshua Park Craig Preuss Qun Qiu Mohindar Sachdev Ilija Voloh Joe Xavier
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f. New Main Committee Members

- **Tom Dahlin**
- **Michael Dood**
- **Randy Hamilton**
- **Keith Houser**
- **Hugo Monterrubio**
- **Claire Patti**
- **Daniel Reckerd**
- **Chris Ruckman**
- **Andre Uribe**

g. PSRC Outgoing Subcommittee Chair Awards

- **Jim O'Brien**  
Outgoing C System Protection SC Chairman 2016
- **Gary Kobet**

Outgoing D Line Protection SC Chairman 2016

h. PSRC 2016 Distinguished Service Award

- **Mike McDonald**  
Outgoing PSRC Committee Chairman 2015-2016

**B3: Membership Activity Report**

**Chair: M. Swanson**

**Vice-chair: Cathy Dalton**

No information available.

**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: Roger Hedding**

No information available.

**B9: PSRC Web Site**

**Chair: Russ Patterson**

No report.

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

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

1. The following motion was moved by Don Lukash (K SC Chair): "Mr. Chair, the Substation Protection Subcommittee, K, requests approval for the transmittal of PC37.116, IEEE Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks, to the IEEE SA for balloting, contingent upon final draft 1.9 approval of the K13 Working Group". The motion was seconded by Roger Hedding and it was approved unanimously.
2. The following motion was moved by Don Lukash (K SC Chair): "Mr. Chair, the Substation Protection Subcommittee, K, requests approval for the transmittal of C37.112, Standard Inverse-Time Characteristic Equations for Overcurrent Relays, to the IEEE SA for balloting, contingent upon PAR approval expected at the NESCOM

March 23, 2017 meeting”. The motion was seconded by Mike Thompson and it was approved unanimously.

## VII. SUBCOMMITTEE REPORTS

### C. SYSTEM PROTECTION SUBCOMMITTEE

**Chair: G. Henneberg**

**Vice-Chair: F. Friend**

#### **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 January 11 in New Orleans, LA in conjunction with the IEEE JTCM. The participants introduced themselves, a quorum was achieved (26 of 37 members and 57 guests), and the September 2016 minutes were approved.

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

- 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 and must return it at the end of the working group meeting.
- Send your WG documents to Russ Paterson for posting to the PSRC web site
- Looking for Main committee presentations for May and September (C2 is ready for May)
- Consider turning WG reports into transactions papers; PSRC has not been submitting many transactions papers.
  - Gene will send out a link to the PSRC O&P and P&P manuals to the WG chairs and vice chairs.
  - 268 attendees at PSRC this time, near a record, with 9 new attendees

#### **Working Group Reports**

The minutes of the Working Groups are attached.

The final report of the C2 WG (Role of Protective Relaying in the Smart Grid) will be issued to the C subcommittee members in the next few days after resolving the comments received during the subcommittee ballot (>75% returned with 96% affirmative). There was discussion about forming a task force to determine if a transactions paper should be created (and include the work from H2).

WG C18 (C37.246 Guide for Protection Systems of Transmission to Generation Interconnections) did not meet. The balloting body was formed with about 100 registered participants. There has been some difficulty in getting the ballot sent out, but it should be forthcoming. The working group is planning to conduct webex meetings to resolve any ballot comments.

CTF32 (Protection Practices for the Interconnection of Solar Generating Facilities to the Utility Transmission Systems) was approved to become a working group (WG C32). There assignment is to “Generate a report for the PSRC that addresses protection challenges and

practices for the interconnection of inverter based generation to utility transmission systems.” It was suggested they collaborate with C20 (Impact of VSC HVDC Transmission on AC Protective Relaying).

There was a caution from Phil Winston: Care should be taken in using NERC documents as an outline/ roadmap for our reports/ guides.

### **Old Business**

There was no old business.

### **New Business**

Gustavo Brunello soliciting input on IEC Standard 181 from IEEE draft next week, comments due middle of March. The request will come from Eric Udren to circulate among the C subcommittee.

### **General Discussion**

There was no general discussion

### **Working Group/Task Force Reports:**

#### **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.

The meeting was attended by 8 members and 28 guests.

The report was distributed to the subcommittee and approved by more than 75% but many excellent comments were received and are being incorporated.

Balloted draft of the document was reviewed and changes made in the meeting. There are a few more changes to be made to address those received. These are expected to be completed by the end of February. The report will then be submitted to the committee for approval.

Next meeting requirements: single session for 30 attendees with computer projector.

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

**Chair:** Alla Deronja (aderonja@atcllc.com)

**Vice Chair:** Keith Houser (keith.houser@dom.com)

**Output:** IEEE Guide PC37.246

**Draft:**

**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 did not meet as the guide is ready to ballot.

Next meeting requirements: single session for 35 attendees with computer projector.

Please avoid conflict with C25 working group meeting.

**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.

Attendees: 4 members, 4 corresponding members & 2 guests attended.

- Patent/IP related IEEE slides were shown  
We had a quorum. However, previous meeting minutes had already been approved electronically.
- WG C19 PAR, Assignment, Purpose, and Scope were presented
- The WG's task status was presented.
  - The PAR expires at the end of this year, and at this stage, an extension looks likely. It should be applied for well before October 15th this year, so there is time enough, and two meetings to go to assess the situation.
  - The project duration and the web meeting / teleconference frequency and schedule.
  - Function description has been completed in December 2015
  - Performance requirements are almost complete. One item needs resolution, was addressed in this meeting (included below).
  - An outline for the testing section has been completed, and the section is under work currently.
- Discussion items follow:
- How should the standard address loss of time synchronization at the PDC, in the following situation?
  - The PDC has been using absolute wait time.
  - On losing synch, its own clock will begin to drift
  - PMUs are sending good data, with good time stamps
  - Eventually, the PDC will start rejecting data, because of its own clock drifting off.
- After a considerable discussion, the meeting reached the following conclusion:
  - The PDC should be required to specify how long its own clock would maintain satisfactory synchronization

- The PDC should switch to relative wait times, after a user settable time period.
- Users should set this based on their knowledge of the quality / characteristics of the PDC's local clock.
  
- If the PDC local clock is disciplined, and synchronized to GPS regularly, the user may allow a time period before the switch over.
- If the PDC local clock is not disciplined, or not synchronized to GPS, the switchover should be immediate.
- The PDC should never resort to "sort by arrival" in such a situation.
- When the PDC regains synchronization, the only requirement for switching back to it is that there should be no data loss.
- A question was raised – whether the PDC should inform the user that relative wait time is being used. At present, there is no mechanism in the 118.2 standard to do this. Besides, this is not going to cause any performance hit, as the receivers will continue to receive data at a similar latency. The PDC should log this event in its event log.
- Leap second handling
  - How should a PDC deal with leap seconds? After a discussion, the meeting reached the following conclusion:
  - The PDC should have a setting for the next leap second occurrence.
  - It should expect PMUs to follow the leap second inclusion and indication rules.
  - Problem PMUs are to be dealt with in the following fashion
    - PMUs including the extra second, but no indication
      - Data should be included in time alignment, as though the PMU has included the leap second indication.
  - PMUs not obeying the leap second
    - Timestamps from such PMUs will be forever off by 1 second. Data from such PMUs may be included as "sort by arrival".
    - The "sort by arrival" inclusion should be a user setting, in case some users prefer to have such data rejected.
    - Such PMUs may fix the timestamp error at a later time. In such cases, their data should be included normally.
    - The 118 related annex should include these items in the "sort by arrival" section.
    - The annex should also include a need for time stamp critical applications to reject such data.
    - Usually, the magnitude values may be right, but the angle values may be off in such cases. However, this is not a certainty.
- PMU clock errors
  - In such cases, a PDC is not in a position to do anything other than report what it sees in the PMU data.

Next meeting requirements: single session for 25 attendees with computer projector.

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

**Chair:** Joe Mooney

**Vice Chair:** Ian Tualla

**Output:** PSRC Report

**Draft:** 1

**Expected Completion Date:** December 2017

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

The Working Group met Tuesday afternoon with 35 attendees; 11 members and 24 guests.

The Working Group [WG] Chair gave background information since there was a lot of new guests and the WG reviewed the current report Draft. WG chair suggested moving section "DC breakers" to section "HVDC response to AC System Faults." WG chair will contact author of "DC breakers" section and see if there are any issues with this. WG Chair mentioned that he was aware of a new project off the coast of the New England area that will use Wind Turbines offshore and transport power using VSC HVDC systems. It was noted that two writing assignments remained outstanding [Brian Johnson and Norman Fischer] and that the Chair remained active seeking those assignments. Several guests asked to receive a copy of the current report, and was willing to offer comments, as well. WG Chair stated that the current Draft will be sent to guests and WG members via email. The Chair & Vice-Chair stressed that our goal remains to have the WG report draft completed by the end of 2017.

Next meeting requirements: single session for 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, January 10, 2017 in New Orleans, LA in a single session chaired by Yi Hu and Gene Henneberg with 9 members, and 4 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).

A quorum was not established with the number of members attending the meeting. Yi and Gene will be reviewing the membership list for active members.

To meet the development plan of this guide, the target date to produce a draft Guide ready for WG approval is still May 2017, our upcoming meeting.

The editing team (Hu, Henneberg, Miller, Deronja, Johnson, Patel, Whittaker) had a two editing conference call sessions since the September 2016 meeting. The present draft has separated the original SIPS flow chart produced by Alfredo de la Quintana into separate sections.

Yi asked that the next editing effort for the team will have everyone on the editing team to review the entire document, rather than individual sections.

The main part of the meeting discussion was a review of these SIPS flow chart figures, including how and where to incorporate them into the document. There was a fairly extended discussion of the proposed section 5.2.3 representation and where that discussion section should fitput. The conclusion was that this material is really part of the output from the Planning SIPS conceptual design study function (not intended to be described in detail in this



guide). However, this material does need to be covered at a level to make clear what the output of that process needs to be to provide the appropriate clarity for input to the conceptual Engineering process.

Yi Hu will edit create a clean version of the draft Guide to include the edits /changes as discussed at this meeting. The editing team will review / edit / comment the new draft and have additional web meetings to finalize the draft prior to to prepare for the May 2017 meeting to prepare for WG vote of the draft at the May meeting.

Next meeting requirements: single session for 20 attendees with computer projector.

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

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

**Vice Chair:** Allen Goldstein

**Output:** Ongoing Liaison

**Draft:** N/A

**Completion:** Ongoing Liaison

**Assignment:**

The ongoing task force will provide three main functions:

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

**Meeting Agenda**

1. Introductions
2. Meeting Minute Approved via email ballot prior to meeting.
3. NASPI Update
  - a. NASPI Meeting in Seattle, October 19-20,
  - b. NASPI Technical Workshop - Model Verification Tools
4. Next NASPI Meeting: SAVE the date! March 22-23, 2017 - NASPI Work Group meeting in Gaithersburg, MD
5. IEEE Workgroup Activity

	Title	Status
<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>PSCC P8</b>	Development of standard Mapping between C37.118.2 and IEC61850	In Progress
<b>PSRC H40</b>	Recommended Practice for Databases used in SAS	In Progress
<b>IEEE SCASC</b>	Synchrophasor Measurement Conformity Assessment Steering Committee	Revising TSS
<b>IEEE SDCASC</b>	Synchrophasor Data Conformity Assessment Steering Committee	On Hold
<b>PSCC TBD</b>	C37.118.2 Revision	In Progress

6. Old Business
7. New Business
  - a. Discussion of the DOE/GPA project (currently called Advanced Synchrophasor Protocol (ASP)). There are different ways that this can be presented to PSCCC. 1) Make it part of the Revision of C37.118.2 revision work group 2) start a new work group or task force. Tony will ask PSCCC to create a task force to study the ASP project and report back to PSCCC.
  - b. Discussion of the scope of work in the .2 protocol. Do we try to make it work for higher volumes or look towards another protocol for PDC to PDC communications and keep .2 constrained to PMU to PDC comms.
  - c. Tony will contact Teresa Carlon on behalf of the three members of the NASPI Leadership Team and see if some time (20 minutes?) can be given to a presentation of ASP.
  - d. Need to update the C23 status with the new names from the PSCCC working groups.
  - e. During the HTF36 report out to PSCCC, a request will be made to form a working group to revise C37.118.2.
8. Adjourn

Attendance: 8 Members, 8 guests.

Next meeting requirements: single session for 25 attendees with 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 September 2016 meeting
3. Discussion of WG survey and updates on responses

- a. GE
- b. PSCAD Model - University of Manitoba/Manitoba HVDC Research Center
4. Discussion of the report outline and assignments
5. Adjourn

The meeting started with introductions and then the September 2016 minutes were approved.

It was announced that the material of the WG has been 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 an internal draft report describing the short-circuit behavior of GE WTGs has been issued, but still requires further internal review before the information is made public. The information will eventually be published in a GE white paper. GE has agreed to contribute to the WG report.
- An updated 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 report was updated to include simulation results for unbalanced faults, as was discussed in the previous meeting. The content of the report was further discussed during the meeting. The report will be further studied to understand the results. It was suggested by the WG to simulate faults in additional locations of the test system and compare the results. It was suggested to check whether crowbar is activated for the Type III WTG. Finally, it was suggested to compare the PSCAD Type IV results with the model provided by Siemens.

Finally, a draft outline of the final report was presented and discussed. Writing assignments were made for the sections of the report. The target date for the first write-ups by the contributors was set to April 1.

There were total 31 attendees in the meeting, 14 members and 17 guests.

Next meeting requirements: single session for 30 attendees with computer projector.

Please avoid conflict with C25 working group meeting.

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

**Chair:** *Martin Best*

**Vice Chair:** Keith Houser

**Output:** PSRC Report

**Draft:** 3.1

**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 New Orleans, LA on Wednesday, January 11, 2017 at 08:00 AM with 8 members and 8 guests. The Vice-chair conducted the meeting. Copies of the agenda, September 21, 2016 meeting minutes and Draft 3.1 of the Report were reviewed by the Working Group members and guests.

After introductions, the September 21, 2016 meeting minutes were cited for comment, additions or corrections; two corrections were identified and made. The Vice-chair called for a motion to approve the corrected meeting minutes. Brian Boysen made a motion to vote for approval of the minutes; Raluca Lascu provided a second to the motion. The WG approved the corrected C25 Meeting Minutes from the September 21, 2016 meeting in Cincinnati, OH.

The Vice-chair reviewed the assignment with the working group. The WG members requested that to the extent possible, C-25 meetings should be scheduled to avoid conflicts with C-30 and K-16 in addition to those identified previously. After a review of the agenda, a review of the latest received writing assignment additions to the document (draft 3.1) began at section 3.1.2 Voltage and Frequency Protection and Coordination. During the review of section 3.1.2.1, it was noted that the text currently states: "The collector circuits and substation may not require specific under/overvoltage relaying since the wind plant relaying and control functions are designed to keep voltages within acceptable limits." After considerable discussion, it was decided that: a) a reference to back-up relaying or relay functions (somewhere) would be prudent, should a control failure occur; b) this section should be expanded to be more comprehensive (what is being protected and why); and c) consider what needs to be coordinated, if anything, [PRC-19]. It was also noted that the individual paragraph content should to be decided with respect to the context of the whole report.

During the review of section 3.1.2.2, Temporary Overvoltage, it was suggested that the citing of numerous other industry references might add greatly to our report. Also, the discussion asked whether PRC-019 and PRC-024 compliance was relevant to this section.

Discussion of the content of section 3.1.2.3 - Frequency suggested that similar to section 3.1.2.1, an expansion of this material to greater depth will be required.

Section 3.1.3, Arc Flash Protection has not yet been assigned. The Vice-chair has taken an Action Item to contact Jacob Lien to see if he would agree to take on this writing assignment. Al Powers volunteered to assist whoever is assigned this topic.

Section 3.1.4, Removal of WTGs and Static VAR Devices from Collector Feeders Under Fault also needs assignment. The Vice-chair will work with the Chair to provide more direction on the intended content of his section which will be assigned in May 2017.

During the review of section 3.2, Grounding Transformer Protection, it was discussed that this section needs to be geared to both the application of the Ground Banks on the collector feeder circuits and the application of Ground Banks on the collector bus (where a wye-delta transmission voltage-medium voltage transformer connection is used). The Vice-chair will expand this section to cover those two specific applications.

Section 3.4 [including, 3.4.1 and 3.4.2] on Main Transformer Protection has been assigned to Duane Buchanan.

Section 3.6 was reviewed and discussed. It was agreed that all of the information was developed in significant detail. The information may be re-segmented slightly to better align with the index headings (which may also be slightly adjusted to better fit what was already thoroughly developed. Section 3.6.1, Typical Communications Assisted Protection Schemes will be renamed: Typical Communications Assisted [Pilot] Protection Schemes.

All these new writing assignments will be due back to the Chair/Vice-chair by mid-April [Monday, April 17, 2017].

Next meeting requirements: single session for 30 attendees with computer projector.

Please avoid conflict with C18, C24, C30, and K16 working group meetings.

Meeting Adjourned @ 09:18 EDT.

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

**Chair:** Don Ware

**Vice Chair:** Matt Black

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

**Draft:** 2.1

**Established:** January 2016

**Completion:** November 2019

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

The C26 working group, chaired by Don Ware, met on Tuesday, Sept 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

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

Please avoid conflict with K16, I2, I25 and I29 working group meetings.

### **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:** 20170110

**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.

28 attendees, 9/13 members, 0 Contributing members. We had a quorum.

- 1) Introductions,

2) Patent Slides

3) Document review:

Since we had a quorum, we were able to look at the draft document changes proposed by Ken Martin and his task force. Detailed review, revision and acceptance many of the changes took place. The majority of the session was spent accepting changes from the beginning of the document up to about the middle of section 6. Details of the meeting are captured in changes and comments embedded in the document.

There is another version of the document with additional changes, and these we will be merged together and sent out to the working group.

Document revision number is incremented to 20170110.

4) Next meetings: The working group agreed to commence online monthly meetings. A doodle poll will be sent out to the entire email list (members, contributing members and all guest who have attended meetings since working group inception) to determine the best day of the month and time to hold a recurring meeting.

5) Adjourn.

Next meeting requirements: single session for 30 attendees with computer projector.

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

**Chair:** Heather Malson

**Vice Chair:** Mike Kockott

**Output:** PSRC Report

**Draft:** 0

**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 at 9:30 with 15 members and 18 guests for a total of 33 people.

NOTES:

- At the start of the meeting, it was noted by a show of hands that several people were first time attendees. In addition to a review of the September meeting minutes and assignments, a detailed discussion of the scope (Mike's PPT) with significant Q&A followed.
- Materials (J5 material) and outline to be emailed in a week. Volunteers for assignments requested and first draft date will be indicated via email.
- Possible related data sources? asking utilities for OOS testing data, EPRI, NERC data related from PRC 026 as a source of blocking testing?
- Definitions: RTDS so as not to confuse similar vendor RTS
- Yuchen Lu wants to be a member vice guest
- Email all from May to see if someone knows what Transient testing means in the outline

## **Original Agenda:**

1. Introductions/ Sign-up sheet
2. Review the writing assignments from the Sept 2016 meeting
3. Review the work done at the May 2016 meeting (draft of report outline) following the already assigned writing assignment chapters
4. Based on (3), assign the next writing assignments due for the May 2017 meeting
5. Open discussion (new items for consideration)
6. Other business
7. Adjourn

Next meeting requirements: single session for 45 attendees with computer projector.

Please avoid conflict with J5 & D29 working group meetings.

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

**Chair:** Michael Higginson

**Vice Chair:** Fred Friend

**Output:** PSRC Report

**Draft:** 0

**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 27 members and 17 guests, including 10 new members.

The Chair opened the meeting with introductions, review of the iMeetCentral web site, and approval of the previous minutes.

The definition and assignment were reviewed with discussion surrounding the scope. The working group agreed to add descriptions of AC Microgrid, DC Microgrid, and Hybrid Microgrid, and clearly indicate that the scope of our report includes only AC Microgrids.

The working group reviewed the outline to determine where the protection issues for inverter based microgrids should be covered. Additionally, the working group discussed the need for covering islanding initiation and protection of the interconnected system at the POCC, including the possibility of multiple connections points.

The working group contributions were reviewed with the following comments:

- Modes of Operational Protection (Wayne Hartmann)
- Discussion on the need to cover when only inverters are in the microgrid with and without batteries (no rotating machines) for the feeder protection.
- Reviewers were assigned to further sections as follows:
- Challenges of Microgrid Protection – Mani Venkata/ Athula Rajapakse
- Communications – Derek Haas/ Mike Kockott
- Customized logic to detect system fault conditions – Eric Udren/ Matt Black/ Mike Kockott
- Methods for adapting settings – Amin Zamani/ Masoud Barati/ Alex Apostolov
- Microgrid protective design considerations – Alex Apostolov/ Prem Kumar / Cat Wong



- Resynchronization - Wayne Hartmann/ Scott Short
- Impacts of microgrid control strategy on protection – Mani Venkata will take to 2030.7 WG/ Jim O'Brien/ Chan Wong

The reviewing assignments are due by end of March. Reviewed assignments will be merged and compiled before the next meeting.

Next meeting requirements: single session for 50 attendees with computer projector.

### **CTF-31: Redundancy Requirements for System Protection Redundancy**

**Chair:** Solveig Ward

**Vice Chair:** TBD

**Output:** TBD

**Draft:** 0

**Established:** January 2017

**Expected Completion Date:** TBD

#### **Assignment**

Provide a recommendation to the C subcommittee to form/not form a working group for development of a guide for power system protection redundancy

**Scope:** TBD

Task Force CTF31 met on Wednesday, January 11, 2017 at 11:00am CST in a single session with 40 people attending.

After introductions, the TF Chair provided background information and the group reviewed related reference material such as:

- PSRC report WG I19, 2010
- NERC SPCTF 2009
- NERC TPL-001-4 as applicable to protective relaying
- Utility practices
  - Contingency considerations
- C16 PSRC Report Relay Scheme Design Using Microprocessor Relays, 2014

In addition, the group identified the following documents that may be relevant:

- NERC Directory 1 (2016)
- Ancillary functions K5
- NPPC directory 4

The consensus of the group was that a guide would be of interest to the industry and development of such a guide could be accomplished. 24 of the attendants indicated interest in becoming members of a working group.

However, the C subcommittee Chair suggested that we meet in May, still as a Task Force in order to define the scope for the guide. The tentative title for the guide was discussed and resulted in "Protection System Redundancy for Power System Reliability."

No assignments were made at the meeting but the Chair encouraged potential members to review the above listed material (to be distributed by the Chair) before the May meeting.

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

## **CTF-32: Protection Practices for interconnecting solar or other inverter based generation to utility transmission systems**

**Chair:** James Deaton

**Vice Chair:** Mukesh Nagpal

**Output:** PSRC Report

**Draft:** 0

**Established:** January 2017

**Expected Completion Date:** TBD

### **Assignment**

Evaluate the interest in forming a working group with the assignment to generate a report on protection practices for the interconnection of solar generating facilities (and other inverter based generation) to utility transmission systems.

The first meeting of the task force was held on Tuesday, January 10 at 1:30 with 59 individuals present.

The following items were discussed:

1. The task force assignment was reviewed in view of comments that were expressed during the C subcommittee meeting (September, 2016) when this TF was approved. The following comments were discussed and resolved:
  - a. Should the report focus on solar only or all inverter based generation? Consensus of TF is to include all inverter based generation.
  - b. Should report address transmission only or transmission and distribution interconnections? Consensus of TF is to consider only transmission interconnections.
2. A list of possible topics for the report was developed and reviewed. The potential for overlap with C37.246 was noted and effort will be made not to duplicate content with C37.246 and other documents.
3. TF discussed whether there is sufficient content not covered in other documents to generate a useful report. The group was polled and 15-20 individuals indicated interest in actively contributing to this report.
4. It was decided to request C subcommittee to form a WG with the following assignment: *"Generate a report that addresses protection challenges and practices for the interconnection of inverter based generation to utility transmission systems."*

Next meeting requirements: single session for 50 attendees with computer projector.

Please avoid conflict with C20 working group meeting.

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

**Chair:** K.V. Zimmerman

**Vice Chair:** B.D. Mackie

The Subcommittee meeting was called to order on Wednesday, January 11, 2017 with 27 members and 27 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (27 out of 44 members present). Five new members were added to the subcommittee. The new members are Jorg Blumschein, Rick Gamble, Nathan Gulczynski, Mike Kockott, and Chris Walker.

Minutes from the September 2016 meeting in Cincinnati 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 :1.16**

**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 New Orleans, LA on Tuesday, January 10, 2017, 1:30 pm CST.

There were 17 members and 21 guests. The attendance list is attached.

Don Lukach motioned to approve the September meeting minutes and Mike Meisinger seconded. Motion carried.

Mike Meisinger motioned to approve the November meeting minutes and Joe Mooney seconded. Motion carried.

The patent slides were presented.

Working group discussed outstanding comments and sections:

- New section - 4.2.1 High-impedance faults was reviewed and will be added to the draft for technical review by Pat, Bruce, and Greg.
  - o References to safety, specific manufacturers, and HIZ
- Added a reference to PSRC report Cold Load Pickup Issues to section 7.6.
  - o We may need to modify the format of the reference per SA standards
- New section – 8.3.4 Load Restoration was reviewed and will be added to the draft
- Discussed Don’s comment on section 5.1.3 bus configurations. Don and Greg will work to streamline this section.

### **Assignments:**

The following new assignments were made:

- Review and revise 4.2.1 section on High-impedance faults – Pat Carroll, Bruce Mackie, and Greg Ryan.
- Streamline section 5.1.3 Bus configuration and remove information already contained in C37.234 Guide for Protective Relay Application to Power System Buses – Don Lukach and Greg Ryan.
- Harmonize use of microprocessor, digital, and numerical within sections – Claire Patti
- Clean up communications section 8.7 to incorporated Randy’s previously submitted comments – Brian Boysen

The following assignments are outstanding:

- 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 March 1st. iMeet Central updates are preferred.**

<https://ieee-sa.imeetcentral.com/login>

### **Old Business:**

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.

D29 WG met in single session on January 11 in New Orleans, LA with 14 members (4 new) and 22 guests.

Kevin W. Jones chaired the meeting in the absence of Normann Fischer. Gene Henneberg took meeting minutes.

Following introductions and review of the September 2016 minutes, Kevin outlined that the primary direction for the WG for 2017 will be to concentrate on writing assignments.

Various report sections have assigned writers without material submitted yet. Several other sections are written, but need additional reviewers. There were several new volunteers for review of the various written sections of the report draft.

- PSB vs OST section: Gene Henneberg and Arman Vakili
- Arc Impedance and Relay Reaches: Kevin W. Jones (new material)
- OST Methods / Philosophy: Jurgen Holbach and Mohammed Zadeh
- Loadability: Phil Tatro
- ABB RELAY Characteristics: Lifeng Yang (new material)

Kevin discussed some of his recent work on three-phase arc resistance calculations. It is important for the inner OOS blinder to be set sufficiently outside of the arc resistance boundary.

For the next meeting, D29 will need a room for 40 and an overhead projector.

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

**Chair:** Karl Zimmerman

**Vice-Chair:** Ted Warren

**Established:** Jan 2014

**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 New Orleans on January 10, 2017 with 15 members and 10 guests.

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

The WG reviewed the outline. Several sections of the tutorial have been received and a few have not been submitted, but we have asked those authors to submit them immediately. We will move forward with reviewing the document, and have asked for comments by April 15.

Jorg Blumschein gave a short presentation of a fault on a line with an underground cable where the overreaching Zone 2 failed to operate. Simulations indicated a change in the zero-sequence compensation setting would have improved dependability.

Randy Crellin reported on some events he has reviewed on a Peterson coil grounded subtransmission system in Minnesota. Joe Mooney provided a reference for distance element performance for impedance grounded systems.

The latest draft has been posted to the PSRC website.

We plan on meeting in May in a single session for 30 attendees with a projector.

**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 did not meet. Their assignment is complete and recommend disbanding the working group. The sub-committee approved this recommendation and the working group is disbanded

**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 New Orleans. Due to difficulty in working with CIGRE on this issue and the creation of a new working group, Luis Polanco motioned this working group be disbanded. The subcommittee approved this motion and the working group has been disbanded.

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

**CHAIRMAN: Normann Fischer**

**VICE CHAIR: Joe Mooney**

D34 did not meet in New Orleans and has no minutes to report.

**D35: Evaluation of Transmission Line Pilot Protection Schemes**

**Chair: Rick Gamble**

**Vice Chair: Nathan Gulczynski**

**Established: January 2017**

**Output: Technical report to the Line Protection Subcommittee**

**Assignment: Prepare a technical report to the line protection subcommittee to evaluate advantages and disadvantages of common transmission line pilot protection schemes, including POTT, DCB, DCUB, and line current differential. The schemes will be evaluated in terms of speed, sensitivity, dependability and security based on the design and configuration of transmission lines and system topology. A limited number of example systems will be evaluated.**

**Expected Completion date:**

**Draft: 0**

Working Group D35 met on Tuesday, January 10th, 2017 at 8:00am in a single session with 14 members and 11 guests.

After introductions, the assignment was reviewed and discussed. Step distance schemes were removed from the assignment to focus solely on pilot protection schemes. It was noted there is no need to discuss the justification for pilot protection because there is a PSRC report that discusses this topic – “Justifying Pilot Protection on Transmission Lines”.

Discussed several possible analysis methods – fault tree, table, and scoring system. The general consensus was to the keep the evaluation system simple – use advantage/disadvantage instead of 1-10 point scale.

The idea was proposed to cover the sample systems within the advantages and disadvantages of each scheme. For example state a disadvantage of DCUB is increased scheme complexity for three terminal lines. Also state an advantage of DCB is simplified scheme complexity for three terminal lines. While there was agreement this is a reasonable approach there was no firm decision to move in this direction.

An outline was developed for the report and the writing assignments are shown below. Note that all members are encouraged to provide their perspective of advantages and disadvantages for each of the schemes.

Meeting requirements for the May meeting – single session for 40 with projector.

**Action Items:**

Writing assignments  
Introduction – Rick Gamble  
Description of schemes mentioned in assignment – Ted Warren  
Description of comm paths – Jeff Brown/Addis Kifle  
Description of topologies – Alla Deronja  
Analysis method (advantage/disadvantage) - All

## **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, January 11, with 13 members and 2 guests.

Ian Tualla made a motion to approve the September 2016 meeting minutes, and Gustavo Brunello seconded the motion. The WG approved the September minutes with no changes.

Seven members of the working group who had not attended two consecutive meetings were moved to be corresponding members, thus bringing the working group total to 17 members.

The WG discussed Draft 1 of the paper with comments that had been received to date. A number of editorial changes were made. Some more significant changes that will be made to Draft 1 are the following:

- Additional references will be added to the end of the document.
- Section A, Communications, will be expanded to include more details.
- Section B, Redundancy and Backup Considerations, will be shortened because it was appreciably longer than other sections in the paper.
- The impedances shown in Figure 3 will be defined in the text.

Jeff Barsch made a motion to submit Draft 2 of the paper to the D Subcommittee for review and approval. Joe Mooney seconded the motion. All 13 WG members in attendance approved the motion contingent upon all the editorial changes and the other changes discussed in the meeting be made.

### **Action items:**

- Jeff to submit Draft 2 to the WG by COB on January 18, 2017.
- WG is to review Draft 2 by COB on January 25, 2017 and provide any editorial comments to Jeff and Don.
- Jeff will work with Karl Zimmerman to submit the paper to the D Subcommittee, preferably by the end of January, so that comments can be received well in advance of the May meeting.
- Jeff and Don to work on presentation slides. These will be sent to the WG prior to the May meeting.
- Jeff to register for the 2017 MIPSYCON and WPRC conferences.

The May 2017 meeting will require a single session, computer projector, and a room for 30 attendees.

## **DTF37: Investigate the Need for WG for Effect of Series Compensation on Line Protection**

**Chair: Mike Kockott**

The Task Force DTF37 met in New Orleans on 10 January, 2017 with 19 attendees, of which 10 indicated membership interest.

After some good open discussion in which many opinions were stated supporting the need and merits for forming a Working Group, the question to form a Working Group Yes/No was posed to the attendees. This received a unanimous vote of Yes, indicating full support from all attending that a Working Group was needed to tackle the topic.

After some further discussion it was decided that the deliverable from the Working Group should be in the format of a Report, and that the proposed assignment, to the D subcommittee, for the Working Group would be as follows:

***Prepare a report on the impact of series compensation on transmission line protection***

The May 2017 meeting will require a single session, computer projector, and a room for 30 attendees.

The meeting then adjourned.

At the subcommittee meeting, the working group was approved. Mike Kockett will be the chair and Luis Polanco will be the vice-chair.

### **Coordination Reports:**

#### **T&D Committee / Distribution Subcommittee**

The next T&D Committee / Distribution Subcommittee meeting will occur during the IEEE PES General Meeting July 16 – 20, 2017 at the Sheraton Chicago Hotel & Towers, Chicago, IL.

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: Smart Distribution <http://grouper.ieee.org/groups/td/dist/da/>**

**Chair: Larry Clark**

**Vice Chair: Vacant**

**Secretary: Fred Friend**

The working group is nearly ready to go to ballot on P1854: Smart Distribution Application Guide.

**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 will begin as soon as the working group ballot comments are resolved.

**Task Force: Volt-VAR Control**

**Chair: Larry Conrad**

**Vice Chair: Mike Simms**

**Secretary: John Sell**

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

**Working Group: Switching & Overcurrent Protection**

<http://grouper.ieee.org/groups/td/dist/sop/>

**Chair: Fred Friend**

**Vice Chair: Casey Thompson,**

**Secretary: Joe Viglietta**

Continue working on the "Guide for Reliability Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment", P1806 with the plan to go to ballot by the end 2017.

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

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

**Old Business**

None

**New Business**

Request was made for future presentations at the Main Committee meeting. In addition, a request was made to create a webinar. The vice-chair will attempt to create one from the Summary Paper of C37.243.

The chair initiated a discussion regarding the future of the large guides and possibility of creating guides to delve deeper into portions of the guide.

**General Discussion**

None

**Line Protection operations of interest**

None

The meeting adjourned.

**H: RELAYING COMMUNICATIONS SUBCOMMITTEE**

**Chair: Eric Allen**

**Vice Chair: Galina Antonova**

The Subcommittee met on January 11, 2017 with 32 out of 42 members, comprising a quorum. 27 guests were also present. Minutes of the Sept 2016 meeting were approved without objection.

The Chair presented new items from January Adcom Meeting

- JoinMe tool available for on-line meetings
- Training presentation on P&P/O&P procedures at May 2017 Main Committee meeting
- Standards groups are NOT to use e-mail for standards documents (including drafts)

Amir Makki made a motion for the SC to express disapproval to the Main Committee of such decisions being made without seeking feedback. The motion passed unanimously.

The following clarification was provided by IEEE-SA in respect to this matter by email:

“We don't restrict method, except that it cannot be publicly available, or available to persons/entities other than the recipient (and the recipient has to be a participant as defined in the WG P&Ps, and/or as determined by the WG Chair). In addition, it cannot be forwarded by the participant. Only the WG Chair or designee can provide the draft to a participant.

The rationale lies in a combination of SASB Bylaws, OpsMan, and rights of IEEE as copyright owner of the draft. Of course, the more secure the better but it is not against a policy to email.”

**WG business:**

WG H32 changed title of its report and requested a corresponding change of the Working Group name to “Performance Requirements for Ethernet Circuits Applied to Teleprotection”. The SC approved this change without objection.

WG H31 requested a liaison with IEC TC95.

**Old business:**

None

**New business:**

The SC approved without objection the formation of WG H41 with the assignment to "Revise IEEE standard 1646-2004 – IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation" and Dennis Holstein as chair (pending approval of PSRC officers).

The SC approved without objections the formation of WG H42 with the assignment to "Revise IEEE standard C37.93-2004 - IEEE Guide for Power System Protective Relay Applications of Audio Tones Over Voice Grade Channels" and Marc Benou as chair (pending approval of PSRC officers).

HTF43 Revision of Standard for Common Format for Event Data Exchange (COMFEDE) (Chair A. Adamiak) was disbanded.

The Chair informed the SC about the formation of a new WG in SC K to generate a recommended practice for centralized protection and control (continuation of WG K15), and invited SC H Members and Guests to participate.

**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 7 members and 11 guests, without quorum. The patent policy slides were shown, and no issues were identified.

The session was dedicated to discussing the remainder of the ballot comments. We completed reviewing the list; most are resolved by acceptance, a few still are being discussed off line. Once those are done, we will update the draft to version D0.7 and recirculate. We expect to be complete before the PAR expires.

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 11 members and 8 guests present for the January 10, 2017 meeting.

The minutes from the September 2016 meeting were reviewed and approved with no comment.

The Chair began with a review of the report's status. Charlie indicated that he had received no comments for the latest draft. He indicated that he will ask at the H6 Subcommittee meeting to have a vote of the report before putting it on the PSRC webpage.

For the next meeting a single session for 30 with a computer projector is requested.

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

**Chair: K. Martin**

**Vice Chair: A. Goldstein**

**Output: Standard**

**Established: 2006**

**Expected completion date: December 2017**

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

WG H11 met on 3 days during this meeting schedule:

Sunday, January 8, 2017, 10:00 AM - 5:00 PM

Monday, January 9, 2017, 8:00 AM - 12:00 PM (noon)

Wednesday Jan 11, 2017, 9:30 – 10:45 AM

Total attendance was 14 members and 27 guests. The 3 meetings all followed the same process: attendees introduced themselves, the patent announcements were made, and a roster was circulated. This was followed by a review of the current status:

The IEC circulation completed 25 Nov 16 with 27 comments to address. The IEEE ballot closed 02 Dec 16 with 6 negative, 56 affirmative, and 4 abstention votes. There are 84 comments to address. A preliminary review of the comments notes that the majority of comments are editorial and grammatical in nature, but that several are requesting significant changes in the draft. The IEC and IEEE comments do not appear to be odds with each other (ie, pulling in different directions), so issues carefully resolved for one group will likely be acceptable to the other group.

The IEEE public review period closed at the end of December; no comments were received under this process.

The remainder of each session was devoted to resolution of the comments and ensuing discussion. The relevant points are as follows:

- About 70 comments were resolved.
- Comment i9 which also relates to comment i81 was not resolved. The WG will attempt to create a definition that really fits and propose it to the draft.
- The WG formed a task force of Allen Goldstein, Ken Martin, and Harold Kirkham to rewrite annex C to address comments i31 & i32. This task force will complete their revision by Feb 28, 2017.
- The WG will add extended accuracy requirements for ROCOF to Annex G in response to comment i50.
- The WG will address i75 after further exploration of the question being raised.
- A. Goldstein and H. Kirkham will apply consistent font types and sizes to the formulas in the document when the other edits are completed.
- The WG discussed the first comment from the IEC response and has a partially agreed answer. The scope paragraph will be kept as is and the 'object' paragraph deleted (this paragraph was the purpose in the IEEE standard, and is not a part of the scope). Deleting this paragraph will also satisfy comment i15, M. Yalla will check that this still meets IEC requirements.

- WG members agreed to a conference call on January 18 at 11 AM eastern (8 AM pacific). I will send the web invitation. It is anticipated that we will require 3-4 web meetings to complete comment resolution.
- Several editorial comments that remain will be resolved by the chair (chief editor, at this point) and presented for approval to the WG.

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.

### **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.

Working group met on January 10, 2017. The meeting was attended by 7 members and 14 guests.

After an introduction of the attendees and a short overview of the scope, the WG discussed the current status of the document. This was followed by a discussion about the use of XML in COMTRADE. Mark will crosscheck section 4.2 about update needs due to the XML/COMTRADE work. Herb confirmed that section 4.1 does not require any update.

Discussions on the status of uses cases and the data requirements analysis for the uses cases followed.

Herb suggested that Christoph sends to the members of the working group the UML files (Enterprise Architect) for the Fault Locator use case by the end of January 2017.

The following assignments were made:

Deepak will review the complete Chapter 2 for consistency.

The following individuals will analyze the use cases to identify the data requirements and create the use case diagrams:

- 2.1 Dimitri committed to do it
- 2.2 Herb and Mark will do it
- 2.3 Alex to complete it and do the data analysis
- 2.4 Herb and Mark will do it
- 2.5 to be refined by Christoph
- 2.6 Peter will do it
- 2.7 Benton to do it with Alex
- 2.8 Herb and Alex

All missing and new contributions to be submitted to Christoph by the end of March 2017, so the document can be updated before the May 2017 meeting.

Room for 25 people and computer projector.

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

**Chair: Amir Makki**

**Chair C19: Denis Holstein**

**Vice Chair: Cesar Calix**

**Secretary: R. Cornelison**

**Output: Guide**

**Established: January 2014**

**Expected completion date: January 2018**

**Assignment:** Identify and categorize protection related data files based on content, use, and risk of disclosure or compromise. Protection related data files include but are not limited to files used for configuration, management, and analysis of protective relaying systems.

The Working Group met on time with 11 members and 11 guests present. The meeting began with a review of the PAR status. The PAR expires at the end of 2018.

The group then reviewed the consensus reached during the last meeting 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 proposed that the plan for this meeting would be to define the format for the additional sections and present an example to be used in one of the sections. The review then evolved into extensive discussions on how to best define the criteria for assessment of the security objectives. The group debated the validity of the criteria for certain applications, including the concept of “file type” vs. “application type”. Situations where “composite” assessments are needed were also discussed.

The chair proposed that member volunteers should add the two new sections to each of their assigned file type categories. Each category would then have a total of three new sections: the two newly added, and a “Risk Assessment” section that would contain the existing language. Completed assignments were requested to be submitted by April 15th, 2017. The chair also requested criteria for assessment from Chris and rules for “composite” assessment (multiple type contents requiring different assessments).

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.

H23 did not meet in January. PC37.248 is beginning the SA balloting process. A room for 20 people is requested for the May meeting.

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

**Chair: C. Chelmecki**

**Vice Chair: Bharadwaj Vasudevan**

**Output: Standard**

**Established: September 2013**

**Estimated Completion Date: September 2017**

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

The working group met with 8 members and 2 guests in attendance. Chris showed patent/copyright slides. The group then reviewed the initial draft outline.

The group discussed missing content and people that could help. The group mentioned that the SEL RTAC configuration software will export to xml. Craig sent Dave Whitehead (SEL director of technology) an email requesting assistance. It was also mentioned that IPS has an xml format. Randy Norman may be a good contact.

The group next discussed creation of schema for both verifying compliance to the standard and verifying manufacturer specific formatting is adhered to when a user loads a file. The first schema would be provided as part of the COMSET standard, the second would be provided by the manufacturer to the user.

The group discussed standardizing a hierarchy for COMSET. The concept was explained and Charlie Sufana agreed to create an initial hierarchy. An attendee asked if we should be looking at IEEE standards for naming conventions, IEEE names vs. IEC names, the use of COMDEV, etc.

Benton also suggested a section should be defined for the addition of customer extensions / conversions.

Action Items:

1. Charlie agreed to take a look at the hierarchy for the COMSET files
2. Eric and Benton to look at what standards use as reference for naming conventions to be used in COMSET files
3. Benton to give information on the xrio files implementation for customer specific information.
4. Chris will ask Herb Faulk for input in SCL namespace extensions.

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 Working Group met on Jan 10 with 5 members and 24 Guests. Chair requested members and attendees to review the draft R03 and provide comments.

The current engineering process described in part-6 of IEC 61850 standard was discussed and purpose of various system configuration (SCL) files ICD, IID, CID, SCD etc. were briefly stated. In relation to this process, comparison was drawn to traditional non-IEC 61850 engineering process. Advantages and disadvantages of IEC 61850 top down engineering process were stated with regard to system configuration, signal mapping, automated-checking, multiple tool management, data duplication, simultaneous multi-user configuration and integrity of files.

The user feedback received from utilities from NATF (North American Transmission Forum) were discussed. The utilities had primarily stated that the existing IEC 61850 configuration process is complicated, laborious and error prone which negated the cost savings and benefits from implementing IEC 61850 due to additional effort spent in configuring and managing the files.

In response to this discussion, various attendees stated that the problem does not exist in the standard but in the configuration tools. In a perfect system, the configuration tools should abstract the complexity and users should not be concerned about various SCL files. Progress has to be made by relay manufacturers and 3rd party vendor to simplify the process to end users in the configuration tools. Currently, there are no clear rules on how to simplify the configuration process in a multivendor system.

Further, the problem was attributed to the technical knowhow of IEC 61850 standard. Many end users are not aware and lack the concept of the new functionalities brought about by the standard.

Some attendees expressed that the current configuration process is not much different from DNP3 widely utilized in North America for SCADA communication. Though this is generally the case for SCADA type of communication performed with IEC 61850-MMS protocol, it was stated that complexity lies with protection configuration with GOOSE communication.

For next meeting, the group decided to:

- Discuss used cases of traditional non-IEC 61850 engineering process followed by North American utilities in order to compare with IEC 61850 process.
- Bring-in the end users experience identifying the deficiency in tools for configuration, maintenance and troubleshooting activities.

Room for 30 people and projector are needed for the May 2017 meeting.

### **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 Working Group met on Jan-11th with 6 members and 14 Guests.

The group discussed the current models of under frequency function described in IEC 61850 part 7-4 standard.

The function Start ("Str") parameter was represented using common data class (CDC) for directional element (ACD) even though directionality is immaterial for under frequency function. Group decided to retain the parameter as it as the class has the parameter to specify the directionality as "UNKNOWN".

The group decided that the CT/PT signal assignments should only be captured in Input Reference (INREF) parameter though it not widely supported by all manufacturers at this time. The group reviewed the following additional parameters that needs to be added to the model: ClcExp: Calculation Expires, Dropout level/Dropout differential/Pickup-dropout ratio, Direction Supervision, OpDITmms: Operate time setting, RsDITmms: Reset time setting, Restraint: Restraint signal and Block/Restraint, 3I0 removal.

The group decided to complete these models and send them to manufacturers for review. Members also expressed interest in establishing a common guidelines for transforming between drop level, dropout differential and pickup-dropout ratio parameters.

Alex Apostolov presented a new concept to model the overcurrent function in a hierarchical manner.

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

### **H32: Performance requirements for Ethernet circuits applied to teleprotection**

**Chair: K. Fodero**

**Vice Chair: W. McCannon**

**Output: Report**

**Established: September, 2014**

**Estimated Completion Date: 2017**

**Assignment:** Develop a report on the use of Ethernet transport for teleprotection services and line current differential protection. This report will define the channel performance requirements for Ethernet transport systems / circuits that carry pilot protection communications.

The WG met on Tuesday, with 11 members and 4 guests in attendance.

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

We have one section to be written and have an assignment assigned and due next meeting.

The changes agreed to at this meeting will be included in version 0.9 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. Our goal is to complete this report at the May 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 WG met on Tuesday, with 5 members in attendance. Draft 0.2 of the document was reviewed and the need for new features such as support for mixed-rate data (e.g. – incorporation of sequence components that are computed at a different rate than raw samples and harmonics that are an integration of many samples of data) and support for a CIM section that would enable inclusion of the power system model surrounding the source of the COMTRADE file.

For the next meeting: a single session, for 20 attendees with a projector.

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

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

**Assignment:** This guide practice covers the design, installation and monitoring of time synchronization systems in power utility substations. This includes time sources such as Global Positioning Satellite (GPS) and time distribution systems such as Inter-Range Instrumentation Group -B (IRIG-B), Network Time Protocol /Simple Network Time Protocol SNTP (NTP/SNTP), and Standard Profile for Use of IEEE Std. 1588 Precision Time Protocol in Power System Applications - IEEE STD

The WG met on Monday, with 4 members and 14 guests in attendance.

CHAIR'S REMARKS: Purpose of meeting is to discuss the open issues from the ballot resolution. Our PAR has been extended to Dec 31, 2017

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

AGENDA APPROVAL: Agenda approved.

**Review/discuss draft document:** WG had a discussion on how to handle C37.238 on whether to include the latest version even though it is not published yet. Consensus is to include this as it will be approved before we will re-ballot. The chair will approach C37.238 committee for help on updating this guide to include the new requirements. Eric Thibodeau has agreed to provide DNP information for his ballot comments. Chris Huntley has agreed to provide information for his ballot comment

**ACTION ITEMS:** Jim B will work with C23.238 WG for their support on updating the guide to include their work. Eric T will provide updated material for ballot resolution. Chris H will provide updated material ballot resolution

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

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

**Chair: R. Liposchak**

**Vice Chair:**

**Output: Guide**

**Established:**

**Expected completion date: 2017**

**Assignment:** This recommended practice outlines the necessary steps and procedures a utility should undertake to implement an IEC 61850 substation in a multi-vendor equipment environment. The document addresses equipment configuration, equipment procurement specification, documentation procedures and general design philosophy that will condense the IEC61850 standard into a practical working implementation guide. The recommended practice also defines baseline information sets and functionality for IEC 61850 devices to allow users to implement similar design philosophies between vendors of IEC 61850 equipment.

The WG met on Monday, with 4 members, 4 corresponding members and 27 guests in attendance.

The working group is in comment resolution with approximately 50 comments to resolve. Our goal is to complete comment resolution within the next two months and have a working group vote to go to re-ballot.

During our session we determined that there were no copyright issues with the tables or figures presented in the document. We also cleared up some problems that occurred in using the correct document version for comment resolution. The Chair also recognized Tim Tibbals, who has retired, for his work as a member of the working group.

For the next meeting: a single session, for 30 attendees.

**H40: Databases used in SAS**

**Chair: J. Bougie**

**Vice Chair:**

**Output: Guide**

**Established:**

**Expected completion date:**

**Assignment:** This recommended practice presents general requirements, design, and lifecycle costs versus performance for databases associated with substation automation systems. Also included are specifications for database elements that should be standardized to ensure interoperability. Example designs are included for reference purposes, which are not intended to prescribe a definitive database design. Applications utilizing databases can be very different and may have vastly different requirements.

The WG met on Monday, with 7 members and 4 guests in attendance.

CHAIR'S REMARKS: The PAR number has been updated to C37.1.2

APPROVAL OF PREVIOUS MINUTES: Minutes were approved

AGENDA APPROVAL: Agenda approved.

Review/discuss draft document: We will try to have a description of various types of databases by our May meeting. Had a discussion on the different types of storage devices. Had a discussion on database security on whether we would just discuss requirements vs specifying how to secure. It was decided to recommend requirements and work with PSCC for the actual security. Has a discussion on database communications. We will be using Control Center for all of our document storage

ACTION ITEMS: Synchrophasor Database – Galina, Real Time – Tony, IED – Peter, EMS/DMS – Craig

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

#### **HTF41: Revision of IEEE 1646 Communication Delivery Time Performance Requirements**

**TF Chair: C. Preuss**

**Vice Chair: N/A**

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

**Established Date: 2017 January**

**Completion Date: 2017 May**

HTF41 met with 11 attendees to discuss the possibility of forming a new working group to revise IEEE 1646 IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation.

After introductions and review of pre-PAR slides, the Chair reviewed the history of the standard since publication and the work to revise the standard between 2009 and 2013. That work was placed on hold until the publication of PC37.237.

In addition, the chair reviewed the scope and purpose as well as other material from the standard. This was accomplished to gauge interest in whether a new working group should be formed to revise the standard or if it should be withdrawn.

After some discussion, all in attendance agreed that revision of the standard was appropriate because the content was still valuable to industry. All in attendance agreed to support the work, which needs to start soon as the standard is expected to expire in 2018.

Assignment: Prepare a revision to the standard.

The Chair will recommend to the Subcommittee that we proceed with creating a working group. We have a volunteer for Chair, Dennis Holstein.

#### **HTF42: C37.93 Review**

**Chair: Marc Benou**

**Vice Chair: Craig Palmer**

**Output: Revision**

HTF 42 met for the first time on Monday at 3:00 with 7 people who all are interested in becoming members.

The task of the TF is to review C37.93 which is due to expire in 2020 and determine if there is interest in either revising or withdrawing the standard.

Introductions were made and an explanation of the purpose of the TF was made by the chair. There was general agreement that the standard should be revised. The members of the TF also agreed that the chair should request that the TF be made into a WG.

Craig Palmer volunteered to be the vice chair and Marc Benou agreed to chair the WG if the SC approves its formation.

Initial discussion was about revising the standard with no changes. After a short review of the existing document, the group agreed that changes are probably required in order to bring the standard up to the current realities of the industry. The largest initial issue being in Section 4, including the availability of different classes of leased phone lines.

The possible need to change the scope and introduction was also raised. There are possible conflicts and overlaps with C37.236, specifically concerning the inclusion of audio tones over digital networks. A WG would have to determine when an audio channel becomes a digital network and those sections may need to be removed. The addition of a reference to C37.236 was suggested.

In order to review C37.93 properly and the main reference document, IEEE Std 487-2015, the attendees requested electronic copies of both documents along with a copy of C37.236. The chair will attempt to get permission from IEEE to distribute the document and if permission is given, will distribute the document to the members/attendees of the January meeting.

All attendees agreed to review the document(s) and make suggestions at the next meeting in May.

It was strongly recommended to the chair to make the request at the SC meeting for users to attend the May meeting. There were no users at the meeting.

The chair will request to form a WG with the goal of revising C37.93.

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

**HTF43: Revision of C37.239 Standard on a Common Format for Event Data Exchange (COMFEDE)**

**Chair: M. Adamiak**

**Vice Chair: N/A**

**Output: Meeting Minutes**

**Completion Date: January 2017**

**Current Revision: N/A**

**Assignment:** Review the existing standard and determine whether a revision of the COMFEDE standard (C37.239) is needed

The task force meeting was held on Monday, Jan 9 with about 20 attendees. The focus of the meeting was whether changes to the COMFEDE standard were needed. The meeting started with an overview of the standard by the chairman and was followed-up by discussion as to the status of implementations and any identified needs for upgrade. Only one vendor in Montreal had implemented the standard, however, it was never commercialized. There was additional discussion about what features would be desired in the standard, however, closer inspection of the standard showed that the discussed features were already part of the standard.

The question as to whether to re-open the standard at this time was raised for a vote and there was unanimous agreement that nothing needed to be done to the standard at this time.

The recommendation from the TF is to wait until the standard is up for renewal and open a new par with the expectation of re-affirming the standard as is.

***Liaison Reports***

**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 February in Geneva, Switzerland. WG10 has currently the following projects:

1. Finalisation of Edition 2 of IEC 61850:  
All parts except part 2 (Glossary) have been published as second Edition. For part 2 a CD is in circulation.
2. Preparation of an Edition 2.1 of IEC 61850 for some of the major parts  
The Amendments for parts 6, 7-2, 7-3, 7-4 and 9-2 have been approved as CDV. Work on other parts requiring amendments is in preparation. FDIS for the amendment is expected for first quarter of 2017. The new versions will have an Annex discussing compatibility aspects with former versions.
3. 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 circulated 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.
4. Work on technical specifications for mappings between IEC 61850 and Modbus data (TS IEC 61850-80-5) – a first CD is in circulation.
5. For IEC 61850-7-6, guideline for basic application profiles, a first draft is in circulation; we are working on IEC 61850-600, guideline for function modelling in SCL for substation automation.
6. 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.
7. New work to standardize configuration of substation HMIs has been approved
8. Based on an ENTSO-E submission, WG 10 will start working on enhancing the engineering process to include as well the specification process and to include configuration of the communication network. Also, it is planned to provide means to formally specify IED requirements based on the SCL

IEC TC57 / WG17 will meet in Frankfurt, Germany in February 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 61850-7-410 and IEC 61850-7-510.
2. Communication network structures for hydro power plants

IEC TC57 / WG19 is working on a harmonized model of IEC 61850 and CIM.

### **Power System Communications and Cybersecurity Committee: C. Preuss**

Craig Preuss informed the SC that Power System Communications and Cybersecurity Committee will meet 1-4pm on Thursday January 12, 2017, and invited attendees to participate.

## **I. RELAYING PRACTICES SUBCOMMITTEE**

**Chair: B. Mugalian**

**Vice-Chair: A. Uribe**

**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, January 11<sup>th</sup>, 2017 with 24 members in attendance – a quorum was achieved.

- Introductions were held.
- Minutes of the I Subcommittee held in Cincinnati, OH on September 21<sup>st</sup>, 2016 were approved. Motion to accept the minutes by Michael Meisinger and seconded by Kevin Donahoe.
- Coordination & Advisory Committee Meetings Items of Interest
  - Future Meetings:
    - May 2017 – Albuquerque NM
    - September 2017 – Phoenix AZ
    - January 2018 – Jacksonville FL
      - January 2019 – Orange County (Garden Grove) CA
  - ***Join.me*** is available for conference calls/screen sharing – Contact Erin Spiewak and an account can be set up for the WG/TF Chair
    - Some utilities do not allow this site on their computers. Andre Uribe will follow up with Erin about this.
  - Looking for Webinars to publicize our PSRCC work products
  - Looking for presentations for the Main Committee meetings
    - Contact Andre Uribe or Brian Mugalian.
    - Contact Alex Apostolov to submit articles to Protection, Automation & Control World magazine (PACWorld) on your work products

- Working Group I11 – C37.241 Application of Optical Instrument Transformers for Protective Relaying in IEEE-SA ballot: Closes January 15, 2017, we encourage you to join the ballot body!
- For 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 or 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 is ready and will be issued January 2017
  - 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
  - iMeet Central (formerly Central Desktop) is to be used for IEEE Guide/Recommended Practice/Standard documents with a PAR
  - Subcommittee Chair/Vice-Chair will hold progress report conference calls with each WG and TF Chair/Vice-Chair in **late March 2017**
  - Task Force Proposal Submission Form – two received and will be reviewed at the September 2017 meeting contingent on release of members of other working groups that have completed their work

## **Reports from the Working Group Chairs**

### **I2: Terminology Review Working Group**

**Chair: M. Swanson**

**Vice Chair: F. Friend**

**Output: Definitions for IEEE Definition Database (formerly IEEE Std. 100)**

**Expected Completion Date: No expiration date**

**Assignment:** Review drafts of PSRC publications for proper terminology, abbreviations and symbols; and to recommend additions and changes to the IEEE database as appropriate.

The I2 working group, chaired by Mal Swanson, met on Wednesday, January 11, 2017 with 8 members and 2 guests. The working group would like to thank John Miller and John Tengdin for their work in the Terminology Review Working Group and best wishes in their retirement. The working group would like to welcome two new members; Addis Kifle and Oscar Bolado.

Quorum was achieved and minutes from the May meeting in Cincinnati, OH 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 continued with discussion on definitions for 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: Jay Gosalia**

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

**Established: 1990**

**Expected completion date: Meetings are continuing**

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

The WG met on January 10, 2017 with 9 members and one guest to review TC 95 standards activities. I4 WG has new vice chair Jay Gosalia as Dr. Yalla Murty is busy with his new assignments as TC 95 Chair and as secretary of PSRC.

TC 95 held its Plenary Meeting in Paris on October 21; this was preceded by co-located meetings of Maintenance Team MT4 October 17-20 to work on the standards projects listed below.

Eric Udren participated by phone/web in TC 95 plenary meeting on Oct 21, 2016. He presented on how the collaboration is working well with IEEE PSRC and TC 95. Outgoing secretary of TC 95 appreciated very much the message from Eric. TC 95 has a new Secretary, Thierry Bardou of Schneider, a colleague of long-serving Secretary Serge Volut who is retiring.

Murty and Eric updated the attendees on the meeting proceedings and the status of TC projects:

- IEC 60255-181: *Functional requirements for frequency protection* – Comments from US & other countries submitted on CD1 were addressed at the Paris meeting. CD2 is expected shortly.
- IEC 60255-187-1: *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – 2<sup>nd</sup> CD is in the preparation phase.
- IEC 60255-187-2: *Functional requirements for busbar differential protection* – Not progressed very much. Murty is looking in to this and first WG meeting will be organized in early 2017. PSRCC WG in K would be good to plan when 1<sup>st</sup> CD is drafted. Murty will provide us an update on the progress.

- IEC 60255-187-3: *Functional requirements for biased (percentage) differential relays for transmission lines* – new convener will ramp up the work in 2017. PSRCC WG D34 had met to discuss unofficial draft in September 2016.
- IEC 60255-1 Ed. 1: A draft of first CD is nearing completion. The existing document and new drafts should be reviewed at PSRCC, in SC I, to identify gaps.
- Next TC 95 MT meetings are planned in Tokyo during April 5-7. MT 4 will be meeting during April 5-7, MT1, MT2, MT3 will meet April 2-3 at the same venue.
- New TC 95 AHWG has been created headed by Mr. Lietoff of France. This group will document how sampled values per TC 38 IEC 61869-9 impact functional standards being created by MT 4. Mr. Lietoff will chair the group & report back their comments. It is likely that system behavior under various failure and problem scenarios will require some standardization.

Presentations made at the Paris plenary meeting, attached to the minutes, were reviewed for the WG.

Chris Huntley brought up the new project TC 57 IEC 61850-90-13, deterministic Ethernet networks. Chris indicated that NWIP requested to study Ethernet networks deterministic requirements for P&C applications. Ethernet is a best-effort packet service in which delivery latency or jitter of latency is not inherently assured. For P&C applications one will require to characterize or standardize network and communications service design to assure that these times and variations are within tight limits required by P&C applications.

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

**Chair: Farnoosh Rahmatian**

**Vice-Chair: Bruce Pickett**

**Output: Guide PAR-PC37.241**

**Established:, March 25, 2010,**

**Expected Completion: Dec 31, 2017**

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

The Working Group met on January 09, 2017 in a single session at 4:30 PM. The session was chaired by Farnoosh Rahmatian. There were participation from **8 members and 23 guests**. We did not have quorum.

All participants introduced themselves.

The IEEE-SA Patent and Copyright slides were presented – there were no comments from the participants.

Update on the status of the work:

1. On 7-Dec-2016, the IEEE-SA Standards Board approved the extension request for PC37.241 until 31-Dec-2017 (new deadline).
2. Since last meeting, the Draft Guide has gone through IEEE-SA MEC review and minor editing (to satisfy the review feedback). Sponsor balloting has been initiated.
3. Sponsor Ballot on PC37.271 Draft 06 started on December 15, 2016 and will close on January 15, 2017. About half of the individuals who registered to vote have cast their votes. There is 6 more days left for receiving the remaining ballots. REMINDER to

PSRC members/guests: if you have registered to vote, please cast your vote before the deadline.

4. Some of the comments received by the balloters were reviewed by the WG.
5. After January 15<sup>th</sup>, a small Task Force (including TW Cease and Farnoosh Rahmatian) will prepare a first response to the comments. The response will be shared with the entire WG. Will have conference call(s) to manage any issues requiring discussion.

The WG had a visit by Peter Grossman (and Hermann Koch) of IEEE PES Substations Committee WG K16 on use of non-conventional instrument transformers (NCIT) in GIS. There were discussions about possible future collaborations between the Sub-K16 and PSRC-I on matters related to deployment of non-conventional sensors. Peter was invited to make a presentation at a future PSRC session to the entire PSRC participants. Peter to contact Farnoosh to organize.

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

**Chair: Bruce A. Magruder**

**Vice-Chair: Will Knapek**

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

**Established: 2013**

**Expected Completion Date: 2018**

**Assignment:** Correct errors, update with new test methods and equipment

Working Group I23, Revision of C57.13.1 - Guide for Field Testing of Relaying Current Transformers, was held in the Studio Room 10 of the Marriott, New Orleans, LA on January 11, 2017 at 8:00 am. 3 members and 3 guests were present and a quorum was not met. 15 members as of this meeting.

Patent Conflict slides were shown.

1. Read minutes from last meeting. Since quorum was not met so minutes were not approved. Will be sent to members by email for approval
2. Discussed the submission of IEEE of the draft to form a balloting body.
3. Meeting was adjourned.

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

**Chair: Jim Niemira**

**Vice Chair: Jeff Long**

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

**Established: Jan, 2013**

**Expected Completion Date: 2017**

Working Group I24 did not meet. The paper is under review by the working group members and an update will be submitted for review by the May 2017 meeting.

### **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: December 2017**

**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 today, January 10, 2017, in New Orleans, LA with 21 members and 16 guests.

During the meeting the group went over the comments received on the document during the balloting that took place after the September meeting. There was only one negative ballot received but there were several comments that needed to be addressed by the entire group. The review of the major items took place during the meeting and several issues were resolved but a few issues still require some vetting. Due to the fact that FERC and NERC are very interested in the completion of this document a small group will review the remaining items and ensuring that these issues are resolved quickly.

Bob Cummings representing NERC asked that we provide a draft copy of the document (clearly labeled draft throughout the document) to NERC for distribution to FERC. This request will be discussed at the Subcommittee meeting.

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

**Chair: Mike Meisinger**

**Vice Chair: Steve Turner**

**Output: Revise Transactions Paper**

**Established: 2013**

**Expected Completion Date: December 2018**

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

**Agenda**

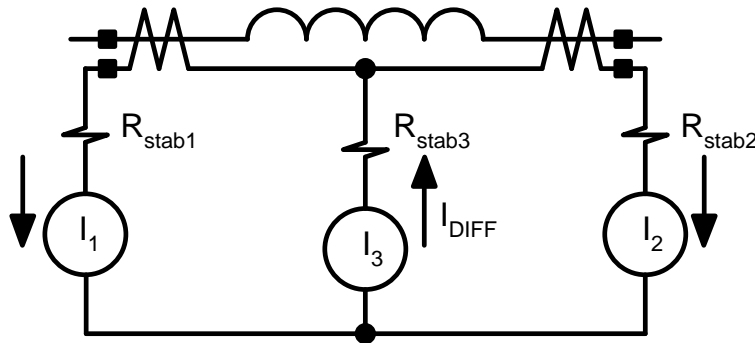
1. Introductions
2. Approval of minutes from September 2016 meeting
3. Discussion of data that was reviewed
4. New assignments

The meeting started with introductions and then the September 2016 minutes were approved.

Mike Meisinger gave a summary of the Jiles Atherton model which is popular for CTs since it includes magnetic hysteresis.

Amir Makki presented the data files for CT saturation created at Alstom's synthetic plant. The original report has the CT excitation characteristics that were used for the tests. These types

of data files are csv, doc and plt. The three current signals  $I_1$ ,  $I_2$  and  $I_3$  are measured in terms of the voltage drop across the stabilizing resistors ( $R_{stab}$ ) shown in the figure below. Most of the cases are for external faults but some are also for internal faults. Also there are cases that simulated multi shot reclosing to induce remnant flux in the CTs.



**Figure 1. First Model**

There are also some cases where the second coil was disconnected ( $I_1 = -I_3$  and  $I_2 = 0$ ) to simulate internal faults.

CT burden was simulated using the stabilizing resistors. Peter McLaren stated we should analyze both low and high burden cases.

**Task:**

Amir Makki is to select specific internal test cases that will be used to see if the Jiles Atherton model can produce the same results.

There were a total of 14 attendees, 6 members and 8 guests

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

**Chair:** Roy Moxley  
**Vice Chair:** Cathy Dalton  
**Output:** Report

**Established:** 2014  
**Expected Completion Date:** 2017

**Assignment:** Investigation of Relay self- monitoring capabilities

I-27 met on Wednesday Jan 11<sup>th</sup> at 8:00am with 9 members and 9 guests.

Meeting Notes:

- Discussed the resetting of relays as an attempt to clear self-monitoring alarms.
- Reviewed figure 1
- Reviewed figure 2
  - Remove EPRI as source of Figure 2, per the request of EPRI because the source of the data is unknown.
  - Iliah asked that settings group change be removed. After discussion it is thought that perhaps two tables should be created. One for self-monitoring of relay health and another for things like setting group changes ect.
  - “self test” to be renamed to boot test or something similar
  - Power supply to be added to the table (it is in the explanation)
  - In table 2 explanation, external checking per Tony Seegers. Perhaps in #9-User initiated tests?

- Add communication testing channel.
- Reviewed the text that was removed regarding RAM analysis and such.
- Reviewed Table X.
  - Might need to emphasize that “failure no fault no trip” to something more indicative of the fact it was quiet failure and was found dead but no alarm condition was present. \*Ben note to Roy, perhaps it would be best in the text above to explain each table heading in detail so it is clear and the table headings can be kept to a minimum number of words.
  - Need to scrub customer information from the appendix that this table references.
  - Should break table X into two separate tables.
- Discussed: Performance requirements for Self-Monitoring
  - It was agreed for Utilities that it is expected to receive a contact closure for a relay failure alarm.
  - In addition to the contact closure a digital message can be sent, e.g. 61850 has various messages available to indicate over communications that a relay failure has occurred.
- Testing
  - User Initiated testing (includes automated external testing) should be detailed here. E.g. comparing the analog data between two relays to determine one is drifting.
    - Include auto check-back of com channel e.g. power line carrier?
- From Customer Specification bullet list
  - Second to last bullet is a run-on and should be rewritten to make it clearer.
- Consensus is to have a vote prior to the next meeting. We agreed to have a meeting space and time for May just in case we do not complete

### **Writing Assignments**

**Due by Feb. 14<sup>th</sup>**

Roy- to make the updates discussed above and send the next draft to Ben and Cathy for review prior to sending to the WG for review.

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

**Chair: Joseph Valenzuela**

**Vice Chair: Michael Higginson**

**Output: Revision of the Guide**

**Established: September 2014**

**Expected Completion Date: October 2018**

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

The Working Group I-29 met on Tuesday, January 10, 2017 at New Orleans, LA in a single session chaired by Joseph Valenzuela with a total of **22 attendees**, (11 members and 11 guests). Quorum was met.

Minutes from the past meeting were approved. The motion was provided by Jim Niemira, and seconded by Lee Bigham.

Lee Bigham pointed out that the WG should check C57.13-2016 for alignment with section 5.

The working group reviewed Jim Niemira’s assignment and contributions. Regarding these contributions, the following action items were developed:

- Joseph Valenzuela to request original Visio diagrams from Erin [for editing]
- Joseph Valenzuela to obtain the IEEE C37.234 Bus Protection guide for Jim, which Jim can use to continue editing section 7.4.2

- Jim Niemira will re-sketch figure 26-30 to address accuracy concerns from the group including circuit breaker tagging, and incorrect presentation symbols for current transformers
- It was noted that figures 31 and 32 were identical but have a different description. Michael Higginson will check Figure 25 of previous standard revisions and compare to figures 31 and 32 of working revision, to assess which figure is correct in our revised standard
- WG to review C57.13 Standard requirements for instrument transformers for any updates to the burden calculations in section 5 as part of our integration

The group discussed moving forward with new organization of the guide discussed in our webex meeting.

1. Modifications to C37.110
  - a. Technical, General and Editorial Comments Noted in the WG Comment Log
  - b. Incorporate Additions from Corrigendum 1 – Corrections to Equation 18 and 19
  - c. Section 6 – Electromechanical Relays
    - i. 6.1 Saturation Effects
    - ii. 6.2 Applications of Current Transformers
      1. 6.2.1 Overcurrent Relays
      2. 6.2.2 Differential Relays
        - a. Generator Differential Protection
        - b. Transformer Differential Protection
        - c. Bus Differential Protection
    3. 6.2.3 Distance Protection
  - d. Section 7 – Static Relays
    - i. 7.1 Saturation Effects
    - ii. 7.2 Applications of Current Transformers
      1. 7.2.1 Overcurrent Relays
      2. 7.2.2 Differential Relays
        - a. Generator Differential Protection
        - b. Transformer Differential Protection
        - c. Bus Differential Protection
      3. 7.2.3 Distance Protection
      4. 7.2.4 Other types of high-speed protection
  - e. Section 8 – Microprocessor Relays – *Review Work by Alla Deronja and add content*
    - i. 8.1 Saturation Effects
    - ii. 8.2 Applications of Current Transformers
      1. 8.2.1 Overcurrent Relays
      2. 8.2.2 Differential Relays
        - a. Generator Differential Protection
        - b. Transformer Differential Protection
        - c. Bus Differential Protection
      3. 8.2.3 Distance Protection
      4. 8.2.4 Other types of high-speed protection

The following writing assignments were made:

- Jeff Long will write new sections 6 and 7 and will plan to complete these items by 2/10
  - John Lane can review sections 6 and 7
- Joseph, Michael, and Juergen Holbach will review and provide comments on Alla's contributions on CT saturation impacts on microprocessor relay by 2/10. All WG members were encouraged to review this content as this as microprocessor relays were the basis for the guide revision. Alla's previous contributions can be found at:
 

<https://iee-SA.imeetcentral.com/p/aQAAAAAC4QwE>

- Guillermo Weyer and John Lane will work on general and editorial comments and corrigendum integration. The general and editorial comments can be found at: <https://iee-SA.imeetcentral.com/p/aQAAAAAC7HI>

Joseph Valenzuela will set up WebEx meetings for the group on Fridays 11:00 CST

Jim Niemira moved to adjourn, Will Knappek seconded the motion. The working group voted to adjourn.

### **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 Guide**

**Established: 2014**

**Expected Completion Date: 2020**

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

January 10, 2017 PSRC meeting, 4:30-5:45 PM, Studio 3, New Orleans, LA

I-30 met with 5 members and 7 guests

#### **Meeting Notes:**

- Were able to get iMeet site set-up prior to meeting and discussed working group member access to the site.
- Discussed the safety and other benefits of Rogowski Coils.
- We had lots of discussion about the technical aspects, ratings, and limitations of Rogowski Coils.
- Chair discussed that document is practically finished and we should be ready for balloting by the end of 2017.
- We are waiting on IEC approval of similar standards to ensure our document is in step with the IEC documents.
- We discussed that our revision of the document will be incorporating the much of the accumulated experience industry experience with Rogowski Coils since the last revision of the document.
- The Chair pointed out that IEC refers to Rogowski Coils as Multipurpose CTs.
- We had additional discussion on the need to highlight Rogowski Coils improve substation safety since there is no concern with open circuit issues.
- It was discussed that Rogowski Coils may be smaller, weigh less, and may be useful in microgrid applications.
- It was suggested that we add an Annex where convention and non-conventional CTs were compared to aid the user in evaluating the two.
- We had discussions regarding the use of Rogowski Coils as “Aux CTs” and sensors for low current applications. It was felt that this is possible, but lots of turns on the Rogowski Coil would be needed.
- At the end of the meeting we were able to finalize the initial membership of the working group.
- Members other than chair and vice chair: Ratan Das, Mike Higginson, Ron Pate

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

**Chair: B. Mugalian and J.T. Tengdin**



**Vice Chair: Jerry Ramie**  
**Secretary: Craig Preuss**  
**Established Date: 05-Feb-2016 (PAR approval date)**  
**Completion Date: 31-Dec-2020**  
**Output: Revision**  
**Draft: 0.25**

I31 met with 22 attendees (shown below).

After introductions and review of PAR slides and copyright policy, the Secretary announced quorum was achieved. A motion was made to approve the minutes from the September 2016 meetings and passed. Next, the Secretary reviewed the action item status from the previous meeting:

1. The 802.3 high pot test action item had no progress. The working group decided to address this action item by inviting the correct Sponsor Committee responsible for 802.3 to ballot the standard.
2. The 60950 action item related to product safety identified a safety expert, but that expert became unresponsive to repeated efforts to follow up. The working group decided to address this action item by inviting the correct Sponsor Committee responsible for product safety to ballot the standard.
3. A request was made to include the EMC Society in the ballot pool.

Next the working group reviewed the comments received to date:

1. A spreadsheet containing received comments was reviewed. One comment was specifically requested to be addressed by the chair to remove text associated with a note recommending a wide range power supply. The working group agreed to remove the note.
2. Other comments in a Word document received were discussed. After lengthy discussion, the conclusion reached was that additional work is required to:
  - a. Edit the text to explain Zone B in more detail as to what it pertains to and to improve the description of when enclosure doors are open and closed during different tests. It was agreed that doors should be open for radiated RF and closed for all other tests.
  - b. Chris Goodney agreed to provide some text to help with the clarification.

### **I32: A Survey of Protective System Test Practices**

**Chair: Andre Uribe**  
**Vice Chair: Nef Torres**  
**Output: Review**  
**Established: May 2015**  
**Expected Completion Date: September 2017**

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

The Working Group met Tuesday, January 10<sup>th</sup>, 2017, New Orleans, LA in a single session chaired by Andre Uribe with a total of **28 attendees**, 19 of which were members.

1. Introductions were held.
2. May meeting minutes were reviewed.
3. Working Group reviewed contributors changes

4. One more section is left for review before we go to final draft.  
Adjourned at 9:17 am

### **I33: Review of Relaying Testing Terms**

**Chair: Jay Gosalia**

**Vice Chair: Amir Makki**

**Output: Report**

**Established: 2015**

**Estimated Completion Date: September 2017**

**Assignment:** Review of Relaying Testing Terms

I33 met today on Wednesday January 11 at 11 AM with 9 attendees.

The meeting time published in the brochure and actual time on the reception desk board were not the same. This created low turnout for the meeting.

In the meeting, Jay discussed the terms used in the previous I13 reports. The definitions used in I13 were almost 15 years old so some suggestions were made to make it more meaningful. Some more terms were suggested by the attendees and they are delegated to attendees for creation definition. The efforts to get the copy of the report is unsuccessful so far. We will keep on looking for a copy of the report. Any help we can get will be highly appreciated.

### **I34: Draft Standard for I/O Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs) PC37.1.1**

**Chair: Craig Preuss**

**Vice Chair: N/A**

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

**Draft: 3.0 (sent out after meeting)**

**Established Date: September 3, 2015 (Revised PAR approval date)**

**Completion Date: December 2017**

I34 met with 12 attendees to discuss the transition of PES SUBS WG C3 to PES PSRC WG I34 creating C37.1.1.

After introductions and review of PAR slides, the Chair reviewed the history of the standard since work began after the PAR extension was granted in 2015. That work was placed on hold until the reorganization was completed. This facilitated the reorganization activities supported by the working group chair; provided clarification on the draft's relationship with P1613 (being worked on in parallel); identified that a standard referenced in the draft, C37.90, is up for revision by the I Subcommittee; and allowed the reorganization to complete before moving forward to address the reorganization's impacts on the draft.

There was discussion on how to proceed now that the reorganization has been implemented and the PAR is expiring at the end of 2017. Several options were discussed with the chair of the PSRC I subcommittee, who was in attendance (Brian Mugalian). The idea is to wait for the outcome of the I subcommittee meeting being held on Wednesday to see if a chair for that work can be identified so that work from SUBS C3, transferred to I34, could be transferred to that new working group for addition to C37.90.

In the meantime, Craig Preuss agreed to update the current draft to remove all content not specifically related to simple I/O requirements for distribution (to working group members, clarified post meeting) with these meeting minutes.

Attendee list is below.

Attendee List

<b>Members</b>	
Craig Preuss, I34 Chair	Black & Veatch
<b>Guests</b>	
Mark Allen	Entergy Services Inc
Scott Short	Doble
Matt Black	Sargent & Lundy
Bharadwaj Vasudevan	ABB
Mike Stojak	Gulf Power
Ron Rumrill	Sentient Energy
Oscar Bolado	ZIV
Anthony Newman	Ameren
Ravi Subramaniam	IEEE
Brian Mugalian	S&C Electric Co.
Robert Frye	TVA

**I35: Standard for Electrical Power System Device Function Numbers, Acronyms and Contact Designation**

**Chair: Mike Dood**

**Vice Chair: Marc Lacroix**

**Output: Revision of C37.2**

**Draft: 0.1**

**Established Date: October 2014**

**Completion Date: December 2018**

I35 met with 7 members and 5 guests to discuss proposed modifications to the C37.2 standard.

Mr. Mal Swanson introduced himself as the chair of the Bibliography and Publicity Working Group and offered his services to the working group.

After introductions, the Chair informed the participants about the new work number I35 under the PSRC jurisdiction. It is no longer co-sponsored by a substation committee. Next, the Chairman summarized the work progress. Unfortunately, this process has been slow but the intention is to accelerate the final development with the integration of received comments. These comments were reviewed during the meeting.

- Update the 61850 equivalence table. The table should be updated to reflect the changes in edition 2. Oscar Bolado volunteers to complete this tasks.
- Device 68. The use of “pilot signal” in the description should be revised. After some discussion, it was decided to look back at older versions of the standard to understand the use of this wording.
- Device 78: A new device title is proposed and accepted by the participants.
- Device 11: There are some confusion with the description of the device and the text in section 3.7. Shall should be used instead of may in section 3.7.
- New proposed devices/functions acronym

- IID – Instantaneous Impulse Detection  
Device/function that trig action when measured impulses exceed time, amplitude or count values.  
The first proposition was to name this acronym VPD for voltage peak detector but during the discussion it appeared that this title doesn't represent the intended protection function.
- RAS - Remedial Action Scheme  
It is proposed to add this acronym since this function is used more in more in Power System Stability protection. There were some discussions on the use of scheme logic (LGC) for this type of protection but the consensus is that this function is used so frequently it needs its own definition.

### **Reports from the Task Force Chairs**

#### **ITF36: Revision of IEEE Std. C37.90.2 – IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers**

**Chair: Jeffrey Pond**

**Vice Chair: Jeff Burnworth**

**Output: Recommendation to revise or withdraw the standard**

**Established: September 2016**

**Expected completion date: May 2017**

**Assignment:** To review IEEE Std. C37.90.2 – IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers to determine if it is to be revised.

ITF36 met on Tuesday January 10, 2017 with eight participants, five who have signed on as members.

It was determined that this standard is to be revised. The Task Force will review the comments received from the 2004 ballot, a comparison of C37.90.2 to IEC 60255-26 and IEC61000-4-2, and an email inquiry from 2013 prior to the May meeting. Member comments are to be submitted by Friday April 28, 2017. At the next meeting the TF will determine whether to recommend a WG to go to ballot or to revise C37.90.2 before going to ballot.

- Liaison Reports
- Instrument Transformer Subcommittee – Fred Friend

#### **Status of C57.13 Standards:**

C57.13 "Standard Requirements for Instrument Transformers" was published January 2016.

C57.13.2 "Conformance Test Procedure for Instrument Transformers" will be revised but the start date and leadership has not been established.

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

C57.13.6 "Standard for High Accuracy Instrument Transformers" no activity

C57.13.7 "Standard for Instrument Transformer with max output of 250ma" balloting complete, PAR extension until December 2017.

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

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

The next Instrument Transformers Subcommittee meeting will be conducted during the next Transformers Committee meeting 2 – 6 April 2017 in New Orleans, LA.

- Old Business
- Creation of new Task Forces for IEEE standards expiring in 2021
  - Review our Subcommittee/Standards assigned spreadsheet
    1. C37.90 & C37.92 are up next
      - Request volunteers that participated in the existing revision: Oscar Bolado will chair the new task force for review of IEEE C37.90, and will be ITF37. Eric Udren was the past Chair of C37.92 and will chair this new task force for IEEE C37.92 and will be ITF38.
      - The reviewing Task Forces plan to start at the May and September 2017 PSRCC
      - **Note that Task Force Chair does not need to become the Working Group Chair**
- Update: Traffic of IEEE Std. C37.90.2 – IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers, ITF36 (Chair – Jeff Pond)
  - *From Erin Spiewak: Two PDF copies sold in 2016*
  - *Amir Makki asked for previous years' sales*
- Update: Traffic of IEEE Std. C37.105 – IEEE Standard for Qualifying Class 1E Protective Relays and Auxiliaries, unassigned
  - *From Erin Spiewak: no sales both in IEEE Xplore or in the Standard Store for C37.105 in 2016*
  - *After the Subcommittee meeting, Mario Ranieri discussed moving this document to a different Committee (possibly the IEEE Nuclear and Plasma Sciences Society). Brian Mugalian will follow up with Mario Ranieri.*
- New Business
- Members of I Subcommittee update
  - The Subcommittee welcomes Craig Preuss, Jay Gosalia, Steve Turner, and returning member Jeff Long.
- Other new business?
  - Craig Preuss: I Subcommittee name is relaying practices and scope and identifies only relay practices. Recommends an update to name and scope to add “control” and “control concept”. Craig will volunteer for a write up proposal. Action item: send out the proposal to the subcommittee members for review and comments. Needs to be approved by ADCOM and put in the O&P Manual.
  - Awards: You are encouraged to nominate candidates for Certificate of Appreciation awards. Please send your nominee(s) to Brian Mugalian or Andre Uribe.
- Motion to Adjourn

**J: ROTATING MACHINERY PROTECTION SUBCOMMITTEE**

**Chair: M. Reichard**

**Vice Chair: D. Finney**

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

J SC met with 21/38 members and 15 guests. Quorum was met.  
J SC carried a motion to accept the J7 AURORA Paper.  
JTF2 is disbanded.

## **WG REPORTS:**

### **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:** 12<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 12 members and 11 guests present.

The latest report draft (Draft 13) was reviewed, which captured completed assignments from the last meeting, including the new verbiage in Section VIII on NERC PRC-026. Swing Center Voltage Method and Rate of Change of Impedance Scheme has been moved to Section IV. Juan Gers write up on some verbiage regarding Transient vs Dynamic Stability for Section V was reviewed. The Vice Chair proposed revising the wording to make it more concise and relevant to the J5 paper.

Juan briefly presented the original IEEE paper on the Definition and Classification of Power System Stability. It was decided that a reference to this paper will be added.

Draft 14 will be updated to the J webpage for WG review prior to circulation in the J subcommittee.

A single session with space for 40 people and a computer projector is requested for the May meeting

### **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 Final**

**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 6 members and 4 Guests on January 11, 2017

The chair discussed the work done recently to resolve the ballot issues. All items have been incorporated favorably into the final paper. The chair will request acceptance of the paper at the J-SC later today. Next effort is to produce an IEEE-Transaction paper.

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: 11<sup>th</sup> Meeting**

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

The group met on Wednesday 1/11/2017 in New Orleans with 13 members and 12 guests in attendance.

The Vice-Chair presented the agenda and minutes from the last meeting and then proceeded to review the 3 newly received/completed assignments in the draft R4.0 of the paper.

There was a comment on Section V regarding the ground fault current from a shunt fault being limited to 10A. It was mentioned that there is a recent CFE paper that disputes this. Mike Reichard mentioned of another paper (on Limitation of Earth Fault vs Time) that he recommended the group also review when addressing this comment.

A draft letter from Michael Thompson was shared which proposes that this WG reach out to the IEEE Instrument Transformer Committee to seek assistance in determining a reasonable assumption on values of PT leakage reactance for implementing the V2/V0 ratio method to provide selectivity between external and internal faults. There was agreement that this impedance information was typically not found in PT test reports. The letter will be forwarded to the WG for review and comment.

It was suggested that a discussion on the need for coordination of the Sub-Harmonic Injection Scheme with PT secondary fuses be expanded, if possible.

The Vice-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 May meeting.

The working group will have its 12th meeting in May 2017, with the need for a single session, computer projector and seating for 35 people.

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

**Chair: Juan Gers**  
**Vice Chair: Phil Tatro**

**Assignment:** Work jointly with the Excitation Systems and Controls Subcommittee (ESCS) of the Energy Development and Power Generation Committee (EDPG) and the Power Systems Dynamic Performance Committee (PSDP) to improve cross discipline understanding. Create guidelines that can be used by planning and protection engineers to perform coordination checks of the timing and sensitivity of protective elements with generator control characteristics and settings while maintaining adequate protection of the generating system equipment.

Improve the modeling of the dynamic response of generators and the characteristics of generator excitation control systems to disturbances and stressed system conditions. Improve the modeling of protective relays in power dynamic stability modeling software. Define cases and parameters that may be used for the purpose of ensuring coordination of controls with generator protective relays especially under dynamic conditions. Write a report to the J-Subcommittee summarizing guidelines.

#### WG Report

The working group met with 17 members and 15 guests present. A quorum was achieved (17 members present out of 29 total members).

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

Phil Tatro reported that he will set up a series of monthly WebEx meetings with interested members of ESCS and PSDPC beginning during the first two weeks of February. The meetings will last 2 hours and will address the questions discussed with ESCS and PSDPC at the PES meeting in Boston.

Trevor Sawatzky presented to the group on the effect of the AVR on stable operation with respect to the steady-state stability limit (SSSL). Trevor presented stability simulations using a test system developed by the ESCS 421.5 working group, which he proposed J13 use for consistency. Simulations highlight that the simplified SSSL calculation is valid only with the AVR in manual mode, which is a point that ESCS would like emphasized in the J13 report. Trevor also noted that with the AVR in manual, certain limiters and excitation internal protection are typically out of service. Bob Pettigrew noted it would be useful to have a technique for calculating the SSSL with the AVR in-service.

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.

Mike Reichard led a discussion regarding questions received from the Electrical Machinery Committee Grid Code Task Force regarding the need are for generators to be able to provide short circuit at specified high values for specified times. The group discussed requirements defined in IEEE Std. C50.13 and whether the equation for field current applies for time less than 10 seconds. The working group agreed to accept the task of responding the questions. Juan Gers, Prem Kumar, Deepak Maragal, Bob Pettigrew, Luis Polanco, Mike Reichard, and Phil Tatro will form a subgroup to address this task.

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: 8th Meeting**

The working group held its eighth meeting on Tuesday, January 10th, 2017 with 5 members and 5 guests in attendance.



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

Chair kicked off the meeting with introductions. Minutes from the September 2016 meeting were circulated and approved without comment. Chair presented the status of the writing and review assignments as indicated in the status table in the agenda. Writing assignments have been completed.

Nate Klingerman completed review on Synchronization. Recommended taking into account closing generator breaker on dead bus before exciting the field, ensuring a smooth energization of the GSU. There was some discussion on the need to eventually synchronize the aux bus to the generator bus as part of the process. Chris will add text to this section to address the subject.

Hasnain Ashrafi completed review on Negative Sequence and provided comments that will be incorporated.

Dale Frederickson completed review on the Excitation System and provided comments which were incorporated.

Next Steps and Assignments. 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 (May 2017, Albuquerque).

#### **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: 7th Meeting**

#### ***Assignment:***

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

#### ***Activity:***

1. The WG met January 10th, 2017 with 7 members and 9 guests.
2. Chair reviewed a brief history and purpose of WG, including the focus of reviews, presentations and questions to effect the assignment. Also reviewed were the WG expectations for meeting order and etiquette.

3. Derek Haas presented Motor Bus Transfer Simulation results and the effects of the electromagnetic torque at the motor when varying the closing phase angle from 30, 60, 90, 120, 150, 180 and 360 degrees. These results are useful to support existing thoughts on out-of-phase closures of motors. Derek and Dale will work to complete their modeling by our next meeting in May. See Assignment #3 for details.

*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 and Derek Haas to engage in single motor MBT modeling of:
4. Residual Transfers using IEEE 2012 MBT Report 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 of live transfer airgap torque ratio and modeling correlate.
5. Fast and In-Phase Transfers using IEEE 2012 MBT Report 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 live transfer airgap torque ratio and modeling correlate.
6. Chair to start integration of accomplished literature review assignments and field result observations into a first draft of Report.
7. Chair to contact Dennis Tierney about monitoring one of his power plants for the WG's analysis of synchronous and residual transfers.
8. Assignments 1-3 are to be reported to the Chair by April 14, 2017, for exploration at the May 2017 Meeting.

*Next Meeting:* Single session; projector, 30 people

**JTF16: Revision of C37.101, Guide for AC Generator Ground Protection**

**Chair:** Nate Klingerman  
**Vice Chair:** Sudhir Thakur  
**Established:** Jan 2017  
**Status:** 1st Meeting

Minutes: JTF16 met for the first time on Wednesday at 11:00AM on 1/11/2017. Of the 28 in attendance, 26 have shown interest in becoming Working Group members.

Discussions were held on the following: Using New PAR template. Taking input from J17 PAR including terminology. Requirement to submit the PAR before February 20, 2017. PAR will be circulated to people interested in becoming members for their comments.

The new revision should address among other things the following issues

Arcing ground faults

Issues brought by Generator Expert Clyde Maughan with existing version

Recent OE showing importance of 100% stator ground fault protection

Issue of immediate shutdown vs orderly shutdown on first ground

Coordination of injection method with PT fuses

Need for PT primary fuses

Discussion on moving stator ground protection from 102 to 101

Resolving nomenclature issues like 59N, 59NG.59G etc  
– Scope will be finalized via email over the next few weeks.

The group expects to submit the PAR for approval prior to Feb 20 and upon receiving the expected approval in March, begin the revision work starting in the May meeting.

The working group will have its 2nd meeting in May, with the need for a single session, computer projector and seating for 40 people.

#### **JTF16: Revision of C37.102, Guide for AC Generator Protection**

**Chair: Manish Das**

**Vice Chair: Gary Kobet**

**Established: Jan 2017**

**Status: 1st Meeting**

Minutes: J17 met for the first time on Tuesday at 3:00pm on 1/10/2017. Of the 31 in attendance, 26 have shown interest in becoming Working Group members.

Discussions were held on several items that are expected to be considered during the revision effort, such as - the overlapping scope of ground fault protections in C37.101 and C37.102; ensuring no conflicts exist between the NERC PRC standards and C37.102; ensuring coordination exists with C50.12 and C50.13, etc.

The group then proceeded to work some of the key sections of the PAR. Sections 5.4 – Purpose, Section 5.5 – Need for the project and Section 5.6 Stakeholders for the Standard were completed during this meeting. Section 5.2 – Scope will be finalized via email over the next few weeks.

The group expects to submit the PAR for approval prior to Feb 20 and upon receiving the expected approval in March, begin the revision work starting in the May meeting.

The working group will have its 2nd meeting in May, with the need for a single session, computer projector and seating for 40 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: MEETING CANCELED**

**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 38 participants.

The Chair provided a brief background of the activities assumed by the Task Force since starting in Jan 2016.

Rich Bauer and Bob Cummings from NERC were in attendance. Rich provided an overview of a new process to aid entities with questions regarding Compliance with a Standard. That process is the Compliance Guidance Process. This process allows documents to be created and submitted for approval as Compliance Guidance documents. Implementation Guidance provides a means for registered entities to develop examples or approaches to illustrate how registered entities could comply with a standard that are vetted by industry and endorsed by the ERO Enterprise. Note that this is to be considered as one method of complying with the Standards, but not the sole method.

The NERC System Protection and Control Subcommittee (SPCS) now has a task to create a Compliance Guidance document for PRC-024 showing example evaluations. Rich presented his initial work on creating example evaluations to show the POI voltage levels translated to generator terminal voltage level based on the specific guidance provided in the Standard. The SPCS expects to complete this document in July 2017. Once available, it will be posted on the NERC website.

Separately, NERC has recently signed an MOU with IEEE, which is expected to help facilitate, if necessary, future PSRC collaboration with regards to the Implementation Guidance document.

The Chair announced that the Task Force had accomplished its main objectives and with the completion of this meeting the Task Force was disbanded.

Liaison Reports: J needs a liaison for IAS I&CPS motor protection issues

New Business:

TFJ16 – PC37.101 Guide for Generator Ground Protection revision. WG Chair Klingerman, VC Thakur

TFJ17 – PC37.102 Guide for AC Generator Protection revision. WG Chair Das, VC Kobet

Motion to disband JTF2 Assessing Generator Voltage Protection for PRC-024 Attachment 2

Mike Reichard led a discussion regarding questions received from the Electrical Machinery Committee Grid Code Task Force regarding the need are for generators to be able to provide short circuit at specified high values for specified times. The group discussed requirements defined in IEEE Std. C50.13 and whether the equation for field current applies for time less than 10 seconds. J13 agreed to accept the task of responding the questions. Juan Gers, Prem Kumar, Deepak Maragal, Bob Pettigrew, Luis Polanco, Mike Reichard, and Phil Tatro will form a subgroup to address this task.

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

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TFJ17 – PC37.102 Guide for AC Generator Protection revision. WG Chair Das, VC Kobet  
Motion to disband JTF2 Assessing Generator Voltage Protection for PRC-024 Attachment 2

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**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 January 11, 2017 in New Orleans, with 23 members and 28 guests in attendance. A quorum was achieved. Don Lukach requested a motion to approve the September 2016 subcommittee meeting minutes. Roger Whittaker made the motion, Pat Carroll seconded. Vote was unanimous to approve.

**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 6.3b**  
**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. 13 members and 5 guests were present. After the introduction, a call for quorum was made, and quorum was achieved. A motion was made by Mike Thompson and seconded by Randy Crellin to approve the minutes of the last meeting in Cincinnati, and the minutes were approved. A motion was made by Steve Conrad and seconded by Randy Crellin to approve the minutes of the November WebEx meeting, and the minutes were approved.

Current draft of the document is 6.3b The draft for the next meeting will be 7.1a.

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 contribution from Zoran Gajic with respect to ARS switch design configuration and its relation to phase shift rating was discussed. The group discussed the need to include a brief paragraph about the use of LTC switches and ARS switch in section 5.4.
- Gary Hoffman's additions to section 11.4 on hot spot monitoring were discussed.
- The PAR deadline is approaching. We would like to have the draft finalized and approved by the working group by January 2018.
- Lubo proposed removing Appendix 1 on Through-Fault Current Calculation Example and Appendix 2 on PST Nodal Currents from draft 6.3a. The group agreed with his change.

- Mike Thompson reviewed and provided comments on section 11.5.2 on differential protection. Mike Thompson suggested removal of section 11.5.2.2.3 on automatic magnitude compensation, but was discussed to have another review of this section with more content of the actual magnitude factors calculation

New Assignments (Assignments Due 2/28/17):

- Brandon Davies to expand assignment from November WebEx to include a general discussion of PST LTC switch and ARS switch configurations with references to C57.135.
- Charlie Henville to update section 11.7.1 on overcurrent protection of PSTs and coordinate with Mahfooz Hilaly
- Paul Elkin to review section 8 on PST Overload mitigation.
- Sam Sambasivan and Farajolla Soudi to review the new Appendix 1 from draft 6.3b calculation example prepared by Zoran Gajic and Appendix 2 from draft 6.3b prepared by Mike Thompson.
- Brandon Davies to review Mike Thompsons updates to section 11.5.2 updates to this section and coordinate with Mike to finalize this section.
- Zoran Gajic and Lubo Sevov to review section 11.5.2.2.3 and provide more content on how the calculation of magnitude compensation factors is performed, and update Appendix 1 calculation example as well.

Request for next meeting is a room for 30 attendees double sessions and a projector.

Request to schedule the K1 meetings in time slots avoiding conflict with the one of Standard Coordination meeting.

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

**Chair: R. Ben Kazimier**

**Vice Chair: Mark Siira**

**Established, 1999**

**Output: Standard through the SCC 21**

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

K10 met on Tuesday 1-10-17 at 1:30pm in Studio 3. There were 5 members and 12 guests present.

We discussed that the 1547 draft 6 went out later than expected to the K10 working group, because the 1547 working group was working through some details which took longer than expected, thus the draft was delayed. Members of K10 were sent draft 6 on 12-20-16 with a deadline back to the chair and vice-chair of 1-3-17 so there was time to for the K10 leadership to review the suggestion prior to sending them to the 1547 leadership by the Jan 9<sup>th</sup> deadline. We received two responses prior to Jan 9<sup>th</sup>. In the interim, the 1547 leadership extended the deadline for comments on draft 6 until today, 1-11-17. So far we have not received additional comment forms. The chairperson and vice-chair will provide resolutions to the received comments and facilitate further, necessary communication.

We discussed several sections of 1547 that were highlighted by some email exchanges by some individuals representing utilities at 1547 such as footnote #13 at the end of 4.1, open-phase, the term “under mutual agreement”.

Prior to concluding Mark Siira gave a presentation on SCC21 and Bill Ash of IEEE also provided some insight into the inner workings of SCC21.

The next 1547 meeting will be hosted by NERC on Feb 28<sup>th</sup> – Mar 1<sup>st</sup> in Atlanta. Registration for the meeting is located at the following address: <http://www.cvent.com/d/gvqt45>.

For the next K10 meeting we request a room for approximately 20 people for a single session. We request that conflicts be avoided between K10 and the D28, I27, and I25 working groups.

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

**Chair: Charlie Sufana**

**Vice Chair: M. Urbina**

**Output: Report**

**Draft 6.7**

*Assignment:* Write a report to the K Subcommittee entitled Methods for Analyzing and Detecting an Open Phase Condition of a Power Circuit to a Nuclear Plant Station Service or Startup Transformer.

Introductions were done after a welcome by Chairman Charlie Sufana. There were 9 members and 5 guests in attendance for the January 10, 2017 meeting.

The minutes from the September 20, 2016 K11 meeting were read and approved.

Mike Urbina and Wayne Johnson provided a brief update on NEI. The NRC is looking at what utilities are doing and is expecting initial reports from 4 plants.

Charlie then went over the report and there was discussion on newly added section 2.14 and annex G. This section was added after a contribution was received from Mike Mustafa of Entergy and Mike McAnelly of PCS2000. The original contribution was sent to 3 reviewers for their comments. The initial comments indicated that it should not be included. Charlie indicated that he took the original and extracted portions of it to be included in the report. Charlie will see if Mike and Mike can revise their original contribution to have more technical content and better explain how it works.

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

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

**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 13.3**

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

PSRC K12 had a joint meeting with Substations WG I9 on Monday, January 09, 2017. K12 had 5 members and 17 guests. K12 meeting minutes from last September meeting was reviewed and will be approved after the meeting via email.



Reviewed web meeting minutes from October and November. Some of the K12 members did not get the meeting invite for the web meetings. Satish will follow up with this issue and resolve it for the upcoming web meetings.

The joint working group reviewed comments for Section 7.3 (Transformer Protection) provided by Mike Thompson. As part of the review we decided to revisit Section 7.2 (Bus Protection) to include a sentence that refers to Section 7.3 for HV Buses that includes the transformer. Dean Miller volunteered to add the sentence and revisit section 7.2. Mikael Halonen volunteered to update section 7.3 with protection philosophy for spare transformers. Mike Thompson indicated to refer his paper on spare transformer protection.

Section 9 and 10 of the draft were reviewed.

Section 7.1 review assignment is still pending. Dean Miller's contribution for Section 7.4 need to be incorporated into the main draft and review in the upcoming meeting.

I9 chair applied for PAR extension for two years. Approval is still pending. The plan is to have a good draft by end of this year.

WG K12/I9 plans to have a series of web meetings before the next in person meeting.

The next in person K12 meeting will be in May, 2017. The requirements are a single session, a meeting room for 20 people, and a computer projector.

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

**Chair: Ilia Voloh**

**Vice Chair: Luis Polanco**

**Established: September 2013**

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

**Draft 1.9**

1. WG met on Tuesday, January 10<sup>th</sup>, 2017 with 4 members and 7 guests.
2. IEEE Patent slides were introduced.
3. There was no quorum to approve September 2016 Meeting Minutes. Therefore, Meeting Minutes approval will be done by chair via emails.
4. PAR extension till December 31<sup>st</sup>, 2019 was approved by IEEE Revcom
5. Chair and members discussed updates to the document based on comments received and chair inputs and corrections were discussed.
6. Chair presented comments received from various manufactures on approach for unbalance protection and presented narrative on new section based on the comments.
7. Chair will re-write the portion of the 2 considerations on unbalance protection, for alarming when a single capacitor is blown or fails. This will be in line with the included comments based 10% voltage increase to trip and that variations on the number of cans that would need to fail to reach that voltage.
8. Chair discussed the typical capacitor current unbalance protection settings provided on a table for a capacitor configuration, and the comment received about possibility of having 3 tables one for each type (Internally, Externally and Fuseless) but since provided table are typical suggestion was to keep existing and clarify that settings for each configuration can be substantially different and provided table is for information purposes as an example for a capacitor bank type.
9. Chair and members discussed a suggestion that thresholds and set points to be removed from the table 4 so that it does not become a reference, and rather be something provided as informative data was discussed, but it was decided to keep as shown.

10. Chair discussed the Impact of current distortion contribution from a member and indicated that many Items within the section are focus on system and line protection impact and discussions about possibility of bringing some of these inputs to the newly formed DTF37 Task force, and modify content to re-submit to K13 for this Item.
11. Chair presented comments received on MOV section, especially on the time period for the energy calculations increasing (heating's) and decreasing (cooling), to remove the 1 minute cooling time specified on the standards, since this can be misleading and provide a sentence to indicate this is unique for each bank design MOV and dependent on many factors like, fault magnitude and duration (energy), ambient temperature, etc, and not a fix number.
12. Chair discussed with members the Section 5.3 (Capacitor Protection) and recommended to remove 2 paragraph on this sections of the capacitor protection that were stating that when there is a failed capacitor, this can be "electrically" isolated and then put the bank in service again, but discussions on this item resulted in agreement that there not a practice and that the electrically isolated term is confusing.
13. Chair discussed ABB inputs on the approaches for optional high set level used for externally fused and internally fused capacitors, including corrections on a list of Items that previously used letters and re-wrote as numbers to match table graph, that also included updates on the unbalance protection graph curves labels.
14. Chair to request the main committee to create a ballot body, and members need to vote before the next meeting so that things can move forward faster.
15. Current draft is 1.9

For next meeting a meeting room for 25 persons is required a with AV capabilities.

#### **K16 PC37.91 Revision of IEEE Guide for Protecting Power Transformers**

**Chair: Will English**

**Vice Chair: Steve Conrad**

**Output: Revised IEEE C37.91 Standard -Guide for Protecting Power Transformers**

**Established: May 2014**

**PAR Expires: December 2018**

**Draft: 7**

**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 20 Guests on January 11, 2017, at The Marriott New Orleans, LA.

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.

Quorum was achieved at the start and throughout the meeting.

Terminology review- Mark Schroeder discussed the proposed use of digital relay in the definitions clause. After further discussions, the WG agreed that the term should not be included in the definitions clause and the term 'microprocessor relay' is to be used as appropriate in the guide.

Clauses 12 and 13 were discussed as to the appropriateness of the material, which is covered in C57.104 and C57.140 in much greater detail. Pat Carrol and Bruce Pickett agreed to review and condense these clauses.

Annex – A Through fault durations for cat II was edited in sub section a) and section 1) of the cat III and IV – Brandon Davies will review comments proposed by the chair.

The chair asked for volunteers to review and edit the figures in the guide. After some discussion on the availability of the original figures and the use of Visio stencils, Caesar Calix agreed to take this assignment.

The chairman led discussions on submitted assignments. Discussion focused on submitted revisions/comment incorporated in Draft 6. Assignments to review selected clauses were made as listed above:

Reviews and assignments to be returned to chair by March 1, 2017.

Meeting adjourned.

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

Avoid WG conflicts with 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: 3**

1. K17 met on Tuesday January 10<sup>th</sup> 2017 with 21 participants (8 guests and 13 signed members).
2. Meeting minutes of the K17 September 2016 meeting was previously approved via email.
3. Chair provided updates on the WG report, went over the writing assignments and discussed unassigned sections that we need volunteers to sign on to provide contributions.
4. The FERC Order 830, which directed NERC to modify TPL-007 on the GMD benchmark event and the requirements of GMD data collection and criteria for collecting this data, was discussed. Based on the FERC recommended revisions to TPL-007, it was proposed that a chapter on GIC & Geomagnetic Field Monitoring Methods be added to the WG report. The proposed chapter will address GMD monitoring in general (Sam Sambasivan) and measurements using optical CT (Mark Adamiak), Hall Effect CT (Amir Makki) and Magnetometer (Qun Qiu).
5. Some additional inputs were incorporated in the report at the meeting. Chair recommended based on feedbacks and member's discussions to combine sections 3.3 and 3.4 since Section 3.4 of relay replacement could be a challenge to write.
6. Other discussions entertained by chair and members were related to CT saturation section provided by Michael Thompson and possible impact on relays, possible GMD simulations using RTDS to evaluate electromechanical relays, etc.
7. Vice-chair Luis Polanco will provide write up for section 2.4.1 and 2.4.2 in February and Sam Sambasivan will review and provide input/comments before next meeting in May 2017.
8. Chair/vice-chair will follow up with pending assignments to make sure all previous and new assignments to be completed as scheduled.

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

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

**Chair: Adi Mulawarman**

**Vice Chair: Surarat Pavavicharn**

**Established: May 2015**

**PAR Expires : December 2019**

**Draft: 2.1**

**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? Quorum met, 7 needed

- 22 attendees
- 9 out of 15 members attended
- 0 new members added

2. Approve last meeting minutes

1<sup>st</sup> Member name Don Lukach - motioned

2<sup>nd</sup> Member name Raluca Lascu - 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. Presentation from Charlie Sufana

Annex A's (Response of network relays to system faults.)

6. Update on assignments

- Any comment from Review of Annex B by Adi and Joe. (Adi reviewed and have no comments)
- Any comment from Review of section 1 by Mike T. (Mike is done has no comments to make to section 1.)

- Any comment from Review of section 4 by Don. L (submitted, may be review during the meeting in NOLA)
- Any update on review of section 10 from Charlie. S.
- Any update on review of section 6 from Kevin. D.
- Any update on review of section 9 from Lubo.

7. Other update : (NEW ASSIGNMENTS)

PLEASE DOWNLOAD LATEST DRAFT FROM THIS LINK BELOW

<https://iee-SA.imeetcentral.com/psrcktf18/folder/5770883/#folder:4361073>

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

For the next meeting:

Please reserve a room for 25 people, a projector, and no conflict with K16.

Brief discussion points:

Discussion on section 4.1 and 4.2,

Fixed misspelling “tossport” to “to spot”.

Adding grid network definition section.

Discussion on historical information in both sections and the WG decided to move most of section 4.1 and 4.2 into a new Annex. There was no reference used in writing this historical information in the bibliography so the WG feel it is better to just have it as informative Annex.

Kevin D. will add as needed a sentence or two in section 4.1 or 4.2 as needed when he finished his review of section 6.

Charlie Sufana gave us a very brief overview of how the protection work.

After the meeting, Adi has upload a version D2.1 to be used for the next review

**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 did not meet at the January PSRC meeting.

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

**Chair: Randy Crellin**

**Vice Chair: Michael Thompson**

**Established: May. 2016**

**Output: Revise C37.112**

**Draft: Assign Status**

**Expected Completion Date: TBD based on PAR**

**Assignment: To pursue the renewal of C37.112**

The working group met for the first time on Tuesday January 10, 2017 with 8 of 14 members and 5 guests. Three guests agreed to become new members. This standard was originally written in 1996, reaffirmed in 2008, is due to expire the end of 2018.

After introductions, the working group discussed the details of the four options identified by the KTF21 task force, which are:

- 1) Adopt the IEC 60255-151 Standard directly under a dual logo agreement.
- 2) Adopt the IEC 60255-151 Standard through ANSI (US National Committee of IEC)
- 3) Ballot and revise the C37.112 Standard (using the normal IEEE process)
- 4) Let the C37.112 Standard expire (superseded by the IEC 60255-151 Standard).

Dr. Murty Yalla (Chair of IEC TC95) updated the working group on the recent efforts at the IEC TC95 October meeting in Paris to promote an agreement for the reciprocal adoption of IEC and IEEE standards. The IEC pushed back on our initial request for IEEE to adopt the IEC standard. The current agreement only allows for the IEC adoption of IEEE documents.

Erin Spiewak (IEEE SA) indicated that Sam Sciacca attended the October IEC General Meeting in Frankfurt to discuss revising the current agreement. If this appears to be a viable path, a new agreement might be available to pursue adoption later in 2017.

Erin Spiewak described an alternate path to adoption using the agreement between ANSI and IEC. The IEEE is no longer a member of the US National Committee of IEC, however ANSI is and has an agreement. If there is conflict regarding IEEE adoption using ANSI, it would be between IEC and ANSI and not affect IEEE

It was discussed that, we could also proceed with Option 3 and if Option 1 or 2 appear attractive in the future, we could simply not submit C57.112 to Revcom and instead adopt the IEC standard. It was also discussed that by proceeding with the Option 1 it may provide the incentive for the IEC and IEEE to negotiate a bi-lateral agreement.

After much discussion, the working group decided to pursue Option 3, to ballot and revise the C37.112 Standard using the normal IEEE process. The working group then completed, approved, and submitted the Project Authorization Request (PAR) to NESCOM for its approval during their March 23 meeting. It was then motioned and approved to request from the K Subcommittee to form a balloting body contingent upon the PAR approval.

Brian Boysen motioned to approve the PAR and Don Lukach seconded the motion. All members agreed to prepare and submit a PAR which was completed and submitted before the meeting was adjourned.

Don Lukach motioned to request of the main committee to form a balloting body contingent upon approval of the PAR. Rick Gamble seconded. All members voted to approve this plan

The tentative time line for the project is as follows:

- Submit the PAR for the NESCOM meeting in March (Completed).
- Upon approval of the PAR, immediately form a balloting body (30 days invitation).
- Ballot the current version of C37.112. (30 days ballot)
- Compile any comments received and send them to the members.
- Schedule a WebEx between the closing of the ballot and the September meeting.
- Revise C37.112 as necessary to resolve ballot comments at the September meeting.
- Recirculate a final draft to the balloting body.

Parallel to this activity, Erin Spiewak will continue to pursue discussions with IEC on negotiating a bi-lateral adoption agreement.

Don Lukach motioned to approve the minutes from the September KTF21 meeting and the October conference call of the K21 working group. Brian Boysen seconded. All approved.

The working group will not meet in May.

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

**Chair: Abu Bapary**

**Vice Chair: Michael Thompson**

**Established: September, 2016**

**Output: Revise C37.324**

**Draft: Assign**

**Expected Completion Date: September, 2016**

**Assignment: Revise C37.324**

The K WG22 met for the first time with 29 members and 9 guests. This standard is due to expire in 2019. It was originally written in 2009.

Introductions were made.

The scope of the existing guide was discussed and edited. Hilman Ladner motioned to approve the modified scope of the guide. The motion was seconded by Lubomir Sevov. The motion carried.

The WG filled out the PAR form in real-time discussion. Once the form was completed, Greg Ryan motioned to submit the PAR to NESCOM. The motion was seconded by Steve Conrad. The motion carried.

The chair will set up a central desktop work area and make the doc file available as soon as it is available. A pdf version will likely be available sooner.

The chair discussed the plan for executing our assignment. The first step is to assign teams to review each section of the existing document and report back to the WG on recommended changes required. Assignments were made as follows to be ready for discussion at the May meeting. The first name listed is the lead of the review team for that section.

Section 4, S. Conrad, L. Sevov, A. Deronja

Section 5, J. Barsch, N. Gulczynski

Section 6, J. O'Brien, I. Tualla, C. Walker

Section 7, B. Davies, A. Nguyen, M. Leyba

Section 8.1-6, G. Ryan, D. Lukach, I. Voloh

Section 8.7-12, R. Crellin, A. Mulawarman, B. Boysen, R. Hedding

Section 8.13-18, G. Moskos, C. Suffana

Annex A, M. Nagpal

Annex B, TBD

Annex C, J. Barsch

We request a single meeting with room for 30 to 40 and a computer projector for May 2017

**K23     Summary Paper for C37.119 IEEE Guide for Breaker Failure Protection of Power Circuit Breakers**

**Chairman: Roger Whittaker**

**Vice Chair: Adi Mulawarman**

**Established: 2016**

**Output: Summary Paper for C37.119-2016**

Introductions were given and a new roster was made to list the new members of workgroup K23. Adi will update and make a new roster. There were 13 members that signed up and also 10 guests so we had quorum.

The Cincinnati meeting minutes of oldK5/newK23 were approved. Adi Mulawarman motion with Jeff Barsch second.

Roger explained that each of the summary paper writing assignments have been completed and that he has done some preliminary editing and placed the information within the conference paper dual column template. Figures were added from the guide. Roger then summarized the contributions.

It was agreed that before we submit the abstract to conferences we will finish the paper edit process.

There was discussion on proper length of the paper. The current length is about 9 pages. The limit for an IEEE transactions paper might be 7 pages. Several thought that this paper is for conferences and not necessarily for an IEEE transaction. Roger was asked to check with Sukumar Brahma about paper length. For now it was agreed that the length is OK at 9 pages. We are tentatively planning for 2018 presentations at conferences, (not 2017).

Jeff Long and Yuchen Li each agreed to read and edit the overall document. Roger will send them each a copy for review. The document is due back to Roger by March 30. Once preliminary editing is complete then the workgroup can take a vote and make comments to approve the paper for presentation. This before presenting to the subcommittee.

The group discussed making a power point presentation and agreed to postpone this until after the editing process is complete.

Several breaker failure events were discussed. Roger presented an event where multiple breakers failed at the same substation for the same fault event. A transformer low liquid-level sensor trip/ breaker failure initiate was discussed. It was mentioned that this condition likely would not produce much current for the BF current detector.

The workgroup is currently working on draft 1 of the summary paper and requests a room for 25 people with a computer projector for the next May meeting.

Minutes by Adi Mulawarman and Roger Whittaker.

### **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/>



### **Old Business:**

No Old Business was discussed.

### **New Business:**

Ratan Das motioned to disband working group K15. Seconded by Don Lukach. Vote was unanimous.

Don Lukach motioned to disband working group K20. Seconded by Ilia Voloh. Vote was unanimous.

Ratan Das motioned to form a new task force to carry on the work of the old K15 working group. The proposed assignment is to explore the possibility to form a working group to look into the preparation of a 'Guide for centralized protection and control system within a substation'. The motion was seconded by Don Lukach and carried unanimously. The new Task Force will be KTF24, Chaired by Ratan Das and Vice-Chaired by Mital Kanabar.

The Awards Committee-(B1) Chairman Hugo Monterrubio made a presentation to the K15 Chairman and the K15 WG for recognition of the 2016 Best Technical Paper Award from the IEEE-PES for the IEEE PWRD Transactions Paper.

Chairman Lukach emphasized the need for all Subcommittee members to attend 2 out of 3 meetings in order to meet the minimum attendance requirements.

Two new members were welcomed to the K Subcommittee: Ratan Das and Brandon Davies.

Motion to adjourn made by Don Lukach and seconded by Bruce Pickett. Motion passed unanimously.

### **Motions to be made at the Main Committee Meeting:**

Mr. Chair, The Substation Protection Subcommittee, K, requests approval for the transmittal of PC37.116, IEEE Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks, to the IEEE SA for balloting, contingent upon final draft 1.9 approval of the K13 Working Group.

Mr. Chair, The Substation Protection Subcommittee, K, requests approval for the transmittal of C37.112, Standard Inverse-Time Characteristic Equations for Overcurrent Relays, to the IEEE SA for balloting, contingent upon PAR approval expected at the NESCOM March 23, 2017 meeting.