



**POWER SYSTEM RELAYING COMMITTEE
OF THE IEEE POWER and ENERGY SOCIETY
MINUTES OF THE MEETING
May 9-12, 2016
Denver, CO
Final**

I. Call to order/ Introductions Mike McDonald

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

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

II. Approval of Minutes & Financial Report Russ Patterson

Motion to approve Minutes of the January 2016 meeting in Memphis, TN was moved by Sukumar Brahma and seconded by Fred Friend and was approved unanimously.

The financial status of PSRC is in good standing.

III. Chairman's Report Mike McDonald

If you missed the Denver PSRC Committee meeting last week we had a great meeting with record, or at least near record, attendance with over 250 attendees. Much was accomplished in a very nice hotel with a very responsive staff. While the distant mountains had a beautiful snowcap, the weather was reasonable for May in Denver.

The PSCCC leadership and the PSRCC leadership completed the review of working group associations that was started at the January JTCM meeting. Agreement has been reached as to what Substations C0 working groups will come into the PSRCC and which H SC working groups will be moving to the PSCCC. These results will be fully shared with all PSRCC attendees not later than the Main Committee meeting in September. At the September Main Committee meeting, in lieu of working group presentations, the PSCCC and PSRCC will outline how our two Technical Committees will be meeting and working together – something that I have repeatedly stated was our plan.

It was announced that, at least for the foreseeable future, our committees will be meeting jointly at all three meetings during the year. The meeting this September will be as previous September C0 joint meetings were planned, with 'purely' C0 WG meetings on Monday with 'joint' H/C0 meetings spread throughout the week. The intent of the PSCCC leadership is to have the PSCCC meeting officially beginning at the January JTCM meeting in New Orleans. That meeting, as all Joint Technical Committee Meetings, is planned by the JTCM where our committees just provide our meeting requirements and requests for time coordinated slots.

A few other announcements:

Galina Antonova will fill out the H SC Vice Chair position as the existing Vice Chair will be transitioning to the PSCCC. This provides Galina a chance to get 4 meetings under her belt before assuming the SC Chair position in 2018. We thank Marc for his service as VC and look forward to working with him in whatever role he fills in the PSCCC.

I am very happy to announce that Dr. Murty Yalla will be the incoming Secretary beginning in January. Murty brings a treasure trove of experience with both the IEEE and IEC. Congratulations to Murty!

Mike
PSRC Chairman

IV. Reports of Interest

A. Report from the Vice- Chair – Pratap Mysore

a. Technical Paper Coordinator's Report.

2016 PES general meeting: Seventeen conference papers were accepted out of forty. Nine transaction papers were accepted for presentation at the meeting.

b. Future Meetings

May 2017 meeting will be held from May 8-12, 2017 at Embassy Suites, Albuquerque, NM. RFPs are sent out for September 2017 and 2018 meetings.

JTCM meeting in January 2017 will be in New Orleans from January 8-12th.

B. CIGRE B5 Activities Report – Rich Hunt

The next B5 meeting will be held on Thursday, August 25th, 2016 at the CIGRE General Session in Paris.

Working Groups

- No New working groups of interest have formed since the last meeting.

US National Committee Annual General Meeting

The US National Committee (USNC) Annual General Meeting will be held July 18th, 2016 in Boston, MA. This meeting is held in conjunction with the IEEE PES General Meeting.

CIGRE 2016 General Session

The 2016 CIGRE General Session is in Paris (August 21-26, 2016). Details can be found at <http://www.cigre.org/Events/Session/Session-2016>. There are 2 B5 technical sessions at the General Session. The US National Committee had 28 synopses accepted, the most ever. Two of these synopses were submitted to B5.

B5-102 Comparison of Risk Assessment Approaches in Wide Area Protection Coordination

B. GWYN, S. ALAEDDINI, I. ANAND, A. GOPALAKRISHNAN, G. WEBSTER, J. SCHMIDT, D. WONG, J. STORER, P. NYOMBI, G. SARKINEN, A. MULAWARMAN, M. GUTZMAN – USA

B5-201 A Universal Relay Protection Coordination Model for Synchronous Machine Based on Transient Stability

S. CHEN, M. MUSAVI, P. VILLENEUVE, P. LERLEY - USA

CIGRE Grid of the Future Conference 2016

The CIGRE Grid of the Future Conference takes place October 30th to November 1st, 2016, in Philadelphia, PA. Immediately following the conference will be the The Evolution of Power System Planning to Support Connection of Generation, Distributed Resources and Alternative Technologies Colloquium on November 2nd and 3rd, 2016, organized by the CIGRE Technical Committee and the USNC. For details, see: <http://cigre-usnc.org/grid-of-the-future/>

Other CIGRE items of interest:

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

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

C. IAS Power System Protection Committee - Suparat Pavavicharn

No information available.

D. IEC Report - Eric Udren

TC 95, Measuring Relays and Protection Systems

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

There are no drafts or voting documents out for review at the time of this report, although two CDs received USNC responses since the January report.

The functional standards maintenance team MT4 is working on the projects listed below. A new strategic feature first reported in May is that we are establishing PSRC working groups in relevant subcommittees to collaborate with and support the IEC WG, so the resulting standard reflects the needs and contributions of PSRC participants as well as IEC participant users.

MT4 met in Macau, China, April 11-14, 2016 to work on the following projects:

- IEC 60255-187-1 - *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – Now supported by PSRC WG K19 under Gustavo Brunello. The WG will supply COMTRADE dynamic test cases with the functional standard – a first that will likely be used in with other functional standards in the future. The first CD was issued in late January; the USNC compiled comments from K19 and individual contributors and submitted to IEC for consideration by MT4.
- IEC 60255-187-3 - *Functional requirements for biased (percentage) differential relays for transmission lines* – outline reviewed by PSRC WG D34 under Normann Fischer.
- IEC 60255-181 Functional requirements for frequency protection – The MT updated its draft, as it published the table of contents for National Committee comments. The MT is using a liaison relationship with TC 95 JWG1 developing the IEC Synchrophasor measurement standard – this brings expertise on performance issues and measurement techniques for frequency and rate of change of frequency (ROCOF).

The next MT4 meeting is in Paris, October 17-21, 2016. A TC 95 plenary meeting will be scheduled at the end of this week of MT4 meetings.

- Separately from MT4, TC 95 Joint Working Group (JWG) 1 chaired by Ken Martin is developing IEC 60255-188-1 Synchrophasor Standard. CD2 comments including those from USNC were discussed at the PSRC meeting of JWG1.

TC 95 is revisiting several base requirements and type-testing standards to add requirements for smart grid protection or control devices (equipment on distribution circuits with distributed generation and inverters, or microgrids). The USNC still seeks participants for the WGs that will handle the following; contact USNC TA Eric Udren if you are interested in participating. The PSRC should set up WGs to support US input to these projects as drafts are developed.

- Update to IEC 60255-1 Ed. 1: *Measuring relays and protection equipment – Part 1: Common requirements*. Like IEEE C37.90, but broader.
- Update to IEC 60255-26 Ed. 3: *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*. Do we test adequately for influences from Smart Grid devices (electronic power converters/ inverters/conditioners/controls)?
- Update to IEC 60255-27 Ed. 2: *Measuring relays and protection equipment – Part 27: Product safety requirements*. Adapt the standard to meet the new requirements of the European Low

Voltage Directive covering protection of people and animals from all risks; and internal production conformity control. In addition, revised base standard IEC 61010 now includes risk assessments and considers other aspects of safety not covered by IEC 60255-27 Ed.2.

TC 57, Power systems management and associated information exchange

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

E. Standard Coordinators Report – Adi Mulawarman

PSR Standards Coordinator’s Report Spring May, 2016

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

RevCom = Revision of existing standard

NesCom = New Standard

Revision to Existing Standards Completed

PAR for revising existing standard or creation of new standard Approved

- PC37.251 Standard for Common Protection and Control Settings or Configuration Data Format (COMSET)
- P1613 IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations
- PC37.245 Guide for the Application of Protective Relaying for Phase Shifting Transformers extension approved.

Standards due for 10 year review

Ballot Activity:

See attached spreadsheet.

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

PARS expiring at the end of 2016

PC37.237	No extension needed, plan to be done. (Adi has emailed Chair for progress). Chair indicates that the WG will finish according to schedule.
PC37.241	Indicate may need extension and they will decide by May meeting. (Adi will email chair for progress)
PC37.119	Work completed.

PARS expiring at the end of 2017-2018

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

Orange will expire at the end of the following year.

No.	PAR Date	PAR Exp	Revise or withdraw 12/31/ xxxx	PSRC SC	Title
PC37.241	2010	2016		I	Guide for Application of Optical Instrument Transformers for Protective Relaying
PC37.237	2012	2016		H	Standard Requirements for Time Tags Created by Intelligent Electronic Devices - COMTAG(TM)
PC37.116	2013	2017	2018	K	IEEE Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks
P60255-118-1	2013	2017	2021	H	IEEE Standard for Synchrophasor Measurements for Power Systems
PC57.13.1	2013	2017	2022	I	IEEE Guide for Field Testing of Relaying Current Transformers
C37.118.1a	2013	2017		H	Amendment for IEEE Standard for Synchrophasor Measurements for Power Systems
PC37.246	2013	2017		C	Guide for Protection Systems of Transmission to Generation Interconnections
PC37.247	2013	2017		C	Standard for Phasor Data Concentrators for Power Systems
PC37.248	2013	2017		H	Guide for Common Format for Naming Intelligent Electronic Devices (COMDEV)
PC37.245	2012	2018		K	Guide for the Application of Protective Relaying for Phase Shifting Transformers
C37.94	2014	2018	2018	H	IEEE Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment
PC37.230	2014	2018	2018	D	IEEE Guide for Protective Relay Applications to Distribution Lines
PC37.91	2014	2018	2018	K	IEEE Guide for Protecting Power Transformers
PC37.249	2014	2018		H	Guide for Categorizing Security Needs for Protection and Automation Related Data Files (joint with subs)
PC37.250	2014	2018		C	Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes
C37.108	2015	2019	2018	K	IEEE Guide for the Protection of Network Transformers
C37.110	2015	2019	2018	I	IEEE Guide for the Application of Current Transformers Used for Protective Relaying Purposes
C37.235	2015	2019	2018	I	IEEE Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes

PARS expiring beyond 2018

See attached spreadsheet

PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:

NesCom/RevCom Submittal

Deadlines:

09 December 2015

22 January 2016

22 March 2016

20 May 2016

05 August 2016

17 October 2016

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

Chair: C. Preuss

Vice Chair: Vacant
Secretary: Vacant

No information available.

G. NERC Report - Bob Cummings

No information available.

V. ADVISORY COMMITTEE REPORTS

Chair: Mike McDonald
Vice Chair: Pratap Mysore

B1: Awards and Technical Paper Recognition

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

Chair: Hugo Monterrubio
Vice Chair: Mal Swanson

The B1 Working Group met on Monday May 9, 2016 in Denver with 5 members. The group approved the January 2016 meeting minutes. The following items were discussed during this meeting:

1. **NEW Members:** Two new members were introduced to the WG
 - a. Andre Uribe is the incoming I SC Vice Chair replacing Jeff Long
 - b. Galina Antonova is the acting H SC Vice Chair replacing Marc Benou
2. **Awards Database:** The WG review the progress made on building the PSRC individual and WG awards database. In the next phase the WG members will do a final review of the content of this database before making it available to our members via our website.
3. **Awards WG Operations Calendar:** All the IEEE, PES, SA and PSRC awards that our WG typically pursues have been documented and organized in an award index. These awards were then grouped based on their due date to submit nominations and based on that a WG Operations Calendar has been created. This calendar will allow us to be more focused, effective and proactive in identifying and nominating PSRC members in a timely manner. Starting our next meeting in September 2016 the WG will operate and issue awards as follows:

	January	May	September
B1 WG Meeting Main Focus	IEEE Tech Council & PSRC Awards	SA & PSRC Individual Awards	PES Tech Committee & WG Awards
Awards to be Issued during MCM	PES Tech Committee & WG Awards	IEEE Tech Council & PSRC Awards	SA & PSRC Individual Awards

4. **PSRC Awards:** During this meeting the WG discussed and nominated PSRC Members for Individual Awards in the following categories:
 - a. **2015 PES/PSRC Distinguished Service Award** –This personal recognition acknowledges the efforts of an individual whose sustained performance, over many years, has contributed to the advancement of the committee technology.
 - b. **SA Standards Medallion** (Nomination Due Date: July 31 - <https://standards.ieee.org/develop/awards/med/nominate.html>) The Standards

Medallion is awarded for major contributions to the development of standards. Examples include but are not limited to the following:

- i. Leadership in standardization of new technologies
- ii. Assuring achievement of standards development goals
- iii. Identifying opportunities to better serve the needs of standards users
- iv. Other contributions viewed as deserving of such recognition

c. SA Lifetime Achievement Award (July 31 –

<https://standards.ieee.org/develop/awards/lifetime/nominate.html>) This award is presented annually to an individual having a 15+ year commitment to standards development within IEEE and other national and international standards activities who provided significant technical contributions to a standards committee or in their field of interest.

The recipients of the PSRC awards will be announced in the next Main Committee Meeting. For PES and SA awards if successful these will be announced in the following meeting after the award is delivered.

5. **Awards issued at MCM** – The following Individual and WG Awards were issued on Wednesday May 12, 2016 during the Main Committee Meeting in Denver.

Working Group Awards

- a. **PSRC WG Recognition Award – Gary Kobet (Chair) and Alex Lee (Vice Chair)**
WG I7 “Guide Rev of C37.103 Guide for Differential & Polarizing Relay Circuit Testing”
- b. **IEEE PES PSRC WG Recognition Award – Michael J. Thompson**
For his leadership as Chairman of the K Substation Protection Subcommittee
- c. **2015 PES Technical Report** – The 2015 PSRC Technical Report (WG C14) “Use of Synchrophasor Measurements in Protective Relaying Applications” was selected by the PES as the 2015 PES Technical Report. As such it was recognized during the PES Awards ceremony at the IEEE PES General Meeting in Denver, Colorado on July 28, 2016

Jim O'Brien (Chair) and Alla Deronja (Vice-Chair)

WG Members

**Alex Apostolov
Andrew Arana
Miroslav Begovic
Sukumar Brahma
Gustavo Brunello
Fernando Calero
Herb Faulk
Yi Hu
Gary Kobet
Harold Kirkham
Yuan Liao
Chih-Wen Liu
Yuchen Lu**

**Don Lukach
Ken Martin
Joe Mooney
Jay Murphy
Krish Narendra
Damir Novosel
Mahendra Patel
Elmo Price
Sinan Saygin
Veselin Skendzic
Rick Taylor
Demetrious Tziouvaras
Solveig Ward**

Individual Awards

- d. **2015 PSRC Career Service Award – Gerald F. Johnson**
For his commitment and services to the Power Systems Relaying Committee
- e. **2015 Young Professional Award – Claire Patti**
For her commitment and services to the Power Systems Relaying Committee

Respectfully Submitted

Hugo Monterrubio

B1 Chair

B3, Membership Activity Report

Chair: M. Swanson

Vice-chair: Cathy Dalton

Assignment: Assist in searching for new attendees.

Cathy Dalton is our new Vice-Chair: Welcome!

Attendance during the Denver meeting was 250, which might be our highest number.

18 new attendees were in our Newcomers Orientation meeting on Tuesday.

No management support letters were written. As a further note, if any attendee needs stronger management support for PSRC participation, we encourage them to let us know.

One Service Awards was presented.

Regards,

Malcolm J. Swanson
Membership Chairman

B4: O & P Manual and WG Training

Chair: Phil Winston: O&P Manual:

No information available.

Chair: R Hunt: WG Training:

No information available.

B5: Bibliography and Publicity

Chair: T.S. Sidhu

Vice Chair: M. Nagpal

No information available.

B8: Long Range Planning

Chair: Bob Pettigrew

No information available.

B9: PSRC Web Site

Chair: Russ Patterson

No report.

VI. Items from the Main Committee meeting:

- A. There were no new Main Committee members announced
- B. There were no new Fellows announced
- C. There were no Motions from SC chairs to the Main Committee

VII. SUBCOMMITTEE REPORTS

C. SYSTEM PROTECTION SUBCOMMITTEE

Chair: J. O'Brien

Vice-Chair: G. Henneberg

System Protection Subcommittee Scope

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

May 2016 Meeting Minutes

The System Protection Subcommittee of the PSRC met May 11 in Denver, CO in conjunction with the PSRC. The participants introduced themselves. A quorum was achieved (26 of 44 members and 40 guests) and the January 2016 minutes were approved.

Advisory Committee Items of Interest

Timely submittal of WG minutes is important to be able to assemble both the subcommittee and main committee meeting minutes. Most WG chairs already deliver the reports from their computers during these subcommittee meetings. Jim requested that WG chairs submit their minutes by Friday, May 20 to both himself and Gene Henneberg.

C Subcommittee Membership Updates

Rich Young is retiring after this May meeting and will no longer be attending regularly so he has asked to be removed from C membership. Four new members are chairs of "C" Working Groups: Don Ware (C26), Alan Goldstein (C28), Heather Malson (C29), and Michael Higginson (C30).

Working Group Reports

The minutes of the Working Groups are attached.

The C2 Working Group did not meet in Denver, so there are no meeting minutes. The final changes to the report are being compiled and are expected to be issued for C subcommittee review and approval very soon. Subcommittee members are reminded that report review is part of the member's responsibilities.

Old Business

There was no old business.

New Business

There was no new business.

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

Chair: Alex Apostolov

Vice Chair: Roy Moxley

Output: PSRC Report
Draft: Last
Expected Completion Date: September 2016

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

As noted above, this Working Group did not meet in Denver and anticipates completing their assignment prior to the September 2016 meeting, so no meeting is scheduled in Cincinnati.

C-18: Transmission to Generation Interconnection Protection Considerations

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

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

Scope:

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

Purpose:

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

Working group C18 met Wednesday, May 11, 2016, with 18 voting members, 0 corresponding member, and 16 guests present. The quorum was achieved.

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

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

January 11, 2016, meeting minutes; January 28, 2016, webcast meeting minutes; February 11, 2016, webcast meeting minutes; February 25, 2015, webcast meeting minutes; March 10, 2016, webcast meeting minutes; March 24, 2016, webcast meeting minutes; and April 28, 2016, webcast meeting minutes. Motion: Rich Young; Second: Will English. Vote: Approved.

The WG chair then proposed to schedule a couple of more by-weekly webcast meetings, beginning on May 26, 2016, with the plan to finish editing the Guide by the end of June.

The WG reviewed the status of the following missing assignment.

Mike Jensen and Will English will verify the location of Figure 1 as it is related to sub-clause 4.2.1.1.2 *Protection considerations to coordinate with generation facility* and recommend its reference in the text.

The working group then proceeded to review technical issues raised during the spring webcast meetings.

- A new definition was proposed for conventional power plants: Power plants utilizing synchronous generators. There were no comments, and the WG terminology liaison, Yuan Liao, will check to finalize the proposed definition.
- We have introduced several definitions for the line between the transmission system and generation facility: dedicated express line (since retired), direct intertie line, intertie line, direct tie line, and tie line. One consistent definition throughout the document needs to be chosen.

Intertie line was thought to be referring to a line between two transmission systems. Tie line appeared more general and the most appropriate and was approved. The WG terminology liaison, Yuan Liao, will check whether this definition needs to be included in Clause 3.0 *Definitions*.

- The WG reviewed Heather Malson's latest addition to sub-clause 4.2.1.1.3 *Protection considerations to assure power system stability* to refer a reader for further information on out-of-step tripping for transmission lines, which was not considered in the sub-clause. The addition was approved with minor editing.
- The WG addressed another proposed contested configuration to sub-clause 5.1 *Considerations in choosing interconnection configuration*. The WG chair indicated that figure 6(e) was not initially copied to the Guide correctly and presented its correct version. At the last webcast meeting, the WG discussed Mike Jensen's inclusion of yet another figure 6(f) and a paragraph that replaced the paragraph dedicated to figure 6(e) and initially decided not to add figure 6(f).

At the present meeting, Mike Jensen defended figure 6(f) as a valid existing configuration, distinct from almost identical figure 6(c). Mike explained in detail that this is not really a special case, but a consequence of the ring bus interconnection with distribution load, which has some advantages to the tapped interconnection with distribution load presented in figure 6(e). He had a support of another meeting participant.

The WG was OK with keeping both figures 6(e) and 6(f) in the Guide.

Mike will write a new paragraph to accompany figure 6(f). The paragraph that accompanies figure 6(e) earlier contributed by Dean Miller will remain as is.

- The WG re-addressed added figure 11(a) and its paragraph in sub-clause 7.7 *Communication channel implications/transfer trip requirements*. As discussed at the last

webcast meeting, it appeared as a special case and was not favored to be included in the Guide. Mike Jensen who authored figure 11(a) defended it as a legitimate case. He had a support of another WG member.

The WG agreed to keep this example in the Guide. Mike Jensen will expand the paragraph to present other options for this scheme like operating agreements limiting when the generation may operate in order to eliminate the need for transfer trip. The term “Loop Station” will be changed to a different term such as “Station B” and load connection will be shown similar to the representation on the other figures. The breaker on the right side will be open.

Rich Young pointed that Clause 2.0 *Normative references* did not contain any material. The normative references would be chosen from all the references listed in Bibliography, and Rich volunteered for the task.

Action items (tentative due date May 25, 2016):

1. **Mike Jensen** and **Will English** will verify the location of Figure 1 as it is related to sub-clause 4.2.1.1.2 *Protection considerations to coordinate with generation facility* and recommend its reference in the text.
2. **Heather Malson** and **Mike Jensen** will review and re-organize sub-clause 7.8.1 *Tapped interconnections*. They will also review Figure 12 to determine whether it needs to be revised or Figure 10 can be referenced instead.
3. **Yuan Liao** will check to finalize the proposed definition for conventional power plants.
4. **Yuan Liao** will check whether the tie line definition needs to be included in Clause 3.0 *Definitions*.
5. **Mike Jensen** will write a new paragraph to accompany figure 6(f) in sub-clause 5.1 *Considerations in choosing interconnection configuration*.
6. **Mike Jensen** will expand the paragraph for new figure 11(a) to present other options for this scheme that are operating agreements limiting when the generation may operate in order to eliminate the need for transfer trip in sub-clause 7.7 *Communication channel implications/transfer trip requirements*.
7. **John Miller** will re-draw Figure 11(a) in current consistent drawing format.
8. **Rich Young** will select and add normative references to Clause 2.0 *Normative references* from Bibliography.

Requirements for the next meeting: Wednesday 9:30 am single session, meeting room for 35 - 40 people with a computer projector.

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

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

Chair: Vasudev Gharpure

Vice-chair: Mital Kanabar

Output: IEEE Guide C37.246

Draft: 2.2

Established: September 2011

Expected Completion Date: December 2017

Assignment:

Develop a standard for Phasor Data Concentrators for power systems.

16 Attendees: 6 members, 4 corresponding members & 4 guests attended. The meeting roaster is attached.

- 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 project duration and the web meeting / teleconference frequency and schedule.
 - Function description was completed in December 2015
 - Performance requirements outline was completed April 2016. It will be converted to text / paragraph from next.
 - Testing section is the next up for the WG, and needed some discussion.
- Testing
 - A conceptual test configuration diagram was shown
 - An outline of the testing section included in the PDC GUIDE was shown
 - The WG is considering what / how much to include in the testing section in this standard.
 - The WG has considered a few possibilities. These were shown and discussed
 - An informative annex
 - Test equipment requirements
 - A subsection to each function / requirement in the main body of the standard
 - Nothing. Leave it to the PCASC when formed (PDC Conformity Assessment Steering Committee)
 - The group opinion is summarized in the following:
 - Including "Nothing" should not be an option.
 - This should not be left only to the PCASC.
 - The standard must include sufficient guidance to the user.
 - The standard should not include any specific testing implementations.
 - The standard must include requirements that are testable – clear, concise, unambiguous.
 - If there are any areas that may be prone to multiple interpretations, the standard should provide clarifications. This may happen if different testing labs interpret the requirements differently.
 - The standard must clearly define a PDC.
 - A discussion on the "garbage" data test / requirement. The group's opinion was:
 - There are multiple methods and an infinite range of data. The standard must pick a few options and specify them as the test requirement.
 - These may include "denial of service" type of attacks.
 - A discussion on whether there should be a separate section on testing, with a one to one correspondence to each function / requirement, or should there be a subsection next to each of these?
 - If a testing requirement is mandatory, and clear enough and unique enough for each function / requirement, it can be included as a sub-section in the body of the standard.
 - There should be a separate, informative section on testing, with a one to one correspondence to each function / requirement (as applicable).
 - The standard should use the verbs "should", "shall", "can", "may" etc. selectively and appropriately. IEEE have explicit guidelines for this.
 - An example was given – an impulse test: it spells out the exact testing requirement.
 - The standard should include the uncertainties (TUR – test uncertainty ratio) that may result due to the nature of the function / testing equipment. An example given was the latency function. S operation will depend on the task priorities /

- latencies of the operating system task scheduler, such as Windows.
- This may be an annex or a main section. As far as possible, it should include explicit tables of requirements. These will make the requirements clear, and leave little room for differing interpretations.
- A discussion on data rate conversion. After a swirl of discussion, the following conclusion was reached.
 - It was emphasized that decimation of data should not be permitted without filtering. effectively, data rate conversion to lower data rate should not be permitted. The function should be modified so the data rate should be stepped up, with “data unavailable” tags inserted.
- The latest document draft should be circulated to the group as soon as possible.

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

Chair: Joe Mooney

Vice Chair: Ian Tualla

Output: PSRC Report

Draft: 1

Expected Completion Date: May 2017

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

The Working Group met Tuesday afternoon with 33 attendees; 5 members and 28 guests.

Since there were a number of guests, the WG Chair provided a brief summary of the background and purpose of WG group. WG Chair noted that several writing assignments remain outstanding and requested volunteers. It was noted that overall use of symbols, including transformers, lacked consistency. The WG vice chair sent the templates of standard ANSI symbols (Microsoft VISIO) to the WG members. The plan is to have the authors update their figures utilizing these standard ANSI symbols. The WG reviewed and discussed the most recent Draft of the Technical Report. WG Vice Chair contacted the assigned authors of outstanding writing assignments for details on the status of those assignments via email and no response was received. WG guest asked if paper will include filter banks and WG chair responded with yes. WG member commented on including new cable technology in report and it was noted. WG chair showed a presentation on HVDC transmission and background technology.

Report Outline

1. Introduction to HVdc Technology
2. Reasons for Using HVdc
3. VSC Description/Technology
 - a. Converter Technology
 - b. Harmonics and Filtering
 - c. Control systems, start-up and shut-down, DC protection
 - d. HVdc response to AC system faults
 - e. AC system response DC faults
4. AC System Protection
 - a. Converter Terminal AC Protection (converter transformer, bus, filter banks)
 - b. AC line protection (overcurrent, distance, differential)
 - c. Communications related to line protection
5. Field Experience
6. Communication between HVdc and AC systems

Next meeting Requirements [September 2016]: one session, 40 attendees, computer projector.

Meeting adjourned @ 17:30 local time.

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: 0.10

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, May 10, 2016 in Denver, CO in a double session chaired by Yi Hu and Gene Henneberg with 13 members, and 6 guests attending one or both sessions. Each session of the meeting was started by 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).

We received enough participation and affirmative votes for the January 2016 meeting minutes to achieve a quorum with combined electronic and in-person votes at this meeting.

The most recent draft 0.10 was distributed via email to WG members last week. This draft includes contributions from Bonian Shi and Phil Beaumont that were not available in January 2016 meeting.

WG members had a discussion on the content of several parts of Section 5. The WG concluded after a good amount of discussion that section 5.2.2 should describe "*Coordination considerations in SIPS engineering design*" rather than the original "*Criteria for allocation of responsibilities between SIPS and load dispatching system*". Dean Miller volunteered to contribute this section. WG members also discussed the section 5.2.11 "*Design for management of NCRE (non-conventional renewable energy) on congested transmission lines*", and agreed to remove it as there is insufficient information to include this section in this guide.

All sections except for section 6.2.4 "*SIPS training*" have received initial full or partial contributions. WG chairs will follow up with assigned WG members for sections with partial or no contributions to obtain full contributions for these sections before September 2016 meeting.

There was a lively discussion on section 5.2.4 "*SIPS architectural choices*". There was not complete agreement on whether SIPS architectures can only be classified as either distributed or centralized. The WG seemed to be approaching a conclusion that in addition to "Distributed" and "Centralized" architectures there may exist other types of architectures, something like "hierarchical", that would cover a range of implemented SIPS. Fernando Calero agreed to edit this section based on the WG discussions.

Manish Patel volunteered to review and edit section 5.2.3 "*Selection of type of SIPS in accordance with target power system phenomena*".

Yi and Gene will draft some editing guidelines for other WG members to use in their review and editing efforts as the WG revises the draft Guide. For example there was a discussion of

further focusing the content in the main body of the guide on SIPS. Parts of the present draft covered subjects that are important to SIPS, but may also be equally important to other aspects of protection engineering. These may be included fully as in the present draft, as Appendices, or simply by reference, depending on the WG decision.

WG Chairs will send this May 2016 meeting minutes to WG members for electronic approval.

Requirements for September PSRC meeting in Cincinnati, OH – Room for 20 people, double session, projector.

C-23: Coordination of Synchrophasor Related Activities

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

Vice Chair: Allen Goldstein

Output: Ongoing Liaison

Completion: Ongoing Liaison

Assignment:

The ongoing working group will provide three main functions:

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

Meeting Agenda

1. Introductions
2. Approve of the Jan. 2016 meeting minutes – Deferred to email ballot due to lack of quorum
3. NASPI Update
 - a. NASPI Meeting in Atlanta in March.
 - b. NASPI Technical Workshop: Synchrophasor Data Quality Management and Improvement
 - c. NASPI International Synchrophasor Symposium
 - d. Presentations have been posted for both the Workshop and Symposium
 - e. NASPI PMU Applications Requirement Task Force (Part F)
 - f. Next Meeting October 19-20, Seattle WA. Call for abstracts on www.naspi.org
4. IEEE Workgroup Activity

	Title	Status
PSRC C19	PC37.247 Standard for Phasor Data concentrators	In Progress
PSRC C28	IEEE Guide for Synchronization, Calibration, Testing and Installation of PMUs	In Progress
PSRC H11	Synchrophasor Standards Working group	In Progress

(C37.118.1)		
PSRC H21	Standard Mapping between C37.118 and IEC 61850-90-5	In Progress
PSRC HTF36	Revision of C37.118.2	In Progress
Substation C20	Recommended Practice for Databases used in SAS	In Progress
IEEE SCASC	Synchrophasor Measurement Conformity Assessment Steering Committee	Standing
IEEE SDCASC	Synchrophasor Data Conformity Assessment Steering Committee	On Hold

5. Old Business
6. New Business
 - a. NASPI PARTF Discussion – Provided discussion of task force work.
 - b. Update NASPI on the status of IEEE Synchrophasor related Standards. We will prepare a presentation for October NASPI meeting.
 - c. NIST workshops
 - i. October – Time Synch issues
 - ii. March – Gathersburg MD,
 1. March 21, NIST – Alternate method of time distribution
 2. March 24, NIST – Advanced Power System Sensors.
7. Adjourn

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

Attendance: 6 Members, 14 Guests.

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 January 2016 meeting.
3. Discussion of WG survey and updated manufacturer responses
 - a. Type IV updates from Siemens
 - b. Type III updates from GE

- c. No response from Enercon
 - d. Grid Codes – Charlie Henville
4. Discussion of implementation of EPRI models in ASPEN and CAPE & relation to manufacturers responses
 5. Future course of action for the working group.
 6. Adjourn

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

There was a question whether the scope of the WG includes also models for solar PV models. The group discussed that for utility scale installations the PV inverter controls may be similar to the Type IV wind turbine inverter controls, so the Type IV model that is being developed could be used. The distribution connected solar PVs that do not have fault ride through capabilities are not part of the scope of the WG.

Then the WG chair and vice-chair described to the attendees the correspondence that has been carried on with Siemens for the Type IV WTG model since the January 2016 meeting. The questions that were raised by the WG during the January 2016 meeting had been sent to Siemens; Siemens provided responses which were presented to the attendees. There was a consensus that the information provided by Siemens is sufficient to develop a draft version of the Type IV WTG model in commercial fault calculation programs. Also it was discussed that there is a need for an iterative solution for the models in the commercial programs since the fault response of these devices is nonlinear.

For the Type III WTG model, GE restated through email correspondence prior to the meeting that they will generate and provide data to the WG within the next few months. No response has been received by Enercon.

Then EPRI provided a short progress update on the development of the EPRI models and presented how they are related to the Type IV model information that Siemens has provided. It was reported that EPRI had face-to-face meetings with both ASPEN and Electrocon (CAPE) in March and April, and implementation of a draft version of the models is in progress by both commercial fault calculation program vendors.

A set of technical papers on grid codes was provided by Charlie Henville, and they were sent to the WG members and guests.

Finally, the WG agreed to start drafting the report describing the Type IV WTG model. An outline will be presented for discussion at the upcoming WG meeting in September 2016.

There were total 39 attendees in the meeting, 12 members and 27 guests.

For the next meeting in September 2016, we need a room with capacity of 30, and a computer projector. Please avoid conflict with WG C25.

C-25: Protection of Wind Electric Plants

Chair: *Martin Best*

Vice Chair: Keith Houser

Output: PSRC Report

Draft: 2.2

Established: September 2013

Completion: December 2018

Assignment:

Write a report to provide guidance on relay protection and coordination at wind electric plants. This report will cover protection of generator step up transformers, collector system feeders, grounding transformers, collector buses, reactors, capacitors, main station transformers, tie lines and points of interconnection and associated arc flash issues. Although the report will address coordination with wind turbine generator protective devices and static var sources, the protection of the wind turbine generators and static var sources will not be included.

Working Group [WG] C25 met in Denver, CO on Wednesday, May 11, 2016 at 08:00 with 10 members and 13 guests. The Vice-chair conducted the meeting. Raluca Lascu agreed to take the meeting minutes. Copies of the agenda, January 11, 2016 meeting minutes and Draft 2.2 of the Report were distributed to Working Group guests.

After introductions, the January 11, 2016 meeting minutes were cited for comment, additions or corrections; none were made. The Vice-chair called for a motion to approve the meeting minutes. Sukumar Brahma motioned for a vote of approval. The WG approved the C25 Meeting Minutes from the January 11, 2016 meeting in Memphis, TN.

The Vice-chair made an appeal for members to offer contacts/contact leads with knowledge of offshore Wind Plant design. The WG leadership will continue to identify and pursue acquisition of that expertise into the WG.

The WG then reviewed Report Draft 2.2 at the line level and it was noted that a few of the previously assigned section writing assignments had not yet been received. The Vice-chair will individually contact assigned contributors in the next two weeks to follow-up on the outstanding assignments.

Subsection 1.2, sentence four was revised to read: "By comparison, a large modern wind powered generation plant will have large number small generators – that is, perhaps 80 to 100 turbines each 1.5 MW to 5 MW ~~or so~~ in size."

WG members also noted that there is possibly inconsistency in either the font type or the font size, or both in the report. Attention to this detail needs to be addressed, now or during the general editing phase of the report.

In Subsection 2.1, paragraph 2, sentence four was revised to read: "Although collector systems are normally operated at the highest ~~medium~~ distribution voltage (34.5kV in North America ~~or~~ ~~33kV in Europe~~), they are sometimes designed to operate at a voltage as low as 12kV depending on the available substation voltages.

The WG proposed combining the first and third paragraphs of Subsection 2.1 in order to better contrast the differences between overhead and underground collector system designs while eliminating redundancy of factors influencing those designs.

The WG questioned the meaning of 3.3kV/6kV as used in paragraph five of Subsection 2.1. The Vice-chair explained his interpretation was: in a wye system he has seen the voltage referenced as phase-ground voltage/phase-phase voltage with the phase-phase voltage sometimes rounded. Therefore, we see 3.3kV/6kV instead of 3.3kV/5.97kV. However, the Vice-chair will take an Action Item to contact the author, and verify this is the referenced case. If this is not the case, the sentence will be modified to include only the phase-phase voltage: 6kV.

In Subsection 2.2, paragraph 1, sentence two, the WG resolved the use of medium-voltage bus and high-voltage bus to be both correct and the least confusing way to present that content. Therefore, this sentence will remain as written.

Also, in Subsection 2.2, paragraph 1, sentence two, the WG resolved the use of the abbreviation ST for Substation Transformer should be removed (and in the abbreviation section); Therefore, the term Substation Transformer should be spelled out every place it is used in this report.

Also, in Subsection 2.2, paragraph 1, the last sentence: "Figure 2(c) indicates that a ST with the delta connection on the collector side requires some other means (e.g., a grounding transformer connected to the medium-voltage side) to provide adequate grounding when the substation collector breaker is open" needs to be corrected. This statement is not technically correct as it is presented and as illustrated in Figure 2(c).

A general editing note from the WG is the consistent use of North American symbols such as transformers (instead of using European symbols). Corrections should begin whenever a Figure is assigned for revision and then expanded throughout the entire report during general editing work.

Also, in Subsection 2.2, paragraph 2, the first sentence: "Collector substations for WPPs typically use an open-air bus design with single bus or sectionalized bus arrangements [1]" needs revision. Both open-air and enclosed switchgear are utilized.

Figure 3 needs to be modified to focus on the concepts of single transformer/bus and dual transformer/bus configurations without confusing the element of transformer connection (and supplying a ground reference).

Figure 5(c) needs to be updated to show the more standard interconnection of generation into a system (higher reliability design configuration).

Table 1 needs to be revised to include Xs in the Double Breaker – Double Bus line of the table at a minimum. A better solution might be to include another column to better identify where applicable. Vice-chair to check reference to further clarify the source of this information and report back to WG.

WG members should plan on the completion and submission of the outstanding writing assignments no later than the last Friday of June 2016 [June 24, 2016].

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

Meeting Adjourned @ 09:18 MDT.

Respectively Submitted 5-11-2016, Raluca Lascu

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

Chair: Don Ware

Vice Chair: Matt Black

(Mark Siira assisting in absence of Matthew Black)

Output: IEEE Guide, C37.233

Draft: 0

Established: January 2016

Completion: November 2019

Assignment: Revise C37.233 Power System Protection Testing Guide

This was the second meeting as a Working Group. The C26 working group met in a single session on Tuesday May 10 with 17 people raising their hands as members. All those members voted to approve the minutes from the first working group meeting from January 2016 in Memphis, TN.

After reviewing the initial membership list from January 10, 2016 meeting of the original 22 members that were present then and by the end of our meeting, 10 new members have signed up. Attendance for our meeting was 20 members and 9 guests. The membership lists will be revised.

Introductions were done; Patent slides were presented with patent statements made, and the working group assignment with the expected dates of completion stated.

Don Ware attended a class prior to the meeting on the "Responsibilities of a Working Group Chair" and stated that the expected editable WORD document draft of C26 will be provided to all members in the next few weeks as promised by our IEEE representative.

Alternatively, we can use the draft with IEEE template and clause numbers applied that Mark Siira submitted. Noted is the draft that was submitted had no clause numbers, making editing and comparison to the 2009 draft difficult.

Assignment update of review of document sections is as follows:

6.2 – Eugenio Carvalheira – some comments received, not complete

6.3 – Scott Cooper – **received - complete**

6.4 – Brian Boysen – not yet

6.5 – Guillermo Weyer – not present, no response; not yet

6.6 – Guillermo Weyer - not present, no response, not yet

6.7 – Don Ware – **received – complete**

6.8 – Nestor Casilla – **not received – complete**

6.9 – Sungsoo Kim – not yet

6.10 – Mike Stojak – **not received - complete**

7.1 – Jeff Brown – **received – complete**

7.2 - Jun Verzosa – **not received – complete**

7.3 – Andre Uribe with assistance from Adrian Zvarych – **received – complete**

Sections 8 & 9 – Mark Siira – not yet, but has received approval to use technical papers as reference

Annex E – Jeff Brown – not yet

New assignments to review document sections are as follows:

1 – 2 - Andre Uribe

3 – Yuan Liao

4 – Steve Turner
4.3 – Brian Moores
4.6.4 – Jun Verzosa
5 – Steve Turner
6.2 – Jeff Brown and Eugenio Carvalheira
8 – Mark Siira with assistance from Karl Zimmerman
9 – Mark Siira
Annex B – Eugenio Carvalheira

Assignment Due date - August 1, 2016

Vahid Madani made comments stating to add tools within revised document and state informative references at end of document.

Also, Vahid stimulated conversation about security and there was discussion about NERC/CIP and the challenges it now brings with security issues, etc. There is some mention within section 1.7.6 for reference.

Jeff Brown volunteered to provide more information on NERC/CIP.

Note to Don Ware to send reminders by July 15, 2016 to volunteers on assignment progress to remind them of due date of August 1, 2016.

The next meeting will require a computer projector, a room for 40, and a single session. No conflict with K16, I25 and I32 is requested.

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

Chair: Allen Goldstein
Vice Chair: Harold Kirkham
Output: IEEE Guide, C37.242
Draft: ?
Completion: **November 2019**
Established: September 2015
Completion: TBD

Scope:

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

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

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

Introductions

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

Minutes presented and approved unanimously.

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

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

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

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

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

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

Call for new business: there is none.

Latest Draft will be distributed next week.

Adjourn.

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

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

Chair: Heather Malson

Vice Chair: Mike Kockott

Output: PSRC Report

Draft: 0

Established: January 2016

Completion: TBD

Initially Proposed WG Assignment: Create a report on test instructions/parameters to accompany the [J5 Application of Out-Of-Step Protection Schemes for Generators and D29 Investigate the need for a guide for OOS protection applications to Transmission lines working](#)

group documents 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.

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

1. Introductions/ Sign-up sheet
 - a. Attendance: 16 Members, 28 Guests. 44 Total
2. Review Assignment / Modifications to Assignment?
 - a. Assignment text was edited without changing scope of assignment
 - b. A request was made to broaden scope followed by discussion. The request did not have support from the group.
3. Review notes from January meeting.
 - a. Will be distributed with May notes again for review by attendees.
4. Open discussion – new items for consideration - None
5. Presentations - None
6. Review/Edit/Draft Outline
 - a. Proposed outline was reviewed and edited. A clean and redline copy will be provided for review and comment by email.
7. Other - None
8. To do list for September
 - a. Plan to assign writing sections in September
 - b. Any presentations, contact Heather and/or Mike for scheduling
9. Meeting concluded on time.

Draft Outline Sections for Report

1. Introduction
 - a. Background, Scope, Purpose
 - b. Applications
 - c. Audience and assumptions on experience
 - d. Suggested References – “before using this document...” (not the same as bibliography) and documents we are supporting – D29 and J5 outputs
 - e. Definitions – references may be enough from other documents, certain terms to be considered so that it is a stand alone document.
2. Test Equipment and Environment
 - a. Equipment Types and variations affecting test methods
 - b. Lab tests
 - c. Field Tests
 - i. Safety
 - ii. Energized and Isolated
 - iii. De-Energized
3. Types of Tests

What, why, goals, how to determine method of testing, desired results – know your system and the area of interest if it may impact your testing

 - a. Static
 - i. Description
 - ii. Test purpose/specifications
 - iii. Advantages, disadvantages, and challenges
 - iv. example of sample test data – not HOW, just output here
 - b. Dynamic
 - i. Description

- ii. Test purpose/specifications
 - iii. Advantages, disadvantages, and challenges
 - iv. example of sample test data – not HOW, just output here
 - v.
 - c. Transient
- 4. Test Data Formats and Creation*****add J5 info
 - a. Static
 - i. Discrete Points
 - ii. Zones – blinders and distance for evolving events
 - iii. Timers
 - iv. OOT
 - v. Blocking
 - vi. Evolving events – monitoring
 - vii. Logic as applicable - supervision
 - b. Dynamic
 - i. Pseudo-dynamic files (enough discrete points to closely resemble a dynamic playback)
 - ii. COMTRADE files
 - iii. Other playback files – real events
 - iv. Zones– blinders and distance for evolving events
 - v. Timers
 - vi. OOT
 - vii. Blocking
 - viii. Evolving events – monitoring
 - ix. Logic as applicable - supervision
 - c. Transient
 - i. Pseudo-dynamic files (enough discrete points to closely resemble a dynamic playback)
 - ii. COMTRADE files
 - iii. Other playback files – real events
 - iv. Zones– blinders and distance for evolving events
 - v. Timers
 - vi. OOT
 - vii. Blocking
 - viii. Evolving events – monitoring
 - ix. Logic as applicable - supervision
 - x.
- 5. Interpreting Test Results/Troubleshooting with Relay Setter – always get event reports ☺ - examples, indicators,etc., for pass, fail, who knows?
 - a. Pass/Fail are evident
 - b. Results are inconsistent – pass and fail in multiple attempts
 - c. Results are unexpected – various reasons
 - d. All else – call application engineers...

C-30 Microgrid Protection Systems

Chair: Michael Higginson

Vice Chair: Fred Friend

Output: PSRC Report

Established: January 2016

Expected Completion Date: December 2018

Assignment

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

May 10, 2016
Denver, CO

The first working group meeting was conducted on Tuesday morning at 8:00 am with 27 attendees, 20 requested membership.

The Chair opened the meeting with introductions and began a review of a proposed outline. Discussion involved nanogrids, which is out of scope for this document; the various other microgrid definitions, both US and international; what is in scope, voltage level (medium voltage power systems), DC micro grids (no), hybrid microgrids (no).

The outline was revised and writing assignments were made, which are due by August 15:

1. Introduction (Vahid Madani will coordinate with Mani Venkata and Ratan Das)
 - a. Definition of Microgrid – Propose DOE definition
 - b. Modes of operation
 - c. Protection architecture
2. Challenges of Microgrid Protection
 - a. Variable Fault Current Levels (Sukumar Brahma and Rob Fowler)
 - i. Sensitivity of protection system
 1. Detection of fault currents
 - ii. Maintaining security accuracy for high fault current levels when grid-tied
 - b. Bi-directional fault current flow (Michael Higginson)
 - i. Achieving selectivity
 1. Avoiding unnecessary DER unavailability as a consequence of protective device trip for both faults inside and outside of microgrid
 - ii. Ensuring fault is isolated from all sources
 - c. Utilizing protection to detect loss of source (single or three phase) (Mouad Oubidar)
 - i. Riding through temporary utility system faults
 - ii. Isolating immediately for faults on the utility system
 - d. Re-synchronization (Ratan Das will coordinate with Mani Venkata and Yuan Liao)
3. Potential Solutions to Challenges of Microgrid Protection
 - a. Carefully selecting protection equipment to ensure that all system protection requirements can be met (Mike Bloder)
 - b. Available Solutions
 - i. Adaptive relay settings (Mike Kockett)
 1. Methods of adapting settings
 - ii. Communication-based protection schemes (Bruce Mackie)
 - iii. Customized logic to detect system fault conditions (Lifeng Yang)
 - c. Emerging Technologies
 - i. Signal processing-based approach (Sukumar Brahma)
4. Conclusion (Michael Higginson and Fred Friend)

D: LINE PROTECTION SUBCOMMITTEE

Chair: G.L. Kobet

Vice Chair: K.V. Zimmerman

The Subcommittee meeting was called to order on Wednesday, May 11, 2016 with 27 members and 30 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).

Minutes from the September 2016 meeting in Memphis were approved.

The Chair reviewed items of interest from the Advisory Committee.

Working groups gave reports on their activity.

Reports from the WG Chairs:

D19: PC37.113, DRAFT Guide for Protective Relay Applications to Transmission Lines

Chair: Don Lukach

Vice Chair: Jeff Barsch

Chair Emeritus: Rick Taylor

Chair Emeritus: Mohindar Sachdev

RevCom approved in December 2015

Scope: Concepts of transmission line protection are discussed in this guide. Applications of these concepts to various system configurations and line termination arrangements are presented. Many important issues, such as coordination of settings, operating times, characteristics of relays, impact of mutual coupling of lines on the protection systems, automatic reclosing and use of communication channels are examined. Special protection systems, multi-terminal lines and single phase tripping and reclosing are also included. The impact that system parameters and system performance have on the selection of relays and relay schemes is discussed as well.

WG Guide (First proof from IEEE SA Editorial)

The D19 working group met in a single session on Wednesday, May 11, with 8 of 20 (40%) balloting members present. Also in attendance were 1 corresponding member and 16 guests.

The September 2015 meeting minutes from La Jolla, CA will be emailed to the WG for approval.

The WG discussed the status of the guide. Don Lukach and Jeff Barsch will address the comments provided by the SA editorial review. The WG reviewed a few comments.

- Joe Mooney will look at Figure 35 to determine if the symbols used for the different curves can be made more distinguishable.
- Comment AB61 was discussed. The sentence may be removed or rephrased to eliminate confusion with the reference to Figure 76.
- Gary Kobet will check to see if he has access to reference [B22]. The reference as shown is missing some of the authors' names.

The WG discussed a summary paper. Assignments were made for the summary paper outline. A new working group will be formed to write this summary paper. Writing assignments are due by August 8, 2016.

The WG discussed possible locations for presentation of the summary paper. Possibilities include the 2017 Western Protective Relay Conference, the 2018 Georgia Tech and Texas A&M relay conferences, the Minnesota relay conference, and the PAC World conference. The new working group will address all the presentations.

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

Chairman: Brian Boysen

Vice Chair: Claire Patti

Established: 2013

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

Draft :1.13

Expected Completion Date: 2018

Assignment: To review and revise C37.230-2007, “Guide for Protective Relay Applications to Distribution Lines” to correct errors and address additional distribution line protection related topics.

The working group in Denver, CO on Tuesday, May 10, 2016, 1:30 pm MDT.

There were 22 members and 14 guests. The attendance list is attached.

The patent slides were presented.

Meeting minutes from January and April minutes were presented and approved.

Working group reviewed the guide starting with section 9: Smart Grid and Distribution Automation.

The revised section 7.2 was presented to the working group by Karl Zimmerman. The working group discussed the use of terms coordination margin vs. coordination time interval (CTI). Working group is fine with coordination margin, but will add “as known as coordination time interval” to the section 7.2.

Working group discussed the practice of showing either the nominal or response band curves on TCC plots.

6.1.1 and 6.1.2 were removed as they duplicate parts of section 7.

Bruce Mackie presented the results of his research on the use of undervoltage loadshedding schemes.

Removing section 5.1.4 Bus Configurations was discussed but no decision was reached.

Assignments:

The following new assignments were made:

- Mike Meisinger is going to write something up to describe the two methods of showing coordination curves and what factors influence the section of a coordination margin
- Mike Meisinger is going to review section 9: Smart Grid and Distribution Automation.
- Bruce will provide some guidance on setting UVLS relays to be added to Section 8.3 Loadshedding
- Umer Usman, David Aldrich, and Craig Holt will review the entire document and review for consistency and flow. Umer will lead this group.
- Fred Friend will provide his terminology research

The following assignments are outstanding:

- Raluca will look for the other section on protection of undergrounded systems.
- David Aldrich will look at adding information on automatic restoration to 8.3 Underfrequency Load Shedding.
- Randy Crellin will review and revise section 8.7 Communications – missing figures

Most assignments are due June 30th. Central Desktop updates are preferred.

New Business:

- Randy Crellin reported that some figures are missing from section 8.

Old Business:

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

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

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

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

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

D29: CHAIRMAN: Normann Fischer
VICE CHAIR: Kevin W. Jones

ASSIGNMENT:

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

OVERVIEW:

Normann Fischer began the meeting by giving an overview of the agenda.

Introductions followed the agenda overview. The group met with 19 members and 28 guests (Member who have not attended three consecutive meeting without notifying the chair, will be converted from members to guest).

Meeting minutes from the January, 2016 meeting in Memphis, TN were review. Normann Fischer made a motion to approve. Kevin Jones seconded the motion. Hearing no objections, the previous meeting minutes were approved.

Jörg Blumschein with Siemens gave a presentation on the Siemens continuous impedance monitoring out-of-step algorithm. The presentation was well received and many questions were asked and addressed.

The writing assignment was reviewed. Additional assignments were made and documented in the master writing assignment document. Reviewers were assigned/re-assigned to review and provide comment on the un-reviewed sections previously written. This document will be re-distributed to members and guests by Normann Fischer after the May meeting.

Jörg Blumschein with Siemens will give a presentation at the next meeting on the Siemens setting-less power swing method. Demetrios Tziouvaras will give a presentation at the next meeting on the Swing Center Voltage setting-less method.

Additional studies will be performed on the D29 test system by Kevin Jones, Phil Tatro and Manish Patel using PSS/E, by Joe Mooney using RTDS, and by Demetrios Tziouvaras using Power World. The results will be compared and presented at the next meeting.

The meeting was adjourned.

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

Chair: Karl Zimmerman
Vice-Chair: Ted Warren
Established: Jan 2014

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

The working group met in Denver on May 10, 2016 with 15 members and 17 guests.

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

Christopher Walker delivered an excellent presentation of his Draft 0 write up on the effect of zero-sequence mutual coupling on ground distance elements. He covered several arrangements of parallel lines, and the over- or under-reaching impact of the induced zero-sequence mutual current. He also covered several corner cases, and some other cases were discussed. All in all, very fruitful discussion. We appreciate the efforts and expertise delivered by all of the participants.

As for format, the WG settled on a "textbook" style using the Word format. It is easier to edit, and could be transferred to a powerpoint format in the future. Also, each section will be treated as a separate

“chapter” of the tutorial. This will make the document easier to edit and present moving forward, and minimize the effect of different writing styles.

We made a few additional writing assignments. Now, all authors are asked to adapt their material to the Section 2 and 3 write-up, which the WG Chair will distribute to everyone.

D31: Summary presentation for C37.114 Fault Locating Guide

WG Chair: Joe Mooney

Vice Chair: NA

Assignment: Create summary presentation for the latest revision of the C37.114 Fault Locating Guide for presentation at the Main Committee meeting.

Expected Completion Date: January 2016

Joe Mooney presented the summary presentation at the Main Committee Meeting. WG D31 did not meet at the next PSRC meeting.

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: 1.1

Working Group D32 met on Tuesday, May 10, 2016 at 3:00pm MDT in a single session with 7 members and 9 guests.

After introductions, the previous minutes were reviewed.

Draft 1.1 of the paper with review notes was distributed. The review notes were discussed and corrections made as necessary. The document has been completed. After the meeting, the document will be emailed to the working group members so the members can vote for approval for the document to be submitted to the sub-committee for their approval.

The draft presentation was also discussed. The presentation will be made available to anyone making a presentation at a conference and that individual can edit the presentation as needed.

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:

1. DTF33 met on Tuesday, May 11th, 2016 with 16 attendees. 3 signed members.
2. DTF33 Chair and attendees proceed with introductions, and attendance sheet sign in.
3. DTF33 Chair discussed the Agenda, and provided details on CIGRE Working Group TOR-JWG C4_B5.41 first and second meetings from May and November, 2015, and indicated to audience that we have a pending input status on CIGRE 3rd meeting from April, 2016 from Russ Patterson to understand further actions within DTF33 Task force.
4. Chair presented the CIGRE Working Group TOR-JWG C4_B5.41 Draft content of the Technical Brochure that was discussed on the previous CIGRE WG meeting.

5. Chair indicated that on previous DTF33 task force meeting in January 2016, discussions on the possibility of collaboration in parallel with the CIGRE WG members on the development of the Technical Brochure, was not going to be pursued. Major reason is delivery timeline, since CIGRE is scheduled to complete their work by end of 2017.
6. Chair indicated that DTF33 instead of collaboration in parallel and making sections contributions on the development of the CIGRE technical brochure, IEEE PSRC DTF33 task force members focus discussions on an assignment to providing input/comments on their technical brochure draft work.
7. DTF33 chair proposed to keep IEEE DTF33 task force open until we received Russ Patterson input from CIGRE on the proposed DTF33 assignment : **“To Provide Comments to CIGRE Working Group TOR-JWG C4_B5.41 Technical Brochure: Challenges with series compensation applications in power systems when overcompensating lines.”**
8. Chair provided input/comments from DTF33 members/participants on last meeting with respect to propose IEEE PSRC task force to look into **“Line Protection design considerations and implementation challenges when applied on series compensated power systems”** to explore the need of having a dedicated document that will look deep into this subject.
9. The proposed statement of the requested New Task force is **“To submit a document to the PSRC D Line Subcommittee to evaluate and provide recommendations on application challenges related to transmission Line protection implementation on series compensated systems, and the effects of system topology, level of compensation, short-circuit current contributions, protection scheme, and experiences on performance of protection systems during Disturbances on series compensated lines.”**
10. DTF33 will be scheduled to meet on September, 2016, contingent on Russ Patterson input from CIGRE 3rd meeting from this past April, 2016.

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

CHAIRMAN: Normann Fischer

VICE CHAIR: Joe Mooney

ASSIGNMENT:

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

MINUTES:

The working group meet with 5 members and 2 guests. Since the 1st draft from the IEC was only received two weeks prior to our meeting in May no one had the opportunity to review the documents and as such no comments could be made.

The chair requested that all comments from this draft be sent to him by the middle of August so that he can combine all the comments in preparation for the September meeting.

DTF35 Investigate Need for WG to Evaluate Line Protection Schemes

Chair: None (Gary Kobet as D-SC Chaired this meeting)

Output: Recommendation for Assignment to Subcommittee

Established: September 2015

Expected completion date: September 2016

Assignment: Investigate the need for a working group to produce a report to evaluate line protection schemes.

Task Force DTF35 held its meeting in a single session on Tuesday, May 10, 2016.

A total of 35 attendees were present, nine of whom volunteered to be TF members.

The actual purpose of this task force remains unclear, but again there appears to be considerable interest.

Since January there were no citations provided for related technical papers.

Jeff Brown did provide SERC documents and Federico Lopez did provide CIGRE documents related to this subject. These will be distributed to all January attendees and to attendees from this meeting who agreed to serve on the task force.

Karl Zimmermann volunteered to lead a small team to write a proposal for a definite assignment and to lead the task force in September.. Volunteers for the team included Mike Kockott, Alla Deronja, Rick Gamble, Iza Pomales, Ted Warren, Nathan Gulczynski and Jay Anderson.

The volunteers will review C37.113 and other references to validate that the assignment is valid and is not a re-do of previous work.

A first draft proposed assignment is:

"Prepare a technical report to the line protection subcommittee to evaluate advantages and disadvantages of common transmission line protection schemes, including step-distance, POTT, DCB, and line current differential. The schemes will be evaluated in terms of speed, sensitivity, dependability and security. A limited number (3 to 5) of example systems will be evaluated."

The assignment may change after we review C37.113 -- for example, the assignment may focus on expanding on a certain section of C37.113.

Coordination Reports

T&D Committee / Distribution Subcommittee

The next T&D Committee / Distribution Subcommittee meeting will occur during the PES GM in Boston, MA, 18-20 July 2016.

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

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

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

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

Continued discussion on developing the Smart Distribution Application Guide, P1854

Scope: This guide categorizes important smart distribution applications, develops descriptions of the critical functions involved, defines important components of these systems, and provides examples of the systems that can be considered as part of distribution management systems or other smart distribution systems. Gaps were identified and request assistance with development of a section on Advanced Protection, specifically impact of distributed generation.

Two panel sessions are planned for the IEEE PES 2016 General Meeting in Boston, MA:

Session 1 'Protection design for Micro Grids', Chair: Georges Simard and Nouredine Hadjsaid

Session 2 'Distribution planning under uncertainties', Chair: Georges Simard and Nouredine Hadjsaid

Volt-VAR Control Task Force

Work continues on P1885 'Guide for Assessing, Measuring and Verifying Volt-Var Control Optimization (VVO) on Distribution Systems'. Balloting is expected to begin in 2016.

A tutorial on Distribution Volt-Var Control and Optimization is planned for the 2016 GM in Boston. The tutorial will cover basic principles, approaches, challenges, results as well as case studies from GA Power, BC Hydro, and Duke Energy.

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

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

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

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

Old Business

No old business to discuss.

New Business

Luis Polanco brought before the Subcommittee the possibility of forming a new task force for the purpose of evaluating line protection for series-compensated lines. Luis will use the new suggested form and submit at or before the next subcommittee meeting.

General Discussion

None

Line Protection operations of interest

Aaron Martin presented an interesting line operation.

The meeting adjourned.

H: RELAYING COMMUNICATIONS SUBCOMMITTEE

Chair: Eric Allen

Vice Chair: Galina Antonova

The Subcommittee met on May 11 with 21 members of 39 total, comprising a quorum. 32 guests were also present. Minutes of the January 2016 meeting were approved without objection.

The Chair presented several announcements:

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

WG business:

WG H22 is changing their title (added Control) and will make more changes and submit PAR revision by Sept 2016.

WG H31 changed their output from a Guide to a Report which was approved by the SC.

WG H33 and H34 were disbanded after a vote was taken. 10 members voted in favor of disbanding the two working groups and 4 members opposed.

Old business:

None

New business:

Herb Falk suggested to post PSRC agenda earlier, before the deadline for hotel booking expires.

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 6 members and 5 guests in attendance. We did not have a quorum, Memphis minutes will be circulated by email.

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

The standard is presently in sponsor ballot, opening April 14 and closing next Monday, May 16. We are presently at 50% return with 94% approval and 2 negative ballots.

The session was dedicated to discussing the comments received so far, of which there are 32. Most of them are minor editorial fixes and non-controversial. We did have nine comments requiring some discussion. These are being addressed by two task groups, and by the Chair making a request to one negative voter to provide a suggested annex. Unless major new negative comments are received in the next few days, we do not expect to have difficulty submitting to RevCom before the PAR expiration.

For the next meeting: a single session jointly with SubC4, for 30 attendees. The existing slot (4:30 on Tuesday) has a conflict with H21, but it is not clear if any other slot would be better – perhaps Tuesday at 8 AM.

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 17 members and 14 guests present for the May 10, 2016 meeting.

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

The Chair began with a review of the report's status. It has been edited to put it into a final form and ready for a final WG review. All sections which had no support or contributions were removed but if anyone wishes to make a last minute submission.

The Chair proposed to the WG to review it and see if there are any objections to its current form with the intent of submitting it to the SC for review/approval. A discussion began on references to Edition 2 in the report and it was agreed that Jun Verzosa would complete a section on testing with Edition 2 features to clarify those references. Dustin Tessier also volunteered to contribute a section on ideas for isolation of the physical device and logical device functions for testing.

Contributions will be required in the next two weeks in order to meet the goal of completing the report by the Sept meeting.

The Chair asked for an update on any 61850 activities.

Herb Faulk provided a quick update on the status of IEC 61850 Ed 2.1 which is going to ballot. A short discussion on 9-2 LE and IEC 61869-9 replacing it which will also be published. Herb also commented that the SCE C-RAS project has been deployed and is in service which utilized GOOSE.

ConEd will be deploying a new Greenfield 61850 sub with GOOSE but no SV. RTDS will be deploying a new FPGA based SV module capable of 16 streams @ up to 96KHz sample rate for 9-2LE and IEC 61869-9 devices.

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

Respectfully submitted,

Charles Sufana
WG Chair

H11: C37.118.1 Standard for Synchrophasors for Power Systems

Chair: K. Martin

Vice Chair: A. Goldstein

Output: Standard

Established: 2006

Expected completion date: December 2017

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

WG H11 met on Wednesday, May 11, 9:30 AM – 12:15 PM. There were 11 members and 15 guests which was not a quorum. The January minutes will be approved by Email. The meeting started with introductions and a review of the IEEE patent rules.

The current status was reviewed:

In January 2016 the WG resolved the remaining comments from the December WG vote. During February several other issues were raised and resolved. The main change was that the annexes on certification for high currents and higher accuracy were combined and the statements of requirements were improved. The draft CD was submitted to TC95 of the IEC for circulation on March 3 and they posted it on March 11. They honored our request for a short circulation and closed it on May 6. We received the comments back on Monday, May 7, in time for our meeting on May 11. However the comments received from China were the wrong ones (written for a different standard), so we can only review the remaining comments which were from Hungary and the US.

Discussed the next steps—

IEC and IEEE approval processes run independently but need to come to the same conclusion. The process probably works best by bringing the WG final draft to a CD vote in the IEC and sponsor ballot in the IEEE. At this stage, comments from either circulation can be freely edited into a common draft. If significant changes are required after this circulation, a second CD should go to the IEC and a recirculation for the IEEE. This process can be repeated until a circulation yields no substantial changes

(if this stage never happens, just drop it). At that point, the IEC goes to a CDV and the IEEE to another recirculation (hopefully the last).

For the IEC process, once CD comments are received, the WG must address the comments (with or without changes to the document). Once the WG decides the CD is stable, they may request to convert it to a CDV and circulate it (5 month circulation period). (IEC circulations go to each P-member country national committee and from there to designated experts in those countries for review). If there are no significant changes after CDV, the document may go to FDIS (final draft for international standard). If there are significant changes, the draft has to go back to CD circulation.

On the IEEE side, a working group vote is needed to approve the draft for IEEE-SA balloting. Once approved by 2/3 majority of the WG voters, the WG requests PSRC to go to ballot. Once PSRC approves, the document goes to SA for editorial review (MEC), a balloting body is formed, and then the draft goes to ballot. After ballot, then the WG resolves the comments. If there are negative ballots, the document must be re-circulated (unless the negatives are removed). However if any changes are made to the draft, it must be recirculated.

The way forward highly depends on the comments that are received and how they are resolved.

The WG then went through the comments that were received. Most comments were simple to resolve with appropriate changes in the draft. Items requiring more significant effort are listed along with the person who will do the work and a deadline date:

Find appropriate existing IEEE definitions for overshoot, undershoot, and leap second. This will avoid adding new definitions. Allen G. 31 May 16

Clarify references to requiring positive sequence instead of just synchrophasor by making clear it can be a-b-c-+ value. This change in phrase lines 748, 776, and 817. Also change end note in section as needed. Ken M. 31 May 16

Modulation test for determining bandwidth was resolved to not add any requirements but a normative annex that allows determination of bandwidth, possibly at more than just the 3 dB points. Drafting by task group. Allen G. (lead), Tony J., Dan D., Ken M., Bill D., Ryan N. 1st draft 30 June 16

Discussion about the ramp rate factor in the exclusion interval—is it needed? No final conclusion, will investigate. Ken M. 31 May 16

Will change step function notation from $f_1(t)$ to the more common $u(t)$

In Annex C technical development & examples, will change start of ramp from nominal to arbitrary frequency (lines 1398-1415). Ken M. 31 May 16

In testing annex D, accept changes to recommended procedure for testing with repeated steps. a little more description will be provided. Allen G. 31 May 16

In annex G, consideration for SNR in line 1807 was discussed. Will add some discussion relating the concern for THD. Bill D. 31 May 16

We plan to resolve these comments then go to IEEE Ballot. The earliest opportunity for this will be the Sept 2016 PSRC meeting. The WG will try to complete the update by then. Since the WG plans to add a normative annex, another CD circulation will be needed. It can be done concurrently with the IEEE ballot.

For the next meeting, the WG requests a single session with room for 30 people and a CP.

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

Chair: E.A. Udren

Vice Chair: B. Vandiver

Output: Report

Established: 2008

Expected completion date: December 2014

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

Introductions were completed after a welcome by Chair Eric Udren. There were 10 members and 14 guests present for the May 10, 2016 meeting.

The Chair presented the final clean version of the report and then reviewed the parts that were revised or added since the last meeting. Annex B is a new substation Ethernet Switch product implementation conformance statement (PICS), based on UCA interoperability test experiences. Annex B was expanded and finalized in meeting discussion. This report content makes it easier for a user to evaluate, select, and apply Ethernet switches for IEC 61850 and other substation uses.

The action item is now to route this completed Version 0.9 to the WG members for a vote. Depending on the outcome of WG voting and comments returned, and progress in addressing these responses before September, the next meeting will adjust the content to finalize the report or will lead to WG actions for a Subcommittee vote of approval for publication.

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

H17: Establishing links between COMTRADE, IEC 61850 and CIM

Chair: C. Brunner

Vice Chair: A. Apostolov

Output: Report

Established: 2010

Expected completion date: December 2013

Assignment: Develop a standards approach to link IEC 61850, CIM and COMTRADE so that the COMTRADE channels can be associated to a node in the power network.

No Report

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

Chair: Yi Hu

Vice Chair: A. Goldstein

Output: Report

Established: September 2012

Expected completion date: December 2016

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

Working group H21 met on Tuesday, May 10, 2016 in single-session chaired by Yi Hu and Allen Goldstein with 19 people (7 members and 12 guests) attending.

Yi Hu relayed the information received from H subcommittee that WG H21 will be moved out of PSRC to be under the new Power Systems Communications & Cybersecurity Committee (PSCCC) starting from January 2017 JTCM meeting should WG H21 need to continue its work on this report. However, if WG H21 completes and publishes the report as originally planned, then WG H21 will be disbanded at the 2017 JTCM meeting.

Considering that both standards could be changing soon

- IEC TC57 WG 10 is in the process to integrate IEC TR 61850-90-5 into IEC 61850
- PSRC has a task force HTF36 looking into the need of revising / enhancing IEEE C37.118.2-2011

WG members agreed that WG H21 should make an effort to complete the report as was originally planned.

Considering the current status of the draft report:

- The use cases of mapping and the diagrams illustrate the use cases and the conceptual architectures for these use cases have been developed

- Mark Adamiak has developed detailed mapping use case B mapping based on an IEC 61850-90-5 implementation agreement, and identified a few issues for one-to-one mapping, such as leap second, name/ID mapping, etc., that the report needs to address
- However, the report would need some major work to add descriptions to use cases and conceptual architecture diagrams and the detailed mapping for data structure, configuration information and processes for each use case

WG has decided to assemble a task force to expedite the completion and publication of the report. The task force consists of WG Chair and vice chair, Mark Adamiak, Alex Apostolov, Herb Falk, Mital Kanabar, and Eugene Song. The task force has agreed to the following development plan:

- Mark Adamiak and Mital Kanabar will work together to create the first complete draft of the report by adding descriptions for use cases and the related conceptual architecture, and the detailed mappings for data structure, configuration information and processes for each use case – this process is to be completed by June 10, 2016
- Herb Falk, Alex Apostolov and Yi Hu will perform the first round review and edits of the first complete draft of the report – this process is to be completed by July 1, 2016
- The task force will start regular conference calls to review and finalize the report after the completion of the first round review and edits – WG Chairs will schedule weekly calls for this process, and the process is to be completed by August 19, 2016
- Distribute the finalized report to all WG members for review and comments – WG Chair will distribute the report on August 19, 2016, and request WG members to submit comments and suggested edits by September 2, 2016
- Revise the report to incorporate suggested edits and address comments received – WG Chairs to schedule conference calls for task force to review and discuss resolutions to the comments received. This process is to be completed by September 14, 2016 for distributing the revised report to all WG members before the WG meeting in Cincinnati

For next meeting, WG H21 requests a single session (the session shall not conflict with WG C21 sessions, mandatory session for WGs with a PAR, and other synchrophasor related sessions), a room for 20 people and a PC projector

Draft # D0.06

H22: PC 37.249 Guide for Categorizing Security Needs for Protection Related Data Files (Joint Working Group Substations Committee C19 & PSRC H22)

Chair: Amir Makki

Chair C19: Denis Holstein

Vice Chair: Cesar Calix

Output: Guide

Established: January 2014

Expected completion date: January 2018

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

The Working Group met on time with 11 members and 8 guests present.

The members reviewed the reformatted contents of the draft Guide. Consensus was present that the tables that were converted to paragraphs are much easier to read and edit. The group then focused on changing the risk terminology to be consistent with the security objectives as stated in C37.240.

Discussions then focused on the effort needed to complete the reformatting and editing of the draft Guide. Ten (10) members volunteered to help complete the work. Assignments were made accordingly and the volunteers were asked to complete their assignments prior to the next meeting.

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

Respectfully Submitted,

Amir Makki

H23: Guide for Naming Intelligent Electronic Devices (COMDEV)

Chair: R. Cornelison

Vice Chair: Eric Allen

Secretary: Amir Makki

Output: Guide

Established: January, 2013

Estimated Completion Date: January, 2017

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

The Working Group met on Wednesday, May 11, 2016 with 9 members and 6 guests, constituting a quorum.

The minutes of the January 2016 meeting were reviewed and approved. (Motion: Jim Hackett)

The most recent draft (Draft 4) was reviewed, and a few edits relating to the definitions and use of language for an IEEE Guide were made.

David Aldrich volunteered to review the draft for consistent use of the terms “device” and “IED”. Following this review, Eric Allen will review the draft for proper use of language in an IEEE Guide (e.g., “should” vs. “shall”).

Amir Makki volunteered to provide the group with examples of use of the term “line group” in existing literature so that the draft can use a definition consistent with current industry practice.

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

Respectfully submitted,
Eric Allen, H23 Vice-Chair
Amir Makki, H23 Secretary

H24: Investigate Need to Update C37.238 (Joint Working Group Substations Committee C7 & PSRC H24)

Chair: G. Antonova

Chair SubC7: Tim Tibbals

Vice Chair: Bill Dickerson

Output: Standard

Established: January, 2013

Estimated Completion Date: May, 2014

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

Working Group H24/SubC7 met on May 11, 2016 in Denver, CO, in a double session with 25 attendees (5 members, 1 corresponding member and 19 guests). After introductions, Galina Antonova, the H24 co-chair, presented IEEE Patent policy slides and asked attendees to identify any potential pattern issues related to this work. None were raised. Quorum was not achieved. Minutes of January 2016 will be approved electronically.

Update on IEC/IEEE 61850-9-3 was given.

- IEC/IEEE 61850-9-3 was recommended by IEEE RevCom for approval on April 29, 2016
- Approval by tknhe IEEE-SA SB is expected on May 13, 2013.

Discussion on IEEE C37.238 Draft D17 dated May 5, 2016 followed. The following items were discussed:

- PICS proposal was presented by Herb Falk. It was developed jointly with Bill Dickerson, Chris Huntley and Galina Antonova. PICS contains IEC/IEEE 61850-9-3 PICS parameters that is extended by IEEE C37.238 parameters. Separate tables are provided for different clock types, for clarity. A few changes to PICS were proposed and captured.
- Changes to Annex A and Table A.1 were discussed. Updated version was generated.
- Note to 6.2 proposed by Roman Graf was discussed and supported for addition to the draft
- Text was proposed for Annex B to address issue surfaced during C37.238-2011 and IEC/IEEE 61850-9-3 testing. The cause is C37.238-2011 requirement for rejecting Announce messages without TLVs attached. This requirement has been removed, i.e. is not present in any of the IEEE C37.238 revision drafts, thus the issue is resolved with new standard version. To address recirculation ballot comment text was proposed for informative Annex B on compatibility with IEEE C37.238-2011 version.

Roman Graf participated in discussion via email. His comments on PICS and Annex A were received, discussed and addressed during the meeting in the updated PICS and Annex A/Table A.1 versions.

Bill Dickerson provided an update on IEEE 1588v3 Time Inaccuracy TLV. There was not enough time to discuss and approve TI TLV proposed at the 1588v3 meeting in Paris. Bill agreed to pursue prioritization of this action item, but it is unknown when it will be approved by the IEEE 1588v3 WG. IEEE 1588v3 approval is expected in 1.5-2 years. Galina shared that the plan for IEC/IEEE 61850-9-3 revision is to refer to IEEE 1588v3 TLV (instead of IEEE C37.238 TLV), and that it would be good to provide a link to that work, if it would be acceptable to make forward looking statements, Bill expressed concern that providing such statement may lead to confusion and reluctance in implementing C37.238 TLV. Erin Spiewak and Sam Sciacca commented that in general forward looking statements are not encouraged by IEEE. More discussion is needed.

Galina Antonova shared that updated draft will be distributed for review and WG vote. Next RevCom submission deadlines are May 20 and August 2016.

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

H25: Review of C37.94

Chair: M. Benou

PSCC Co-Chair: Roger Ray

Vice Chair: D. Jenkins

Output: Standard

Established: September 2013

Estimated Completion Date: December 2015

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

Did Not Meet

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

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

Chair: C. Chelmecki

Vice Chair: Dylan Jenkins

Output: Standard

Established: September 2013

Estimated Completion Date: September 2017

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

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

Showed patent/copyright slides.

Notified the group that PAR has been approved by NESCOM.

Reviewed the scope of our work with a lot of good input from Alex Apostolov

We spent time discussing file content requirements. A concern was raised on rule based content in devices. That is, if there are interdependences depending on your settings it may change content. For instance some settings will expose additional settings and may change things like min and max values. Discussed purpose of 3rd party tools. Concerns about them being reliable enough to be used on devices were raised. The feeling was you would not want to trust them with your relay settings. We added a couple more data items to the possible content. Here is the current list:

- Value
- Units
- minValue
- maxValue
- stepSize
- Enumeration
- Writeable (permissions)
- Default
- Description
- Category of settings (one setting can belong to multiple categories)
- Setting attributes
- Comments

Wanted to be sure that this standard covers all devices whether or not they support 61850.

Mohammad Zadeh has put together files from all the major relay manufacturers and has agreed to do a presentation at the September meeting in Cincinnati.

Jorg Blumschein also agreed to do a presentation at the next meeting on the structure of the icd file.

Meeting Adjourned.

For the next meeting a single session for 20 attendees is requested. Draft 0.2

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.

Comment was made to include all working groups of TC including 57 and 38 that user feedback would be applied. It was suggested that TC overview be provided to Users of Feedback.

Smart Grid Mapping tool was mentioned

Expectation of IEC 61850 compliant IEDs

- IED Life
- Edition 1 vs. Edition 2
 - Downward Compatibility during life cycle of substation automation system

Idea is that on day one entire system is installed with edition 1. Failure of single device occurs at year 10. What are the compatibility issues?

Edition 1 was a best effort with mistakes.
TC57 10 proposed to no longer TISSUES on edition 1.

Requirements:

Looking back vs. Moving Forward

WG 10 could document changes between Edition 1 and Edition 2.
Is IOP between editions possible?

It was suggested to document specific problems and work with the vendor and authors to see if there are technical fixes available to solution. Edition 1 vs. Edition 2 compatibility could be an application problem vs. an edition application.

Group needs to document specific real cases.

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 in the morning of May 11, 2016. 11 members and 6 guests participated.

The Introduction of attendees was followed by discussion of the scope – extensions to the IEC 61850 logical nodes and determining the need for new logical nodes.

Extensive discussion of what should be modeled. The conclusion was that the focus will be on the modeling of communications visible interfaces and settings. The starting point for each specific function element will be the currently defined logical node(s) in IEC 61850 and identify missing data objects or data attributes.

A spreadsheet will be created by Alex Apostolov to start the discussion of modeling of under/overcurrent; under/overvoltage, under/overfrequency and directional elements. The spreadsheet will be distributed between all major protection manufacturers with the task to map their existing settings to the IEC 61850 settings and add the settings that are additional to the ones defined in the standard. Input, blocking, and status data will also be included

The working group will not consider the modeling of the algorithms used for a function element implementation in order to support interchangeability.

The input from the manufacturers will be summarized in a spreadsheet in order to identify the common settings between the different suppliers and settings that will be considered proprietary.

The meeting in September 2016 will include two presentations:

- Common settings identification based on the analysis of IEDs from multiple suppliers (ETAP)
- Settings implementation in IEC 61850 multifunctional IED (Siemens)

The working group will meet in a single session in September 2016. We need a room for about 30 people and projector.

PIOC discussion. Should the settings be in Primary, Secondary or PU. Decision is Primary as it is in IEC 61850.

Measurement – Fundamental, RMS or Instantaneous. Check what calculation methods are defined at the Basic LN level and if it needs to be extended.

Drop-out to Pick-up ration – probably should be a dedicated setting in LNs.

Blocking – check the current BlkRef if it supports the ability to block 3ph or individual phases.

Drop-off delay for individual protection or protection related functions

Select a list of IEC 61850 and send to all manufacturers to comment on the completeness of the model from their point of view.

Send an e-mail to all manufacturers to identify a WG liaison who will ensure the response to the above requests will come in time from a qualified expert.

H32: Report on Teleprotection over Ethernet
Chair: K. Fodero
Vice Chair: W. McCannon
Output: Recommendation on Formation of a Working Group
Established: September, 2014
Estimated Completion Date: September, 2015

The group met on Tuesday 5/10/2016 with 14 people in attendance. All existing or new members.

Scope: The working group will prepare a report on the use of Ethernet transport for teleprotection services and line current differential protection. The report will cover:

Channel Performance requirements / expectations

Considerations and differences for Ethernet vs current TDM transport

Defining the circuit performance requirements for Teleprotection and line current differential protection over Ethernet transport. To include but not be limited to propagation delay, channel asymmetry, jitter, restoration, equipment initialization times and performance monitoring techniques.

The goal is to create a document that will enable a protection engineer to use with their IT / Telecom counterparts to ensure that protective relay circuits applied over these systems will perform as expected. Additionally provide a document that clearly states the performance requirements for various teleprotection applications for the IT / Telecom departments. This report will discuss the various requirements and explain why they are important to the application. A range of acceptable performance specifications will be documented in the report. A Channel Performance Requirements for the Transport of Protective Relay Communications document will be included as an annex to the report. This document will be used by the protection engineer to communicate and document the technical performance requirements.

This meeting:

We had presentations from members Takaya Shono and Jorg Blumschein on communications channel requirements for Line current differential relays. These presentations did a great job defining performance criteria and explaining these limitations.

We reviewed most of section 4 (Queues) and are waiting on two writing assignments.

Next meeting

We will require a room for at least 25 and an overhead projector.

We are on draft version 0.2 of the document.

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.

May 10, 2016 – Denver, CO

The WG met to review and discuss the presently identified COMTRADE upgrades. The discussion was lively and resulted in the identification several new functions, specifically:

- Addition of Scripting to define how virtual data is to be created
 - Identification of channel data as related to SI units
 - Identification of Channel Pairs (i.e. – voltage and current and status from the same line)
 - Identification of data source (Primary, secondary, per-unit)
- Preliminary writing assignments were made and will be reviewed next meeting.

Mark

HTF36: Standard for Phasor Data Concentrators for Power Systems

Chair: V. Gharpure

Vice Chair:

Output:

Established:

Expected completion date:

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

25 Attendees: The meeting roaster is attached.

- This was the first meeting of HTF 36.
- Introductions.
- Purpose statement: to assess formation of a working group to revise the IEEE Standard 12 C37.118.2-2011
 - o To add needed features
 - o To remove ambiguities
 - o To simplify
 - o To eliminate unused / under used features
- Brief history
 - o 1995: First synchrophasor standard
 - 3 frames defined: Header, config, data
 - o 2005 Major revision:
 - New fields / features added: Sync, frame size, station name, fraction of second, time quality, analog values, concatenation of PMU data in PDC output
 - o 2011 minor revision:
 - Message format essentially unchanged. Cfg3 frame added
- Structure of the current standard
 - o The message format section (section 6 of the standard) is the one expected to undergo changes.
- An example of 118.2 usage.
 - o Data received at regular intervals (e.g. 30/s) from PMUs to a PDC
 - o Data from different PMUs may arrive at different times
 - o PDC waits for some time then combines data for onward transmission
 - o PDC sends output at regular intervals, not necessarily the same as the incoming rate(s)
 - o Missing or late data would be discarded.
- Potential problems
 - o Data frames sizes are limited to 65K bytes, and this will grow as we go up the chain, and be a problem.
 - o A late data frame can hold up all other data.
 - o Data frames need such missing data to be filled in with blank data to maintain the fixed data frame size
 - o Ethernet can break up large data frames into fragments. For a UDP frame, the entire frame is lost on loss of one fragment.
- A look at some of the frame elements that may be candidates for change. It was emphasized that this list has been derived from different sources, and is reproduced here faithfully. It may include contrary items. It would be up to the working group to determine the choice / disposition for changes.
- Proposed enhancements – Data Frame:
 - o Extend the frame size
 - o Pass-through function for critical data
 - (comment, rather than pass-through call it non time-aligned data
 - o Shortened frames for missing data
 - o Allow salvageable fragments (1500 bytes) for Ethernet packet break up.
 - o Add asynchronous events

- o Add signal-level data quality through defined analog fields
- o Add a method to remove problem PMUs from the stream
- o Define disposition of STATUS bits 14,15 for a PDC
- Proposed enhancements – Config Frame:
 - o Config command from CC-PDC-PMU to allow efficient synchrophasor network configuration
 - o Extend cfg-1 like extended cfg-3
 - o Change the “change bit” time limit in successive devices to allow coordination of changes throughout the synchrophasor network.
 - o Move data rate field inside the PMU config block
- Proposed simplifications – Data Frame:
 - o Remove f and f' as required fields
 - (Comment – Allen: allow f & f' results with a different timestamp / data rate).
 - o Restrict data to a single format (floating point, polar)
 - o Remove synchrophasor CRC. Rely on Ethernet CRC. Add “tail WORD” at the end of the 2frame (like “sync” WORD at the start of a frame)
 - o Remove digitals from data frame, since the actual transition time is not known.
 - o Confine a PMU frame to signals from one bus/node (one voltage, one F and f', multiple currents)
 - o Remove trigger bits from STAT word, if underutilized, and if a better use can be found.
 - (Comment – Mark: they are used.).
- Proposed simplifications – Config Frame:
 - o Remove CFG-1, CFG-2. Allow only CFG-3. No data subsets. No changes permitted to a stream.
 - o Restrict time-base values to integer multiples of system frequency, so that fracsec values are always exact integers.
 - o Change all fields to a two byte boundary (SVC_CLASS and station / signal names)
- Other possibilities for including in the revision:
 - o Make 61850 mapping easier, in either direction
 - o Any custom modifications implemented privately to be sought out.
 - o Field experiences to be shared by users.
 - o Split the standard
 - One for PMUs and another for PDCs?
- Considerations:
 - o Any contrary ideas? (Such as CFG1 enhance or eliminate?)
 - o Effect on PDC standard currently under work
 - o Field firmware upgrade difficulties
 - o Balance between enhancements and simplifications.
- Discussion:
 - o Dan: Synchrophasor measurement standard requires f and f' calculations.
 - This standard may not require it to be transmitted with every data frame.
 - o Mahendra: consider that the data frame may contains only one phasor (e.g. separate voltage and currents)
 - o Can changes support mapping between 118.2 and 61850?
 - o Tony: Most of the proposed changes support PDC to PDC communications (this supports the idea of splitting into two)
 - o Vasudev: Some of the proposed enhancements / simplifications can be done by agreement without a change in the standard, such as – time_base values being restricted to integer multiples of system frequency
 - o Gustavo: Must ensure backward compatibility for PMUs installed in the field.
 - o Tony: Consideration of firmware change: if the device is a relay, then all relay functions must be tested for each relay upgraded. This could require at least a 1-day outage per relay. A revision of synchrophasor standard will not qualify for a relay firmware upgrade in the field. A relay firmware upgrade may happen at an interval of 2 – 5 years. As against this, PDC upgrades would not require a line outage.
 - The two preceding items could be helped by version control of the standard. Per the PDC standard under work currently, this would be handled by the manufacturer of the PDC specifying (and the user requiring) specific protocols / versions of the standard to be supported by the PDC.
 - o Mahendra: Data invalid bit is used ambiguously. That and other bits should be well-defined to remove ambiguities.
 - o Tony: Should 118.2 deal with cybersecurity?

- o Ken: Previously, the underlying protocols handled security but some of the revisions proposed may require some cybersecurity considerations.
- o Yi Hu: In the telecom field, versions do not obsolete each other (e.g. 3G, 4G, 5G, etc). This can be considered for this standard.
- o Some discussion of version control and backwards compatibility.

□ Conclusion:

- o Consider creating 2 PARs for separate PMU and PDC standards.
- o The group to send any other ideas to Vasudev for inclusion.
- o Vasudev to send minutes / a copy of the presentation to the group.

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

Chair: S. Kunsman

Vice Chair: C. Wong

Output: Recommendation to form WG

Established:

Expected completion date:

Assignment:

Summary Minutes for Subcommittee Report

The HTF37 meeting was held on Tuesday, May 10, 2016 with 29 attendees.

Purpose of HTF37:

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

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

September 2016 HTF37 meeting will be a single session for 50 people and computer projector.

Detailed Minutes:

Meeting was called to order at 8.05

Meeting started with Taskforce Chair- Steve Kunsman introducing the purpose of the forming of this taskforce and immediately follows up by introduction of audience in the room.

Discussion during the meeting includes:

Craig Preuss commented cloud computing should be consider as an additional gap to be reviewed by our TF. There was several discussion as to whether NERC CIP would allow for cloud applications but the standard should focus on the risk assessment and if the user decide cloud applications is useful, we need to define the requirements to protect these architectures.

Herb Falk presented IEC TC 57 WG15 IEC 62351 standard, its parts and association and their status. The majority of this IEC standard should be completed by end 2016 which is good timing to be used as a base if the TF moves to a WG.

Tony Johnson commented that the existing C37.240 needs to audit support documentation and should be part of our scope to review.

Dustin Tessier commented that clarification is required on certain terms used in the NERC CIP standards (e.g point-to-point, low impact asset, high impact asset) and how these terms apply to C37.240.

Tom Beckwith also commented on how the C37.240 standard can be used to assure NERC CIP compliance. Dialog continued that regardless of NERC CIP, the standard is independent of Bulk Electric System status and needs to allow the utility to assess the risk and criticality to their application. In addition, there were discussions of clarification of the NERC CIP BES and BCA Categories on how a substation is categorized

TW Cease request an IEEE collaboration site be setup to publish all presentation and meeting documentation.

Meeting Adjourned at 9.15

Liaison Reports

PES Substations Committee

C. Preuss

C0: DATA ACQUISITION, PROCESSING, AND CONTROL SYSTEMS SUBCOMMITTEE

Chair: C. Preuss

Vice Chair: Vacant

Secretary: Vacant

No Report

PES Communications Committee

D. Nordell

No report

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

C. Brunner

No Report

I. RELAYING PRACTICES SUBCOMMITTEE

Chair: B. Mugalian

Vice-Chair: J. Long

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

I: RELAYING PRACTICES SUBCOMMITTEE

Chair: B. Mugalian

Vice-Chair: A. Uribe

The I Subcommittee met on Wednesday, May 11, 2016 with 22 members in attendance – a quorum was achieved.

- Minutes of the I Subcommittee meeting held in Memphis, TN on January 13, 2016 were approved. Motion to accept the minutes by Jerry Jodice and seconded by Will Knapek.
 - Coordination & Advisory Committee Meeting Items of Interest: Attendance of 250 at May 2016 PSRC meeting
 - Working Group Chairs should provide their pertinent information to Brian Mugalian and Andre Uribe. Russ Patterson and Rick Gamble will post information for your working group. Email your content to Brian Mugalian and Andre Uribe to review/approve before posting: webmaintenance@pes-psrc.org
 - Future PSRC Meetings
 - September 2016 – Cincinnati, OH
 - January 2017 – New Orleans, LA
 - PSRC is looking for presentations for the September 2016 Main Committee meetings
 - For new reports, we will be using the new IEEE template - still in development
 - Updated versions of myProject are due in July/August 2016 – new version will roll out sometime in the summer.
- Administrative items:
 - Andre Uribe was introduced as the new I Subcommittee Vice-Chair
 - WG Agendas and Minutes are due within 14 days: “The 14-calendar-day rule”
 - Email WG and TF Minutes including membership list to Brian Mugalian and Andre Uribe at: bmugalian@sandc.com and auribe@powergridmail.com
 - Updated PSRC Directory will be issued January 2017, so your rosters should be up to date and forwarded to Brian Mugalian and Andre Uribe at the September 2016 meeting
 - 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
 - Central Desktop used for IEEE Guide/RP/Std. documents with a PAR
 - Subcommittee Chair/Vice-Chair to hold progress report conference calls with each WG and TF Chair/Vice-Chair in late July 2016 – The call request is set up as a Microsoft Outlook meeting request.
 - There were no Task Force Proposal Submission Forms turned in – asked the members to submit their TF recommendations answering the questions on the form.

Reports from the WG Chairs

I2: Terminology Review Working Group

Chair: M. Swanson

Vice Chair: F. Friend

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

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

The I2 working group, chaired by Mal Swanson, met on Wednesday, May 11, 2016 with 8 members and 2 guests.

Minutes from the January meeting in Memphis, TN were reviewed and approved and quorum was achieved.

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 giving attention that acronyms also have a definition.

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.

All working group chair are reminded the database is available to them for use during their document development. All IEEE members have access to the dictionary database 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.

I4: IEC Advisory Working Group

Chair: E.A. Udren

Vice Chair: M. Yalla

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

Established: 1990

Expected completion date: Meetings are continuing

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

The WG met on May 9, 2016 with 8 members & 1 guest to review TC 95 standards activities. There are no standards documents requiring review or comments at this time, but the WG reviewed recent votes submitted, as well as the status of active projects.

Dr. Murty Yalla, IEC TC 95 Chair, and Eric Udren, Technical Advisor to USNC of IEC, updated the attendees on status of TC projects. Murty gave an update from the meeting of the maintenance team MT4 meeting held in Macau, China, April 11-14, 2016.

- IEC 60255-187-1 - *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – Now supported by PSRC WG K19 under Gustavo Brunello. The Committee Draft was circulated by IEC to member nations in January. The Chair solicited USNC comments from WG members and submitted to USNC on March 25. Inputs came from PSRC K19 review and individuals. From all member nations, MT4 got 36 pages of comments total, discussed at Macau meeting. The MT4 comment summary has been returned to K19 for PSRC review. There will be a new CD or maybe CDV in July; comments should be returned to IEC by the next MT4 meeting in Paris, October 17-21.
- IEC 60255-187-3 - *Functional requirements for biased (percentage) differential relays for transmission lines* – only outlined so far, and supported by PSRC WG D34 under Normann Fischer. Issues are definition of standard tests considering the variety of product implementation, and what standards or tests to apply for communications issues.
- IEC 60255-181 *Functional requirements for frequency protection* – The MT updated its draft, as it published the table of contents for National Committee comments. The MT is using a liaison relationship with TC 95 JWG1 developing the IEC Synchrophasor measurement standard – this brings expertise on performance issues and measurement techniques for frequency and rate of change of frequency (ROCOF). The MT is commenting on Draft 6 and will review Draft 7 at the Macau meeting.

The next MT4 meeting is tentatively scheduled for October 17-21 in Paris. A TC 95 plenary meeting will be scheduled at the end of this week of MT4 meetings.

- Separately from MT4, TC 95 Joint Working Group (JWG) 1 chaired by Ken Martin is developing IEC 60255-188-1 Synchrophasor Standard. CD2 was circulated from the Central Office since the last PSRC meeting; the USNC submitted comments based on review by Allen Goldstein. These were discussed at the PSRC meeting of JWG1.

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

- Update to IEC 60255-1 Ed. 1: *Measuring relays and protection equipment – Part 1: Common requirements*.
- Update to IEC 60255-26 Ed. 3: *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*. Do we test adequately for influences from Smart Grid devices (electronic power converters/ inverters/conditioners/controls)?
- Update to IEC 60255-27 Ed. 2: *Measuring relays and protection equipment – Part 27: Product safety requirements*. Adapt the standard to meet the new requirements of the

European Low Voltage Directive covering protection of people and animals from all risks; and internal production conformity control. In addition, revised base standard IEC 61010 now includes risk assessments and considers other aspects of safety not covered by IEC 60255-27 Ed.2.

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

Chair: Farnoosh Rahmatian
Vice-Chair: Bruce Pickett
Established: 2010
Output: Guide PAR PC37.241
Expected Completion Date: 2016

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

I11 did not meet. The document is going to IEEE-SA sponsor balloting in June.

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

Chair: Bruce Magruder
Vice-Chair: Will Knapek
Output: Revision of Guide for Field Testing of Relaying Current Transformers
Established: May 2013
Expected Completion Date: 2018

Assignment: Revision of IEEE C57.13.1 to Correct errors, 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 L11 Room of the Hyatt Regency Tech Center, Denver, CO, on May 11, 2016 at 8:00 am. 7 members and 6 guests were present and a quorum was not met. 14 members as of this meeting. 2 guests asked to become members after the meeting.

Patent Conflict slides were shown.

1. Minutes of last meeting were read and approved.
2. Comments on 12.2.3 from Jeff Burnworth were discussed and a revision by Will Knapek was accepted.
3. Comments on other sections by Gordie Halt were discussed and accepted.
4. Jeff Burnworth will try, with no commitment, to get a digital oscilloscope to replace photos in section 12.
5. Draft 6.2 is ready to go to WG members for approval and resolve any issues and present to I Sub-Committee at the September meeting.

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: January 2013
Expected Completion Date: September 2014

The Working Group I-24 met on Tuesday, May 10, 2016, in Denver in single session chaired by Jim Niemira with a total of **9 attendees** (5 members and 4 guests). Quorum was met.

- Meeting was brought to order at 1:30pm.
- Motion by Amir Makki to approve the minutes from the January 2016 meeting; second by Mario Ranieri; minutes were approved.

- Reviewed newest writing assignments from Amir Makki, revised sections 4 and 6, and John Buffington, revised section 8.
- The group reviewed again the present Draft 8.0 of the report with comments from Jeff Burnworth and including edits made to the report at the January 2016 meeting.
- The report is nearing completion. Jeff Burnworth will send bibliographic information to the chairman for inclusion in the paper within the next 2 weeks. The chairman will put together a new draft including the latest writing assignments and distribute to the WG membership for final review and approval as soon as possible, not later than June 17, 2016. The working group plans to ballot and reconcile any final suggested revisions through e-mail and on-line discussions before the next PSRC meeting in September 2016.

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:

Working Group I-25 met Tuesday day, May 10, 2015, in Denver, CO with 15 members and 14 guests.

- Tony Seegers and Don Ware went through the entire document in an effort to reduce the length of the document and to remove duplications. Once their changes were made to the document the document was sent out to all members. Those individuals that volunteered to review individual sections reviewed their assigned sections and provided their comments. All except one writing contribution submitted and consolidated into one document. During the meeting contributions were briefly reviewed and discussed. The group felt good about the document but there is still a need for more reviewing of the entire document. A group of individuals volunteered to review the entire document and consolidate their comments before the September meeting. Once this is completed the intent is to send the document to the entire group before the September meeting for working group approval. The WG plans on meeting in September and we request a room for approximately 35 to 40 attendees and a projector.
- Several members agreed to review the entire document to ensure consistency/uniformity:
- Specific items to be reviewed are:
- The phrase commissioning agent, is it being used consistently.
- Owning company
- The group also discussed the need to add a section on line current differential schemes to go along with the other differential schemes. Since an assignment made for this section I will contact that person to see if he has a contribution to make. The last item discussed was that the check list needs to have an open item to address those items that may not be completed during the commissioning process. This will need to have an example to be meaningful.

Because there is a short time line to get this document approved the review team will hold a webinar in June to start consolidating review comments, a meeting invite will be sent shortly. The draft has been changed to draft 4 to note the changes that were made during the meeting.

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

Chair: Mike Meisinger

Vice Chair: Alex Lee

Output: Report: Revise Transactions Paper

Established: January 2014

Expected Completion Date: December 2018

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

1. Steve Turner and Amir Makki will develop case studies from actual relay operations which include the CT data such as excitation characteristics derived from field measurements. These case studies will be used to validate the mathematical models. Some of these will be presented at the next meeting. The CT excitation characteristics are to be sent to Dean Ouellette.
2. Test cases for low magnitude current events such as a reverse power operation are desired.
3. Review the article by Zorn on stray flux in buried CTs from the latest PAC magazine.
4. Demetrious will provide C class CT characteristics including the dimensions for the models and output.
5. Peter McLaren will provide test results from Alstom CTs.
6. The working group is looking for an EMTP volunteer.

I27: Investigation of Protective Relay Self-Monitoring Capabilities

Chair: Roy Moxley
Vice Chair: Cathy Dalton
Established: 2014
Output: Report
Expected Completion Date: 2015

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

Minutes of I-27 Working Group--Investigation of Relay self- monitoring capabilities
 September 10, 2016 PSRC meeting, 9:30-10:45am Wind River—Denver, CO
 I-27 met on Tuesday May 10th at 9:30am with 15 members and 16 guests.

- Goal is to have a voting draft for the working group by the end of July
- Call for Utility to provide in-service / maintenance tests to determine if there are gaps between what self-monitoring might catch and in-service tests.
 - Aaron Martin to provide a write-up.
 - Tony Seegers to provide a write-up.
- SMP protocol for reporting relay operational diagnostics (temperature ect).
 - Aaron Martin to provide information to be expanded on by the group.
- Figure 1 was reviewed and agreed upon.
- Reviewed EPRI contribution Figure 2.
- Current draft copy to be sent to members and guests to be reviewed and commented on.

Utility experience contributions were reviewed by the group. Note: self-monitoring failure experiences to be moved to an appendix.

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

Chair: Joseph Valenzuela
Vice Chair: Jeff Long
Output: Revision of the Guide
Established: September 2014
Expected Completion Date: January 2018

Working group I29 met on Tuesday, May 10th with the assignment to revise C37.110 – Guide for the Application of Current Transformers for Protective Relaying Purposes. There were a total of 12 attendees (8 members, 1 corresponding member, and 3 guests). Quorum was met.

Significant items discussed during this meeting are:

- Michael Higginson volunteered to step up as the Vice Chair as our previous Vice Chair is no longer able to attend.
- The working group discussed open revisions, and is planning to incorporate prior comments with a new Central Desktop page. We have recently received a word version of our guide from IEEE SA.
- Several sections of the report are under review by members of the working group. One particular item of discussion was how to incorporate microprocessor relay CT application

considerations in the report, including the incorporation of CT example burden and saturation calculations for microprocessor relays.

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

Chair: Ljubomir Kojovic

Vice Chair: Robert Frye

Output: Revision of the Guide

Established: September 2014

Expected Completion Date: December 2018

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

Working Group I30 held its meeting in a single session on Tuesday, May 10, 2016.

There were 5 participants attended the meeting.

Draft 01 of the document is completed and was discussed during the meeting. Next step is distribution of the document for comments and additional contributions. Conclusion of the I30 group was that progress of the Guide revision is on track.

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

Chair: John Tengdin

Vice Chair: Brian Mugalian for PSRC

Output: Revision

Established: September 2014

Expected Completion Date: TBD

CALL TO ORDER	The meeting was called to order by the Chair.	None
AGENDA APPROVAL	The agenda was shown to the attendees.	None
CHAIR'S REMARKS	Chair welcomed members and guest. The attendees introduced themselves.	None
APPROVAL OF PREVIOUS MINUTES	The previous minutes were reviewed and the presiding officer noted that only 4 members of 11 members were present.	Secretary to send out January 2016 meeting minutes for approval.
Patent Slides	The PAR patent slide was reviewed.	None
Copyright Policy	The IEEE copyright policy was reviewed.	None
Presentations	There were no presentations.	None
Old business	There was no old business.	None
New Business		
Item #1	Secretary reported that a working group roster was provided to the working group chair.	None

Item #2	Secretary reported that the meeting agenda PowerPoint slides were distributed to the working group.	
Item #3	The secretary reported that Jerry still needs to provide some text regarding the addition of new or modification of existing text that describes the history of the five added standards to be placed into the informative annex.	Jerry Ramie needs to provide text.
Item #4	The secretary reported that the editors split the existing informative annex into distinct clauses for easier reference.	None
Item #5	The secretary reported that Jerry and Craig held several meetings to edit the document with an approach to changing the normative references in the EMC-related clauses.	None
Item #6	The secretary reported that while the normative reference work in the EMC clauses was completed, other work remains on other clauses 4, 5, and 6 in draft 0.12. This work should be completed in time for the September meeting.	Editors to work on draft to finish the normative reference work.
Item #7	The secretary presented an example document reorganization approach around the MICE concept (Mechanical, Ingress, Climatic, and Electromagnetic).	
Item #8	In reviewing draft 0.12, there was discussion that Annex C had new text addressing how to deal with protection specific terms in the C37.90 series. The same needs to be done with the IEC normative references.	Editors to review IEC normative references for keywords that need to be clarified in P1613.
Item #9	In reviewing draft 0.12, there was discussion around clause C.5.1 item c), where a new performance class may be needed to distinguish vendors claiming conformance in a generic way versus very specific to devices that do not communicate.	Future work for consideration by the working group.
Item #10	In reviewing draft 0.12, there was discussion on clause 6 regarding the high pot tests and whether they should be applied to communication ports or not. It was noted that the 802.3 standard may have a requirement and the secretary found a requirement in 802.3-2012, section 1, clause 12.10, pages 363 of pdf. It was noted that P1613 should clarify whether or not communication ports are included with the preference by many in attendance that these ports should be first tested without any protection to ensure they would still function after an event and then tested with protection.	Future work for consideration by the working group.
Item #11	In reviewing draft 0.12, there was discussion around the working group being provided the draft.	Secretary to provide draft 0.13 from edits made at the meeting.

Item #12	In reviewing draft 0.12, there was discussion around intended use, where the secretary corrected one instance of “intended function” with “intended use” in C.5.2 (as “intended use” is in the definitions).	Editors to look for any other occurrences of “intended use” and replace.
ITEMS REPORTED OUT OF EXECUTIVE SESSION	No executive session was held.	None

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

Chair: Andre Uribe

Vice Chair: Nefty Torres

Output: Review

Established: January 2015

Expected Completion Date: January 2018

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

The Working Group met Tuesday, May 10th, 2016, Denver, CO in a single session chaired by Andre Uribe with a total of **21 attendees**, 16 of which were members.

1. Introductions were held.
2. January meeting minutes were reviewed.
3. Resolved last session’s issue.
 - a. Should the survey include all industries? Group decided to only survey utilities.
 - i. **WG recommends** that the I-subcommittee consider a task force to develop a survey for the industrial/commercial sector.
 - b. Should the survey be broaden around overall protection or confine to protective relay practices. Members decided to cover overall protection, not just relays. Past survey addresses overall protection.
 - c. **Title change recommendation:** Change “A Survey of Relay Test Practices” to “**A Survey of Protective System Test Practices**”
4. Group reviewed 9 of 74 proposed questions. The remainder questions were assigned for review members to present their recommendations during next session.

Task Force reports

ITF33: Review of Relay Testing Terms

Chair: Jay Gosalia

Vice Chair: Amir Makki

Output: Report

Established: May 2015

Expected Completion Date: September 2017

Assignment: *Produce formal definitions for terms commonly used to describe relay testing procedures and prepare a report for consideration by the I-Subcommittee and future inclusion in the IEEE Dictionary.*

The Task Force met on time with 7 members and 5 guests present. We discussed the testing terms found in the IEEE dictionary collated by Matt Black. The definitions are generic level definitions that do not specifically address relay testing. Jerry Jodice has CIGRE documents which may have definition and will review and supply the details. Jerry will also provide testing terms used in various technical papers. Dustin Tessier will help Amir Makki in creating an inventory of testing terms used in different standards and then classify or group them for further work.

Terms used in C37.233-2009 were also discussed. The terms are not formally defined but are explained in detail. Formal definitions will be developed by the Task Force. The group also discussed the term “System testing”. A template format was proposed by Alex Apostolov to define terms. The template is

based on a what, why, and how format. Alex will provide an example of the template for the next meeting.

Liaison Reports

Instrument Transformer Subcommittee submitted by Fred Friend

Status of C57.13 Standards:

- C57.13 “Standard Requirements for Instrument Transformers” has been approved by RevCom and is awaiting publication.
- 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 just started the revision process. Among the proposed major technical changes, the following items have been discussed:
 - RIV tests will be limited to units rated 230 kV and above.
 - Clause 4.3 “Requirements for accuracy and accuracy calibration systems” will be aligned with the requirements stated in the new edition of C57.13.
 - Allowable leakage rates for gas-insulated instrument transformers at -40°C and -50°C will be reduced respectively to 1,5%/year and 3,0%/year.
 - Ambient temperature range during testing will be changed to +10°C - +40°C.
 - Number of reduced impulses waves. The number of reduced impulse waves with impulse voltage of 50% and higher is now limited to two in order to avoid insulation conditioning by applying several reduced-waves. After discussion, it has been agreed upon to allow more than two reduced impulses if the voltage level is lower than 50% of the full-wave level. This change will be implemented in the next draft.
 - Leakage measurement will be limited to the cumulative test method. An annex based on the content of clause 10 of IEC 62271-306 (Guide for circuit-breakers testing and application) describing the test methodology will be added in draft 2.0.
 - Details regarding chopped-wave test circuit and positioning of the chopping gap have been discussed and a reference to the latest edition of IEEE Std. 4 will be made. The additional requirement of not having a resistor in the chopping gap circuit will be kept.
 - Impulse current measurement during impulse tests will not be required if there is no multiple capacitive grading layers.
 - No short circuit withstand test will be required for CTs having a straight primary conductor and making a single turn. For the thermal aspect of these CTs, calculations have to be provided.
- C57.13.6 “Standard for High Accuracy Instrument Transformers” no activity
- C57.13.7 “Standard for Instrument Transformer with max output of 250ma” is ready for balloting.
- C57.13.8 “Station Service Voltage Transformers” is working on Draft 3
 - Pierre Riffon made a presentation about the use of a Chopped Wave Test to assure the integrity of SSVTs. The presentation showed that there was good correlation between successful tests and field performance. Subsequently, Igor Ziger made a presentation about the use of an Internal Arc Test to accomplish the same purpose. This presentation provided information about the types of SSVT failures experienced. It indicated that the majority of failures were main insulation of the winding. The presentation concluded that the Internal Arc Test is not a desirable means to assure successful field performance SSVTs.
 - The next draft will change the requirement from a specific wire size to a wire size determined by the manufacturer that will melt within 30 electrical degrees.
 - 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 24 – 27 October in Vancouver, BC Canada.

Coordination Reports

None

Old Business

None

New Business

1. New Business
 - a. Presentation – Working Group I4 – IEC Standards Advisory performed by Eric Udren
 - b. Creation of new Task Forces for IEEE standards expiring in 2020
 - i. Request volunteers that participated in the existing revision
 - ii. Task Force would start on September 2016 PSRCC
 - c. Joseph Valenzuela to report back on C37.110
 - d. Brian will ask Erin how do we determine if a standard should be eliminated or submitted for review.

Amir Makki moved to adjourn. Kevin Donohue seconded.

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.

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The J Subcommittee met on Wednesday, May 11, 2016 with 22 members (achieving quorum 22/36) and 17 guests. There was a call for the approval of the minutes of the January 2016 meeting. These minutes were approved by the subcommittee members.

Reports from the WG Chairs:

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

Chair: Sudhir Thakur
Vice Chair: Manish Das
Output: Report to the Subcommittee
Established: 2011
Expected Completion Date: December 2015
Status: 10th 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 14 members and 18 guests present.

The minutes of the Memphis meeting were approved.

WG reviewed and addressed comments received from the completed assignments on Draft 11.

It was agreed to move the Swing Center Voltage and its Rate of Change, Rate of Change of Impedance schemes into the Appendix under Possible Future Schemes. Demetrios Tziouvaras agreed to incorporate additional details into the Swing Center Voltage scheme description.

Appendix B – Frequency Deviation of Voltage method in Appendix B was reworked by Rama Gokaraju and renamed to Power vs Integral of Accelerating Power Method. This and the Equal Area Criterion method will also be moved to Possible Future Scheme.

Discussions were held on a possible limitation of Single Blinder Scheme to trip on first swing, and on the existing description of the blinder settings. Dale Finney will help update this scheme to capture the discussion on two items.

Juan Gers will write a paragraph on dynamic stability for section VI. Stability Studies

Draft 12 will be uploaded to J5 section of the J Subcommittee website folder.

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

J6: Protection Issues Related to Pumped Storage Generation

Chair: Joe Uchiyama

Vice Chair: Dale Finney

The J6 WG met on Tuesday, with seven (7) members and four (4) guests.

WG finished the J-Subcommittee Report in January 2015.

The paper was presented at Georgia Tech, April 2016 conference.

The paper will be presented at WPRC October 2016 conference. Dale F. will be a co-presenter.

WG reviewed and discussed the slides. Charlie Hennville made several good suggestions to the slides.

Next meeting will be 15 people and one session with a computer projector.

J7 Avoiding Unwanted Reclosing on Rotating Apparatus

Chair: Mike Reichard

Vice Chair: Steve Conrad

Output: Report to the Rotating Machinery Protection Subcommittee of the PSRC

Established: 2011

Eleventh Meeting Expected Completion 2015

Status Draft 5.0

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

WG Chairman Mike Reichard called the meeting of the working group to order.

The working group met with 7 members and 7 Guests on May 10, 2106 at the Regency Hyatt Denver Tech Center.

The meeting minutes from the January meeting were approved, The report will be sent to the J-SC for comment.

The meeting centered on the ‘dry run’ of the presentation of the paper to be presented during the May PSRC meeting on Thursday.

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: 9th Meeting

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

The group met on 5/11/2016 in Denver, CO with 17 members and 15 guests in attendance. The minutes from Jan 2016 meeting was approved.

The Chair presented the agenda and reviewed report draft R3.0. The assignments received since the last meeting were reviewed.

Hasnain Ashrafi presented his assignment on Isophase Bus Ground Fault Protection including Wye-Broken delta grounding transformer method and use of Ferroresonance VT in the generator circuit breaker to detect a ground prior to closing the breaker.

Nate Klingerman presented his assignment of sub-harmonic injection scheme. He discussed their recent practice of measuring impedances of the VTs to assist in setting this scheme with faster operation times.

Dale presented the analysis of the sequence network that he had performed on the accelerated tripping scheme previously presented in CFE’s paper. Luis Polanco, Mike Thompson, Dale Frederickson will share their relevant work on this topic and Murty Yalla has offered to review.

Assignments were made or reaffirmed to write the different sections of the paper.

The working group will have its 10th meeting in September 2016, 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 15 members and 12 guests present. A quorum was achieved (15 members present out of 29 total members).

The working group approved the minutes of the January 12, 2016 meeting.

The vice chair requested members to confirm their email addresses on the working group roster. The chair reported he would like to limit the member list to regular attendees and contributors.

Liaison reports were not available because the Excitation Systems and Controls Subcommittee (ESCS) and the Power Systems Dynamic Performance Committee (PSDPC) only meet at the annual PES meeting. Charlie Henville and Phil Tatro will attend the ESCS and PSDPC meeting this summer and present specific questions to each group for the purpose of initiating discussion and obtaining input to the report. Charlie and Phil also will solicit support from PSDPC for drafting remaining sections of the report.

Juan Gers led a review of the report focusing on the overall content of each section and report layout. The discussion yielded the following considerations for revising the report:

- State, early in the report, the protection functions for which modeling of generator controls is important to achieving coordination. Describe how modeling issues pertain to each protection function.
- Which analysis tools should be discussed in the report; should the report focus on tools typically used by protection engineers versus planning engineers?
- Should the report discuss planning tools only to the level that a protection engineer needs to understand to discuss with a planning engineer versus providing guidance to planning engineers on modeling issues important to protection coordination?
- Remove specific references to relay manufacturers and models.
- Refer to software tools generically; remove specific references to software manufacturers and programs.
- Avoid definitive statements regarding “requirements” for transient stability simulations in cases where simulations are beneficial, but not required; e.g., to confirm out-of-step coordination or to demonstrate compliance with a reliability standard.
- Reformat report and move some detailed information to appendices.
- A volunteer is needed to draft the section on governor control systems.

Members were requested to provide updated drafts of their report sections to Juan Gers and Phil Tatro by the end of July to facilitate preparation of the next draft in advance of the September meeting.

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: 6th Meeting

The working group held its sixth meeting on Tuesday, May 10th, 2016 with 13 members and 9 guests in attendance.

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

I. Chair kicked off the meeting with introductions.

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

III. Assignments were reviewed. Chair presented a table summarizing status of assignments and reviews. (Table is included in the meeting agenda).

a. Protection element write ups:

- i. 50, 51 (station service) – There was no concern from the working group members about removing these elements from the paper.
- ii. 78 (Bob Pettigrew) – completed and submitted.
- iii. 81 (Hasnain Ashrafi) – completed and submitted.
- iv. NERC standards (Dale Fredrickson) – Dale reviewed and submitted a summary of his findings. Consensus was reached to add a short write up that addresses impact of standards on black start facilities.
- v. Excitation system write up was previously completed by Matt Basler and has been incorporated into the draft.

b. Protection element review.

- i. 40 (Sungsoo Kim) – completed review and provided comments.

IV. Next Steps and Assignments. Chair requested that all writing assignments and reviews to be completed by the September 2016 meeting.

New Assignments:

a. Write ups

- i. NERC Considerations – Ruckman

b. Reviews

- i. 78 - Will English
- ii. 81 – Joe Uchiyama
- iii. Excitation – Deepak Maragal

V. Other Discussion –

- a. There was some discussion about the use of synch scopes to tie together islands during system restoration.
- b. There was a discussion about how to synchronize the diesel generator back to the main generator. It was agreed that this is more of an operational question than a protection issue. After further discussion it was agreed that the scope of the paper should include energization of the first line, i.e., the high side breaker.
- c. There was a suggestion to include an example of a black start operation. This was suggestion was adopted.
- d. Steve Conrad suggested incorporate single-line diagrams for the black start scenarios to enhance clarity. Chair will see where these can be incorporated.

VI. Adjourn – Meeting adjourned at 2:40pm.

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: 4th Meeting 5-10-16

Assignment:

Work Group Assignment

- Review, compare and contrast NEMA MG-1 with ANSI C50.41 regarding transfer criteria.
- 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.
- Investigate existing open-transition motor bus transfer (MBT) actual data from multiple events at the medium voltage level. Examine for current versus Volts/Hz at transfer periods to see if there is a correlation.
- Examine published reports, papers, C50.41 and NEMA MG-1 on motor fast bus transfer criteria to reconcile the conclusions with the field-measured results.
- 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 obtainable)
- Produce a Report to Subcommittee with the above findings

Activity:

1. The chair could not attend the meeting due to sickness and the vice chair also could not attend as he was chairing I29 at the same time. The meeting was run by acting chair Murty Yalla and minutes were recorded by acting vice chair Ben Kazimier.
2. The WG met Tuesday May 10th, 2016 from 3:00 PM to 04:15 PM with 11 members and 10 guests. WG members and guests introduced themselves.
3. Quorum was not met (11/25) so the Jan. meeting minutes could not be approved. The request to approve the minutes will be sent out via email.
4. The acting chair went through the WG assignment and the agenda of the meeting.
5. Previous working group assignments were reviewed.
 - a. Mital Kanabar: Higgins paper, Induction Motor Models for Bus Transfer, 1990
 - i. Mital stated that the paper compared 5 different Induction Models with model 1 being the simplest and 5 being more accurate and more complex. Models 4 and 5 include the effect of rate of change of flux linkages. The paper compares the computed results of the 5 models with one real life example. Model 5 is considered as more accurate.
 - ii. With reference to a question if the speed of the motor was considered in the model Mital stated that the speed was considered indirectly through slip in the equations A1 to A7 in the appendix.
 - iii. It was also stated that the Phase angle upon reclose is not considered as a parameter in the analysis.
 - iv. It was also stated in the paper that even though it is debatable there is some correlation of inrush current with V/Hz during re-energizing.
 - v. One issue that was brought up is that the shaft system was not modeled.
 - b. Reviewed by Matt Basler: Review of R. C. Moore's (Allis-Chalmers Mfg.) article on Residual Voltage on Induction Motors, Allis-Chalmers Electrical Review – 1955
 - i. It was a short paper that gave basic information, things that are well known to the industry at this time. It did give information on residual

voltage function considering the open circuit time constant of a motor.
Fast transfer was discussed but no metrics were given.

- c. Reviewed by Nate Klingerman: Handbook of Electric Motors
 - i. Report is not completed because the iterative methods used in the paper are difficult to work through and summarize as it relates to V/Hz. The reclose methods used are rudimentary so it is difficult to draw a meaningful conclusion.
6. IEEE Std 666: Tom Beckwith stated that he is having difficulty receiving comments back from the IEEE Std 666 group. There is nothing new beyond what was reported during the last WG meeting.
7. Tom Beckwith and Murty gave presentation on collected field data (subject of a future paper).
- a. The presentation related to 36 cases of field data collected from around the world for fast, in-phase and residual transfer cases.
 - b. Using the collected oscillograph waveforms of voltage and current the air gap torque prior to the transfer and peak air gap torque after the transfer are calculated and the ratio of these two torques are tabulated for all 36 cases.
 - c. The results were briefly discussed and it indicated that residual transfer cases where breaker closing took place with a large phase angle the torque ratios are very high.
 - d. There was a discussion on what was the motor load prior to the transfer as lighter loads tend to give higher torque ratios. It was not possible to determine the loading on individual motors unless instrumentation is available to collect the waveforms of voltages and currents at individual motors.
 - e. The WG is looking for installations where this data can be available so that the torque ratios of individual motors can be calculated. However, to date this has not been possible.

WG Assignments:

1. Mital to send Higgins paper to Norman Fischer for review regarding the modeling questions.
2. Mital to provide a brief summary of his report on the Higgins paper to the working group chair so that it can be included in the WG report where appropriate.
3. Matt Basler to send a condensed summary of the report to the working group chair for a possible inclusion in the WG report to the subcommittee.
4. Mital and Nate to work together on the "Handbook of Electrical Motors" assignment and provide a summary which can be combined with the summary of the Higgins paper.
5. Dennis Tierney indicated that regarding his previous assignment. He is to send schematics and provide information for the plant contact to get permission to obtain data.
6. The report on "The Effects Reclosing of Reclosing on Industrial Plants" was reassigned to Derrick Haas of SEL. Report due prior to the next meeting.

Adjournment

Next Meeting:

Single session, projector, room for 30 people, request that conflicts be avoided with I29, K10, I27, K16, K17, K18, J12.

JSC will establish JTF3 to Investigate JSC including Protection of Inverter-based Energy Sources

K: SUBSTATION PROTECTION SUBCOMMITTEE

Chair: Don Lukach

Vice Chair: Bruce Pickett

The K-Subcommittee met on May 11, 2016 in Denver, CO, with 22 of 28 members and 54 guests in attendance. A quorum was achieved. Bruce Pickett was not able to attend and Mike Thompson filled in. Adi Mulawarman motioned to approve the January, 2016 subcommittee meeting minutes. Gene Henneberg 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: 6.1b

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 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 K1 working group met in a single session. 11 members and 3 guests were present. After the introduction, a call for quorum was made, quorum was achieved. A motion was made and seconded to approve the minutes of the last meeting, and the motion was approved.

Current draft of the document is 6.1b. The draft for the next meeting will be 6.2a.

The following was discussed:

- Meeting minutes from the January meeting in Memphis and the April WebEx meeting were approved.
- 2 year PAR extension was granted by the IEEE SA in February.
- Updated figures in section 5 showing installation configurations were discussed.
- Don L. mentioned that the latest version of the standards style guide uses a certain font and italic text for variables in figures, Steve Conrad to look into this during update of figures.
- Addition of vector group designations presented in IEC/IEEE 60076-57-1202 to the PST protection guide was discussed. After discussion the group voted and unanimously not to include vector group designations to the guide.
- A motion was made to approve section 6 in its current state. The group voted unanimously to approve this section.
- The use of quadrature boosters was discussed. Per Mike Thompson these are used in Great Britain and are protected with Buchholz relays only, no electrical fault detection is used. This will not be discussed in detail in this guide.
- Section 7 on PST inrush was discussed and will be reviewed in detail during the next WebEx meeting.
- Cristian Paduraru joined the working group as member.

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

K5: (PC 37.119.2005): IEEE Guide for Breaker Failure Protection of Power Circuit Breakers

Chairman: Roger Whittaker

Vice Chair: Adi Mulawarman

Established: 2011

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

Draft: Final

Expected Completion Date: Dec. 2016

Assignment: To revise and update C37.119-2005 – IEEE Guide for Breaker Failure Protection of Power Circuit Breakers.

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

Quorum met with 13 members out of 26 in attendance.

2. Approve Memphis minutes (Motion : Rich Young , Second : Phil Tatro)

Minutes approved with minor modification to the word change from Agenda to Minutes in the title.

4. SA Ballot draft 4 recirculation complete-no further comments, no public comments received, 85% participation 98% approval, 67 comments, 1 DNA ballot. Draft 4 submitted to SA/Revcom for final ER. Roger provided explanation what happened since the last meeting.

Draft 4 resubmitted after recirculation to RevCom. No words back from SA if we need to do anymore work on the document before we meet in Denver.

Next step is to submit to SA editor, Don L. said it took 5 months for the line guide.

5. Discuss/outline summary paper, abstract, sections, authors

What's new in the standard – summary paper/presentation.

Advantages of using a new WG for doing the summary paper is more relax requirement. We discussed whether we want to use the time waiting for SA editor to be done to start writing a summary paper.

Mike Thompson made a motion to get the WG to make summary paper and Alla Deronja second it. The WG voted to approve it. Expected due date for final paper is May 2017. Volunteers as tentative presenters were: Roger Whittaker at WPRC, Mike Thompson at Texas A&M, Bruce Mackie at Georgia Tech, and Adi Mulawarman at Mipsycon.

Roger than discuss about outlining the paper and how it is going to be written. The group agreed to the outline and volunteers to write each section were received.

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

Roger will remember to send the outline to members or folks that will be writing the paper.

6. Discuss conference paper procedures/schedules

Assignments due August 30th, sent them to Roger and Adi. The contributions will be put together by Roger and Adi.

Don L. will ask the O&P manual and let Roger W. decide which format to use.

Then we discussed the schedule for having the abstract of the paper available.

We decided this should be complete by about March 2017.

Tentative presenter all for conferences in 2017: Roger Whittaker at WPRC, Mike Thompson at Texas A&M, Bruce Mackie at Georgia Tech, Adi Mulawarman at Mipsycon

7. Breaker failure events?Adjourn

Don Ware mentioned a project where in order to achieve reduction of clearing time the Direct Transfer Trip signal to the remote end is directly wired to bkrs trip coil to save 1 cycle from going through a lockout relay.

K10: SCC21 DISTRIBUTED RESOURCES STANDARD COORDINATION

Chair: R. Ben Kazimier

Vice Chair: Mark Siira

Established, 1999

Output: Standard through the SCC 21

Expected Completion Date: 20xx

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 5-10-16, there were 4 members and 3 guests present.

The working group reviewed the overall structure of the 1547 working group. The minutes from the March 1547 working group meeting were reviewed. Draft 4 of 1547 is scheduled to be out by the end of May. That draft will be circulated to the K10 membership for review and comments. We discussed that the chairperson of 1547 has stated that "1547 development is by individuals and that individuals are invited to become members and contribute personally". This is not possible for many PSRC members and that fact is the basis for the K10 working group. Mark Siira and I will work with the 1547 leadership to insure that the PSRC input is received and taken into consideration. The current goal is to start the 1547 balloting process by Dec. 2016. The next 1547 meeting will be hosted by Portland General Electric on June 14-15 at the World Trade Conference Center in Portland, OR.

For the next meeting we request a room for about 20 people with a projector lasting for a single session. We also request that conflicts be avoided between K10 and the I27, I25, and C26 working groups.

K11: Open Phase Detection for Nuclear Generating Stations

Chair: Charlie Sufana

Vice Chair: M. Urbina

Output: Report

Draft: 5

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 6 members and 10 guests in attendance for the May 10, 2016 meeting.

The minutes from the January 12, 2016 K11 meeting were read and approved.

Wayne Johnson provided an update on NEI and the NRC. NRC is going to inspect one model plant for each detection type. By 2018, every plant will have an inspection, and have to be enabled by 2018.

The working group then reviewed the revision of the entire document. Charlie discussed sections where the report is still missing content:

Section 2.1.7 (phase current detection) was discussed. The submission from Mike Mustafa was just the PCS2000 Pamphlet. Mike Urbina suggested that we remove this section.

Section 2.8.3 (metering class CTs) was reviewed. No volunteer has provided content for this section. Charlie indicated that he will remove it.

Charlie discussed the new organization of the document that was provided by Wayne Johnson.

Annex A.10 – NEI Report – since the report is not finished, this will be changed to just refer to the NEI website.

Charlie has added Annex E on microprocessor relays.

The document will be sent out to the group for final comments.

There was discussion on the approach that plants are taking; that being the use of a detection on the high side, as well as negative sequence on the low side.

Annex E.1 pg 62-65, written by Ahmed Abd-Elkader from SEL, on use of noise, toggling of the LSB, to determine if there is an open phase was reviewed. Mike Urbina indicated that this information may be proprietary. Thus Ahmed will be contacted to verify that it can be included.

The working group then continued with discussion on Alstom scheme – which uses optical CTs to monitor the magnetizing current and filters out harmonics to monitor fundamental current. Thus harmonics do not impact solution. The scheme has been applied at FPL in Florida. The Alstom relay adjusts to the voltage level and variations.

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 11.4

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

PSRC K12 had a meeting on Tuesday, May 10, 2016. K12 had 3 members and 8 guests present. Quorum was not met. One guest expressed interest to be a WG member. The K12 meeting minutes from last January meeting will be approved after the meeting through email. Several sections of draft 11.3 were assigned for review.
Section 7.1 to Roger Whittaker
Section 7.2 to Satish Samineni
Section 7.3 to Mike Thompson
Section 7.4 to Dean Miller

Section 6.1.2 Contribution from Martin Best was also reviewed.

WG K12 plans to have a series of web meetings before the September meeting to review the comments. The next in person K12 meeting will be September, 2016 in Cincinnati, OH. The requirements are a single session, a meeting room for 20 people, and a computer projector. The current draft number is 11.4.

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: 1.7

11. WG met on Tuesday, May 10th, 2016 with 4 members and 7 guests.
12. WG Vice-Chair Luis Polanco was announced as new Vice-chair.
13. IEEE Patent slides were introduced.
14. We had a quorum to approve September Meeting Minutes.
15. Review of Prior Assignments:
 - o Ilia Voloh presented figures correction on representation of externally/internally fused SCBs, updates on better representation of typical capacitor current unbalance protection settings, including others corrections to the section 5.
 - o Group discussions on recommendation to re-phrase statement that when a fused is blown on a SCB, the capacitor unit is not electrical isolated.
 - o Group discussions on unbalance bank protection led to a recommendation to follow up with some manufactures to find out about typical practice to provide recommendations about levels of unbalance protection for the bank and what are the most typical (statistical) failure modes on the SCB-Ilia to follow up.
 - o Luis Polanco follow up on additional contributions to his proposal for the section about impact of the SCB to the line protection, group had discussions on this proposal and agreed to keep expanding on impact of the SCB on the line protection- Luis will continue work on this section.
16. New Assignments
 - o Satish Samineni to provide write-up of new section about modeling of the SCB and transient model development and considerations on SCB protection studies.

- Iliia Voloh will follow up on task to find from SCB manufacture if it is a typical practice for them to provide recommended unbalance protection levels and most typical bank failure modes (statistical).
 - Luis will continue to expand his write-up on impact of the SCB to the line protection (21, 87, 67 etc).
 - Deepak volunteered to review and improve some parts of the sections to re-phrase and provide input comments.
17. Current draft is 1.7.
18. For next meeting a meeting room for 25 persons is required a with AV capabilities.

K15: Centralized Substation Protection and Control

Chair: Ratan Das

Vice-Chair: Mital Kanabar

Assignment: Write a PSRC report describing and analyzing existing and emerging technologies for centralized protection and control within a substation. Additional assignments: writing IEEE Transactions paper and a summary paper for conferences (which was subsequently approved at the K SC meeting 1-13-16).

The working group finished all papers and did not meet in Denver.

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: 5

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 20 members and 19 Guests on 11 May, 2016, at the Regency Hyatt Denver Tech Center.

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 during the meeting.

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

Clause 8.4.3 Reviewer – Don Ware

Clause 8.4.4 Reviewer – Johan van den Berg

Clause 8.4.5 Last two sentences of paragraph removed.

Clause 8.5.1 Discussion of 4 winding transformers is to be replaced by a new section on multi-winding transformers used on 24 pulse inverters – Lubomir Sevov

Clauses 8.5.2 & 8.5.3 Reviewer Brandon Davies

Clause 8.5.4 Reviewer Mark Schroeder

Clause 13 Reviewer Mike Thompson

Clause C.1.2.4 Brandon Davies to review write up on slope.

Mark Schroeder will review definitions (i.e. microprocessors, numerical, digital and REF).

Annex B to be reviewed by Suparat Pavavicharn, and Annex C.2.6 to be reviewed by Will English
Reviews and assignments to be returned to chair by July 15, 2016

Minutes from the January meeting were approved motioned by Rich Young second by Abu Bapary, motion carried.

Meeting adjourned.

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

Avoid WG conflicts with K16 and J7

K17 Geomagnetic Disturbances (GMD)

Chair: Qun Qiu

Vice-Chair: Luis Polanco

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

Draft: 1.0

1. K17 met on Tuesday May 10th with 30 participants (14 guests and 16 signed members).
2. Vice-Chair presented agenda for the meeting of the K17 WG to all participants.
3. Meeting minutes of the K17 last meeting from January 2016 in Memphis, TN, was previously approved via email.
4. Vice-chair went over previously assigned action Items (Assignments) list and also presented unassigned sections we needed volunteers to sign in to provide contributions.
5. Dominick Fontana agreed to provide contribution on section 2.3.2
6. Yuan Liao agreed to provide contribution on section 2.3.3
7. Vice-chair agreed to provide contribution on section 2.4.1 and 2.4.2
8. Patrick Kurelich agreed to provide contribution on section 3.1
9. L. Schroeder agreed to provide contribution on section 3.2
10. B. Davies agreed to provide contribution on section 3.5
11. Group discussions on received contributions from members on their assignments, and some additional inputs were incorporated on their drafts at the meeting.
12. Section 1.4 GMD Experience on BC Hydro – C. Henville
13. Section 2.2.4 Transmission Line Protection – C. Henville
14. Section 2.2.3 (review) – C. Henville
15. Section 2.1 – M. Thompson
16. C. Henville agreed to revise provided assignment contribution with inputs provided within the groups discussions as needed.
17. Chair/vice-chair will follow up with pending assignments to make sure all previous and new assignments to be completed before September 2016 meeting. Listed below are commitments at the January meeting.
18. Review of C37.163 – V. Le and H. Ladner
19. Section 1.1 and review section 1.2.1 – S. Paravicharn
20. Section 1.4.2 Cap Bank Tripping – M. McVey
21. Section 2.2.1 Capacitor Bank Protection – M. McVey
22. Section 1.4.3 Transformer Protection Impacts – N. Fischer
23. Section 2.2.2 Transformer Protection (combined w/ 1.4.3) – N. Fischer
24. Section 2.4.3 Micro-processor Relays – N. Fischer
25. Review of Section 2.3.1 – M. Hilaly
26. For next meeting chair requests a single-session and a meeting room for 30 persons, with AV capabilities.
27. The WG report draft # is 1.

K18 PC37.108, Guide for Protection of Network Transformers

Chair: Adi Mulawarman

Vice Chair: Surarat Pavavicharn

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

Draft: 1

Established: May 2015

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

14 attendees ,10 out of 16 members attended. 2 new corresponding members added, Joe Xavier, Abu Bapary

2. Approve Memphis, TN meeting minutes_Don Lukach – motioned, Joe Xavier - seconded

3. Status on PAR process/submittal/schedule

PAR Submitted for Approval : October 7th 2015

PAR Approved by RevCom : December 5th 2015

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

Projected Completion Date for submittal to RevCom : 08/2018

PAR will expire December 31st 2019

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

4. Title, Scope and Purpose restatement from accepted PAR

Title : Guide for the Protection of Secondary Network Systems

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

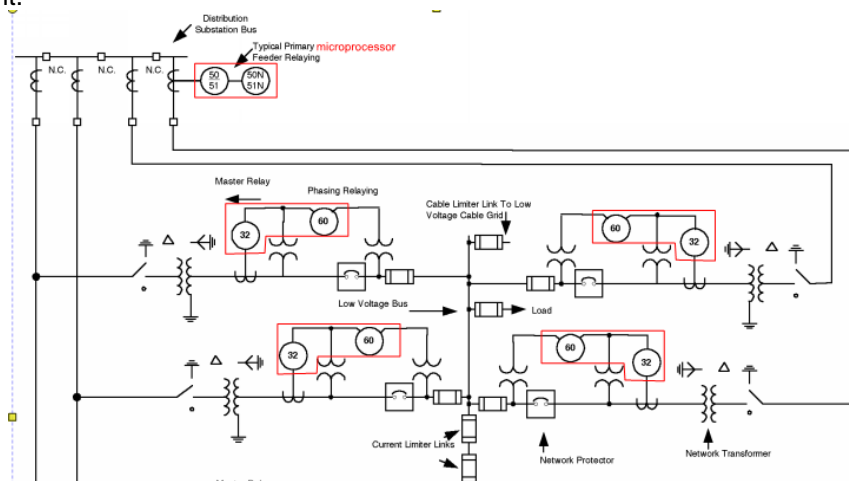
Purpose : This guide covers devices that are being used in secondary network systems protections schemes. These devices should act to sense the fault and initiate fault interruption locally or remotely, thereby minimizing damage and restoration time.

5. Update on assignments

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

<https://iee-SA.meetcentral.com/psrcktf18/folder/5770883/#folder:6721181>

- We asked Mal Swanson for liaison to be assigned to this WG to help with the definition section.
- Mal have assigned Roger Whittaker to be the liaison.
- Bruce Mackie has submitted his comments for section 5. File uploaded to Central Desktop site.
- Adi completed his revision and reviewed for section 7. File uploaded to Central Desktop site.
- Ed has asked microprocessor relay version of Figure 1. Would something like below be sufficient.



- Ed has also asked to add microprocessor into the definition section. Now that we have liason for it, we can ask Roger. Can we take the definition from the dictionary and copy paste it or is the guideline indicate that we do not add it if we already have it in the dictionary. I know we don't need to create a new or different definition here.

- Adi did a quick search in the current dictionary and found no 'microprocessor' in the dictionary.

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

No presentation at this meeting.

We reviewed section 5 and section 7.

Request to SubComm K for next meeting for room for 25 people

And meeting time Monday evening time slot during September meeting.

No conflict with K5,K16,K17,J12,J15

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: Review IEC60255-187-1 Draft and provide comments to the IEC TC95 through the IEC US National Committee

The working group met with 5 members and 4 guests. An overall review of the Standard CD document and comments received by the IEC from around the world were made. A revised document will be circulated within the IEC WG by August 2016 to which we will have access and have an opportunity to comment.

For next meeting we need a room for 20 people plus PC screen projector.

KTF20: Review and comment on C57.21 and C57.109

Chair: Jim Niemira

Established: Jan, 2016

Expected Completion Date: May 2016

Assignment: Review and comment from PSRC perspective on equipment standards presently undergoing revision by the Transformer Committee: C57.21 [IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA]

The Task Force met for the second time on Wednesday, May 11, 2016, in Denver, CO, in single session chaired by Jim Niemira with a total of 10 attendees (9 members and 1 guest).

The group discussed the Task Force Assignment:

Both working groups for C57.21 and C57.109 seem to have just started their work on revising the equipment standards.

The responsibility for review and comment on C57.109 has been passed to the PSRC K16 working group presently revising the C37.91 IEEE Guide for Protecting Power Transformers. Will English, chair K16, will contact the chair of the C57.109 WG to provide PSRC comments to that group and assure that there is a formal response received.

The Task Force agreed that review of the C57.21 standard and the corresponding PSRC protection guide C37.109 would still be valuable to provide any comments from protective relaying perspective to the equipment standard working group. The protection guide C37.109 was last revised in 2006 and reaffirmed in 2012 so it will not be up for revision again for some time.

The Task Force felt that the formation of a Working Group would be appropriate so that formal comments can be made from the chair of the newly formed WG to the chair of the C57.21 WG. The KTF20 Task force requests the K Subcommittee to form a new WG for this purpose. Jim Niemira and Brian Boysen indicated willingness to serve as Chair and Vice-Chair of the new WG, if there are no other volunteers to do so. It is anticipated that the WG would meet once or twice and that most of the work of the group could be completed by correspondence in advance of the September 2016 PSRC meeting.

Action Items:

- 1) Jim Niemira to send copies of latest issues of C57.21 and C37.109 to the members and others who have expressed interest in K20TF who will serve as the foundational members of the new K WG. (complete by 5/14/16)
- 2) Members will review and comment, or indicate that they have no comments, by 6/30/16. Reminders will be sent by the TF Chair on or about 6/1/16, 6/15/16, and 6/25/16.
- 3) Comments will be consolidated and distributed to members. Additional discussion may be arranged.
- 4) New WG to meet at the September PSRC to discuss the comments and compose a transmittal to the C57.21 WG.

Brian Boysen moved to adjourn and Steve Conrad seconded. The meeting adjourned at 10:17 AM

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

Chair: Randy Crellin

Vice Chair: Michael Thompson

Established: May, 2016

Output: Recommendation to K subcommittee

Draft NA

Expected Completion Date: September, 2016

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

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

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

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

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

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

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

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

After discussion, the chair proposed adoption as the path to investigate. To that end, several members of the task force agreed to review the IEC standard and make sure that it adequately covers what is in the existing C37.112 standard and prepare a summary for discussion and decision by the task force in September. Erin Spiewak of IEEE SA will request the IEC document for use by the task force.

Liaison Reports:

No liaison reports were given. Information can be found at the following web addresses for T&D and the Transformers Committee. The IAS report is not yet available.

T&D Committee, Capacitor Subcommittee

Pratap Mysore

<http://grouper.ieee.org/groups/td/cap/>

TX Committee

Fred Friend

<http://www.transformerscommittee.org/>

IAS Arc Flash

Suparat Pavavicharn

The report is expected to be sent prior to the next PSRC meeting.

Old Business:

No Old Business was discussed.

New Business:

Jim Niemira motioned to form K20 to *Review and comment from PSRC perspective on equipment standards presently undergoing revision by the Transformer Committee: C57.21 [IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA]*. Jim will chair the group and the vice chair is Brian Boysen. Motion carried unanimously.

Mike Thompson motioned to form KTF22 for the purpose of reviewing C37.234 IEEE Guide for Protective Relay Applications to Power System Buses as the guide expires in 2018. Steve Conrad seconded, and the motion passed unanimously. Abu Bapary will chair and Mike Thompson will be the vice-chair. Subsequent officer approval of the positions was approved.

IEEE C37.109 was discussed as possibly opening for revision to add microprocessor technologies. It was reaffirmed in 2012 and with the amount of work that the K subcommittee currently has, adequate resources are not available at this time.

General Discussion:

A presentation was given by Ratan Das and Mital Kanabar on their K15 work.

Motion to adjourn made by Don Lukach and seconded by Mike Thompson. Motion passed unanimously.