**POWER SYSTEM RELAYING COMMITTEE**
**OF THE IEEE POWER and ENERGY SOCIETY**
**MINUTES OF THE MEETING**
**January 10-13, 2016**
**Memphis, TN**
**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 September 2015 meeting in La Jolla, CA was moved by Phil Winston and seconded by Roger Hedding and was approved unanimously.

The financial status of PSRC is in good standing.

## III. Chairman's Report Mike McDonald

The January 2016 Joint Technical Committee meeting in Memphis was well attended with over 225 attendees indicating the PSRC as their reason on being there – out of 604 total attendees.

We welcomed Chris Chelmecki, Ian Tuallo and Sukumar Brahma as new members of the Main Committee.

John Boyle, Bob Beresh, Gerald Johnson, Chuck Mozina and Rick Taylor have indicated they will no longer attend regularly and were honored for their long time support of the PSRC by being granted Honorary Membership. We wish them well and invite them to drop in when they can.

On the re-organization front the PES continued to move forward at the JTCM. The overall organization of Technical Committees was approved at the Technical Council and was to be taken up by the Board of Governors on Thursday after our meeting had concluded.

After the September PSRC meeting the SC chairs were requested to have their WG chairs provide input as to whether the WG should reside in the PSRC or the new PSCCC technical committee. The review of the responses by both PSRC and PSCCC key personnel began during the JTCM and will need to be completed in order to come to grips with the final Technical Committee organizations. There will be more on this at the May PSRC meeting.

In regard to the remaining 2016 PSRC meetings – they will be done in the very same manner as previous years while we continue to work out the details for 2017 and beyond. The proposed leadership of the new PSCCC is committed to – as I am – having joint meetings with us. In 2017 and beyond this may require an added day to the meeting – this is just one option being evaluated to insure success of our Committees.

One issue that came up at the JTCM was past Technical Council chair Jeff Nelson provided the Technical Council with an IEEE template for use on all future reports. (The PSRC has been looking to have a standard format for our reports and that aspect is welcomed.) The templated reports will be required to be placed on the PES Resource Center site where they should be available to a wider audience than today if for no other reason that the site will become recognized as a go-to site. PES members can access the documents for free. Following Technical Council discussion of the new requirement we were allowed to keep placing the reports on our website except that we must password protect the documents – which has raised a great concern from our Committee. These papers have been freely distributed information that helped us encourage people to attend our meetings and to show the value of IEEE and PES membership. We are hoping for a positive outcome so we can continue as one of the most successful Technical Committees in the PES.

Mike
PSRC Chairman

## IV. Reports of Interest

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

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

2016 T&D Conference; Ten conference papers were accepted out of eighteen submitted.

2016 PES General meeting: Forty two conference papers were submitted and are in the review process. In addition to this, nine transaction paper abstracts were submitted to paper presentation scheduling.

#### b. Future Meetings

The PSRC Website is updated with the latest information. Please visit http://www.pes-psrc.org

IEEE is still trying to work on locations and contracts for 2017 and 2018 May and September meetings.

### B. CIGRE B5 Activities Report – Rich Hunt

- The 2015 CIGRE B5 Colloquia took place in Nanjing, China, September 25, 2105. TW Cease represented the US at this meeting, as I was unable to attend.
- The B5 Technical Committee approved 3 new Working Groups
  - Near process unit requirements
  - Fast instantaneous protection and network automation systems – implications and requirements
  - New challenges of frequency protection
- The TC also determined the 3 preferential subjects for the 2017 Colloquia to be held in Auckland, NZ
  - Challenges of design and maintenance of IEC 61850 based systems
  - Protection issues in modern power systems with renewable generation and storage and Coordination of Protection and Automation for Future Networks including Storage (To be coordinated and merged)
  - The impact of 'No Build Solutions' on Protection and Control
- Also determined were the preferential subjects and reporters for the 2016 General Session in Paris.
  - PS1 Protection Automation and Control System (PACS) Optimization and Life Time Asset Management Special Reporter: Klaus-Peter Brand (CH)
  - PS2 Coordination of Generator and Power System Protection Special Reporter: Rannveig Loken (NO)
- B5 currently has 17 active Working Groups. Reports were presented on the status of each WG by the convener. B5.44 on phase shifting transformers convener has resigned as convener, and the TC is actively looking for a new cconvener If none is found, the WG may disband.
- Upcoming events:
  - 2016 General Session is in Paris, the last week of August.
  - 2016 CIGRE Grid of the Future is in Philadelphia, PA, October 30 to November 1, 2016
  - 2017 B5 Colloquia will be in Auckland, NZ

A few reminders about CIGRE: anyone can join CIGRE, through the U.S. National Committee. Electronic copies of CIGRE Working Group reports are free to CIGRE members. They are available for purchase by non-CIGRE members. Reports older than 3 years are free for non-members to download.
rich.hunt@ieee.org
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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 this time. 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 is more complete and accurate, meets the requirements of PSRC as well as IEC participant users, and can achieve voting approval as quickly as possible.

MT4 met in Biarritz, France, October 27th-30th, 2015 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.
- 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 Norman 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 Macau, April 11-14. The following 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.

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.

- 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.

**TC 57, Power systems management and associated information exchange**
TC 57 WG 10 continues development of parts of IEC 61850. A major breakthrough is the creation of Edition 2.1 for the core parts of the standard, bused on UML machine-readable electronic modeling format to supplant the massive modeling documents now on thousands of pages of paper for product programmers to struggle with. Electronic representation of modeling will greatly improve consistency, interoperability, and development speed of compliant products.

For a detailed update on the status of TC 57 WG 10 developments for IEC 61850, provided by Christoph Brunner, see SC H Liaison Reports.

The next meeting of WG 10 is in Cathedral City, CA (near Palm Springs), February 15-19.

## E. Standard Coordinators Report – Adi Mulawarman

PSR Standards Coordinator's Report Winter, 2016
The status of standards activities that have taken place since the September 2015 meeting of the PSRC are as follows:

RevCom = Revision of existing standard
NesCom = New Standard

Revision to Existing Standards Completed
C37.113 (Guide for Protective Relay Applications to Transmission Lines) revision is approved by SASB and now under editorial review.
C37.103 revision is approved by SASB Guide for Differential and Polarizing Relay Circuit Testing

PAR for revising existing standard or creation of new standard Approved
These WG will have until 2019 to finish their work.
PC37.108
PC37.110
PC37.233
PC37.235
PC37.242

Standards due for 10 year review
C37.112 will expire in 2018; K Subcomm will create a WG to submit the PAR and reaffirm the standard as is.

Ballot Activity:
See attached spreadsheet.

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

PARS expiring at the end of 2016

| | |
|---|---|
| PC37.245 | No extension needed, plan to be done. |
| PC37.237 | No extension needed, plan to be done. |
| PC37.241 | Indicate may need extension and they will decide by May meeting. |

PARS expiring at the end of 2017-2018
Red may require extension because it will expire this year and no PAR extension submitted.
Orange will expire at the end of the following year.

| No. | PAR Date | PAR Exp | Revise or withdraw | 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) |
| PC37.245 | 2012 | 2016 | | K | Guide for the Application of Protective Relaying for Phase Shifting Transformers |
| 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) |
| 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**

A brief report of the work in Substations Committee was presented at the PSRC A0 Subcommittee meeting on 1/13/2016

A. Substations C0 is working with the PSR Committee AdCom to coordinate activities related to the PES reorganization.

B. The C37.2 standard is being revised, which defines standard IEEE function numbers and acronyms. If anyone knows of edits required to existing numbers/acronyms or needs a new number/acronym defined, please come join the working group so that can be accomplished.

C. Substations C0 will be working to propose adjustments in the proposed PSCC Committee Scope and the complementary portions in the proposed PSRC Scope. This will focus primarily on the last paragraph in the PSCC scope, which tries to explain where the PSCC and PSRC proposed scopes meet. Any proposed changes to the complementary portions of the PSRC scope will be forwarded to the PSR AdCom.

**G. NERC Report - Eric Allen**

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 January 2016**

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

The B1 Working Group met on Monday January 11 at 3:30PM with 6 members. The group approved the September meeting minutes. The following items were discussed during this meeting:

1. **Individual Awards:** Our WG discussed and nominated PSRC Members for Individual Awards for the period October 2014 to September 2015 in the following categories:
    a. PSRC Career Service Award:
    b. PES Technical Council Service Award.
    c. PSRC & PES Young Professional Award

    The recipients of these awards will be announced in the May Main Committee Meeting

2. **Entity Award** – The WG submitted the 2015 PSRC report to the PSRC chair.

3. **January Meeting Awards** – The following Individual and WG Awards for the period October 2014 to September 2015 were awarded on Wednesday January 13, 2016 during the Main Committee Meeting.
    **a. PES WG Recognition Award for 2015 Outstanding Technical Report to:**

| **PSRC WG C17 – Fault Current Contributions from Wind Plants** |
|---|
| Dean Miller (Chair) and Gene Henneberg (Vice Chair) |
| WG Members: |
| Jeff Barsch<br>George Bartok<br>Gabriel Benmouyal<br>Oscar Bolado<br>Brian Boysen<br>Sukumar Brahma<br>Stephan Brettschneider<br>Zeeky Bukhala<br>Jeff Burnworth |

| |
|---|
| Ernst Camm<br>Steve Conrad<br>Randy Crellin<br>Alla Deronja<br>Wayne Dilling<br>Kevin Donahoe<br>Marcus Fischer<br>Jorge Garcia<br>Larry Gross<br>Daryl Hammond<br>Charlie Henville<br>Dustin Howard<br>Doug Hunchuk<br>Raluca Lascu<br>Chuck Mozina<br>Adi Mulawarman<br>Shyam Musunuri<br>Jim Niemira<br>Omer Orar<br>Eric Schellenberg<br>Jens Schoene<br>Travis Smith<br>Isabelle Snyder<br>Michael Starke<br>Phil Waudby<br>Tom Wiedman<br>Rich Young |

**b. PES WG Recognition Award for 2015 Outstanding Standard or Guide**

| **PSRC H13 and Substations Committee C10 WG – C37.240 IEEE Standard Cybersecurity Requirements for Substation Automation, Protection and Control Systems** |
|---|
| Sam Sciacca (Chair) and Tim Tibbals (Co-Chair) |
| WG Members: |
| Ed Cenzon<br>Catherine Dalton<br>Michael Dood<br>Ronald Farquharson<br>Michael Fauchon<br>John Galanos<br>Didier Giarratano<br>Bob Haberman<br>Randy Hamilton<br>Richard Haranda<br>Chris Huntley<br>Anthony Johnson<br>Steven Kunsman<br>Marc LaCroix<br>Theo Laughner<br>Richard Liposchak<br>Craig Preuss<br>Neil Saia<br>Stephen Thompson<br>Alex Wang<br>Solveig Ward<br>Murty Yalla |

c. **IEEE PES PSRC Recognition Award for Outgoing Subcommittee Chair** to:
Michael J Thompson for his leadership and services to the K SC

d. **PSRC Honorary Members** – The following Main Committee Members have been awarded Honorary Member Status for their years of service to the PSRC:
   Chuck Mozina
   John Boyle
   Bob Beresh
   Gerald F. Johnson
   Rick P. Taylor
e. **PSRC New Main Committee Members** – The following PSRC members have been admitted into the PSRC Main Committee:
   Sukumar Brahma
   Chris Chelmecki
   Ian Tualla

f. **IEEE Fellow** – The PSRC is proud to announce that Mahendra Patel has been elevated to IEEE Fellow in 2016 for his contributions to syhnchrophasors standarization

4. **Plans for Next Meeting** - The WG has caught up with issuing pending WG and individual awards and is ready to become proactive in discussing and nominating members for a wider range of awards including:
   a. SA Awards: Medallion, Distinguished Service and Lifetime Achievement Award. WG members to submit suggestions in May.
   b. IEEE – WG will look for other award and recognition opportunities that may be available for our committee that we may have been missing in the past.

Respectfully Submitted

Hugo Monterrubio
B1 Chair

**B3, Membership Activity Report**
**Chair: M. Swanson**

Assignment: Assist in searching for new attendees.

Attendance during the Memphis joint meeting was 225, which is considered a healthy number for us.

8 new attendees were in our Newcomers Orientation meeting on Tuesday. Cathy sent out welcoming emails at all newcomers. We will take some promotional steps to attend our newcomers session during the next meeting.

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.

1 Service Award was presented.

Regards,

Malcolm J. Swanson
Membership Chairman

**B4: <u>O & P Manual and WG Training</u>**

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

No information available.

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

Rich Hunt will be doing WG Chair traning at May 2016 meeting.

**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. Motions from SC chairs to the Main Committee

1. Brian Mugalian: "Mr. Chair, the Relaying Practices Subcommittee requests approval for transmittal of Application of Optical Instrument Transformers for Protective Relaying PC 37.241 to IEEE-SA for creation of a ballot body and subsequent ballot." The motion was approved by the Main Committee.

2. Marc Benou: "Mr. Chair, the H SC requests approval for transmittal of PC37.237 to the IEEE SA for balloting. Provided the ballot is favorable, the proposal will be sent to the IEEE SA for approval and transmittal to ANSI for adoption as an American National Standard." The motion was approved by 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.

**January 2016 Meeting Minutes**
The System Protection Subcommittee of the PSRC met January 13 in Memphis, TN in conjunction with the PSRC and JCTN. The participants introduced themselves. A quorum was achieved (25 members and 52 guests) and the September 2015 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, January 22 to both himself and Gene Henneberg.

The next JCTM meeting will be in New Orleans in January 2017.

The IEEE My Project page is being re-designed, with an expected "go live" date in July.

PES is about to issue a new report template that will be used for PSRC reports going forward.

**Working Group Reports**
The minutes of the Working Groups are attached.

The C2 Working Group did not meet in Memphis, 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 by the time these minutes are issued in draft form. Subcommittee members are reminded that report review is part to of the member's responsibilities.

CTF29 was approved to become an official Working Group, C29, Power System Testing Methods for Power Swing Blocking and Out of Step Tripping. The assignment is part of these minutes. Heather Malson will be chair (pending PSRC officer approval)

CTF30 was approved to become an official Working Group, C30, Microgrid Protection Systems. The assignment is part of these minutes. Michael Higginson will be chair (pending PSRC officer approval).

**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

**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 Memphis and anticipates completing their assignment by the May 2016 meeting, so no meeting is scheduled in Denver.

**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 Monday, January 11, 2016, with 12 voting members, 0 corresponding member, and 7 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 four sets of meeting minutes as follows:

September 16, 2015, meeting minutes; October 15, 2015, webcast meeting minutes: November 12, 2015, webcast meeting minutes; December 17, 2015, webcast meeting minutes: Motion: Jeff Barsch; Second: Randy Cunico. Vote: Approved.

The WG chair then proposed continuing monthly webcast meetings, beginning on January 28, 2016, with the plan to meet every other Thursday until, at least, the May 2016 face-to-face Working Group meeting. The purpose is to continue addressing comments from the editing sub-teams.

The WG reviewed the status of missing writing assignments.

1. Subclause 4.2.1.1.3 *Specific protection considerations to assure power system stability* will be condensed based on Keith's updates. Mukesh Nagpal was assigned and, hopefully, will provide his contribution shortly.
2. Subclause 4.2.1.2.1 *Operating requirements and restraints* – paragraph titled *Voltage and reactive power requirements* was to be clarified to address protection coordination with generation unit capability. Mahendra Patel/Manish Patel were assigned.

   Solveig Ward suggested that the material is the adequate the way it is current presented. If no further contribution is received, we will leave it as is.

3. Subclause 4.2.2.1.1 *Preferred point of interconnection.* Joe Valenzuela was to provide more details concerning the proposed plot plan. Will English volunteered to provide this contribution.

4. Subclause 4.2.2.2.1 *High/low voltage ride-through capability*. Joseph Valenzuela was to add a paragraph on high-voltage ride-through capability. Solveig Ward volunteered to provide this contribution.

The WG then reviewed a contribution received from Dean Miller for sub-clause 5.1 *Typical transmission to generation interconnection configurations*.

The paragraph for the tapped connections was updated to make a stronger case for why these connections are not a "good" solution for both reliability and protection constraints.

Dean provided two figures, one of which for a full transmission network appears redundant to figure 7c. A resolution was to reword "Transmission Substation" in figures 7a, b, c, and d to "Networked Transmission Substation". Dean's second drawing will be inserted as figure 7e.

The Clause 5 Review Team (Jeff Barsch, Nathan Gulczynski, and Mike Jensen) will review updated sub-clause 5.1 with Dean's contribution.

The WG then proceeded to continue the review of Clause 7.

In subclause 7.2 Utility grade relays, the WG voted to remove the last paragraph concerning micro-processor relays.

The updates to sub-clauses 7.3 *Bus differential protection* and 7.4 *Intertie line current differential protection* to concentrate on their affect to the interconnections and make them more concise were approved.

In subclause 7.5 *Interconnection tripping*, a comment was that it applies to more than wind farm; all sources must be disconnected from a faulted segment of circuit/network. The subclause was revised accordingly.

**New action items (due date March 1, 2016)**:

1. **Solveig Ward** will add a paragraph on high-voltage ride-through capability to sub-clause 4.2.2.2.1 *High/Low voltage ride-through capability*.
2. **Will English** will provide more details concerning the proposed plot plan mentioned in 4.2.2.1.1 *Preferred point of interconnection*.
3. **Alla Deronja** will revise Figure 7, to add figure 7e and update the rest of the figures to include "Networked Transmission Station".
4. **Clause 5 Review Team (Jeff Barsch, Nathan Gulczynski, and Mike Jensen)** will review updated sub-clause 5.1 with Dean's contribution.

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

**Chair**: Vasudev Gharpure
**Vice-chair**: Mital Kanabar

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

Memphis – PSRC January 11th, 2016. 15 Attendees: 4 members, 3 corresponding members & 8 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.
  - The functions to be included in the standard were described briefly. These are
    - Time Alignment of Data
    - Data Forwarding
    - Communications
    - Data Format and Coordinate Conversion
    - Reporting Rate Conversion
    - Phase Adjustment
    - System Monitoring
  - The functional description section has been completed. It will be reviewed by the working group in the near future and modified as needed.
- Main features of performance requirements were discussed briefly
  - Processing delay, robustness and processing accuracy have been included
  - Reliability, availability and environmental needs will be included as informative annexes, as these are system and site dependent.
  - Processing Delays
    - These refer to the PDC's ability to complete its tasks within a reasonable time, for it to be ready to process the next set of data.
  - Processing accuracy
    - This refers to the mathematical operations performed by the PDC. These use standard mathematical library functions, and are expected to be accurate enough. However, the standard is expected to include requirements, and hence this section.
- Discussion: Robustness related items were discussed in some detail.

- Robustness, as included in this standard, has been defined as the PDC software surviving a list of adverse conditions. The list is included below.
- These have been gathered during discussion between the working group and others, based on their experience with synchrophasors.
- The group was asked to comment on these in brief, w 1 hether the list needs to be added to, trimmed, or otherwise. At this stage, the details of each condition are not under discussion, but whether they should be included in the list as such. Once the list is settled, the working group will work on the details of each. It was stated that unless the condition is defined well enough to be tested, it will not be included in the standard.
- The standard requires the PDC to survive these conditions, and to continue operations normally after the conditions have ceased, without human intervention. The intent of these requirements is that the user should not need physical access (which may need a drive) to set matters right. However, it would be acceptable if a PDC were to malfunction while the adverse condition exists.
- Data Volume Related
  - Input data bursts
- Released bottleneck
  - Data overload
- Duplicate data
- faster data rates
  - Batching up multiple data frames
  - Unsolicited UDP synchrophasor data
- Data Quality Related
  - Invalid data
- Synchrophasor / Ethernet CRC errors
- Bad stream ID
  - Bad time stamps
- Rounding errors
- Wrong fracsec value
- Timing Related
  - Data arriving too soon / too late
- Clock drifts
- Time zone / DST switch
  - Data arriving within a short spa
  - All inputs not obeying leap second rules
  - Out of order synchrophasor data
  - Loss / regain of time synch source
  - Time jump in time synch source
- Network Related
  - Garbage data on synchrophasor port
  - High data traffic (other data)
  - Network disruptions
- Pulled cable
- Power cycle on router / switch
  - UDP packets dropped partially
  - Spurious connection requests
- Comments / discussion
- Suggestion: The list should include adverse conditions resulting from configuration errors.
- None of the items in the list needs to be trimmed.
- The PDC should be required to re-initiate connection when a network connection is broken.
- (Chair's comment: Although this point was not followed up during the meeting, this is a
- functional requirement in the Communications function of the PDC)
- Some PMUs not obeying "Leap second" rules: Some practical data is available from NIST about behavior of several PMUs. Allen Goldstein provided a link. It can server as a good example of what can happen. (http://dx.doi.org/10.6028/NIST.IR.8077). This has been marked as "to be added" to the time alignment function.
- The items such as "bad device ID" were discussed, and are captured as a subsequent item in a later section below. This should also include a "bad header", bad "frame size" etc.
- The "broken up UDP packet" should be modified to "broken up IP packet". Such a packet would be rejected by the IP stack, and will never make it to the synchrophasor application.

A PDC will see this as missing data. However, a requirement and a test should be included, since this has the potential of crashing the IP functions.
    - If the incoming data rate is twice that specified in the configuration, is the PDC required to accept the valid data and reject the rest? It was clarified that the PDC "may" malfunction during the adverse condition.
    - The clock drift item mentioned in the list includes a drift for the PMU and for the PDC, and should be treated as two separate items.
- Other questions and comments, not directly related to Robustness.
    - Does the data rate conversion function requires a PDC to interpolate / extrapolate data? It was explained that it does not. It is considered to be an advanced function, and a PDC may perform it, but it is not required of every PDC, as it would if it were to appear in the standard.
    - Is the PDC is required to handle non-synchronized data? It was explained that it is not. This condition qualifies as part of the "bad time stamp" condition mentioned above.
    - On the issue of the 118 standard not making any requirements on a PDC, the discussion swirled around the point, whether this standard should make these requirement, or whether they should be included in a normative annex, or an informative annex. The items discussed included use of specific (13 – 15) bits of the STATUS word by PDCs, the PDC making checks on specific fields of the 118 frame, such as device ID, frame size, header WORD etc. The consensus was towards adding an informative annex, though whether it should be 34 normative or informative was not conclusive.
    - A similar discussion took place about inclusion of 61850 related items, to be included in another informative annex. So far, there have not been any contributions to this standard from the 61850 experts. The working group intends to solicit such contributions.
    - If a PMU is out of service, should the PDC remove it from consideration? Otherwise it will wait out the entire wait time, waiting for the data that never arrives: This is a desirable function, and has been discussed several times. So far, the group's consensus has been that it is a difficult function to define and implement. Thus it has been treated as an advanced function, not required of every PDC. The working group was strongly urged to include this in a 118 related informative annex.

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

**Chair:** Joe Mooney
**Vice Chair**: Ian Tualla
**Output:** PSRC Report
**Expected Completion** Date: May 2016
**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 14 attendees; 7 members and 7 guests.

The WG Vice Chair conducted the meeting. Since there were a number of guests, the WG Vice Chair provided a brief summary of the background and purpose of WG group. WG Vice Chair noted that several writing assignments remain outstanding. It was noted that overall use of symbols, including transformers, lacked consistency. The WG agreed consistency needs to be resolved; it was suggested an agreed-upon set of symbols would be helpful. Roger Hedding agreed to provide/forward a template of standard ANSI symbols (Microsoft VISIO) to the WG Vice Chair for this purpose. The plan is to have the authors update their figures utilizing these standard ANSI symbols. The WG reviewed and discussed the most recent writing contribution on AC System Protection. Figure 2 utilized the term Numerical Relay; the use of this term was questioned, discussed and resolved to be correct. Also, the use of ANSI Function 87T for Restricted Earth Fault versus 64T was questioned and discussed; it was resolved 87T is correct as utilized in the figure. It was questioned and discussed whether or not the AC Line Protection would be the same as or different than normal AC Line Protection; this was resolved to be, in part, the focus of the WG's assignment. The issue of the appropriate modeling of the VSC system, pertaining to utilization in commercially available fault analysis software, was raised as a topic for further discussion. Vice Chair will contact the assigned authors of outstanding writing assignments for details on the status of those assignments. WG draft assignment needs to be completed by the end of 2016.

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

Meeting adjourned @ 17:30.

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

**Chair:** Yi Hu
**Vice Chair:** Gene Henneberg
**Established:** September 2013
**Completion:** December 2018
**Assignment:** Develop an IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

Working group C21 met on Tuesday, January 12, 2016 in Memphis, TN in a double session chaired by Yi Hu and Gene Henneberg with 10 previous members, 2 new members and 6 guests attending among each session. 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 did not have a quorum to approve the September 2015 minutes.

The most recent draft 0.10 was distributed via email to WG members last week, Bonian Shi has since provided contributions which will be included in the next version.

Yi led a discussion on the Scope of the guide. The previous list of scheme types not to be covered was moved to section 4.3 with a brief statement in section 1.1 that additional information is included in section 4.3.

The section 3. Definitions will include a SIPS definition as the present first full paragraph was copied from the recent PSRC survey paper. The next paragraph (also from the survey), along with the other material presently in section 3, will be moved to section 4. The term SIPS will be used consistently in this guide. Various other terms, such as SPS, RAS, etc. will be described in an informative Annex with proper references.

Alfredo De La Quintana provided a “flow chart” style diagram that the WG discussed in the second session. The flow chart is intended to identify individual tasks / activities associated with SIPS from conception to commission, though these tasks / activities are not intended as a direct correlation for all SIPS with all sections of the Guide.

WG Chairs will send the September 2015 and January 2016 meeting minutes to WG members for electronic approval. The followings are the action items:

- Bonian Shi – complete his writing assignment and send it to WG chairs
- Zuyi Ren, Bonian Shi, Alfredo de la Quintana, Takaya Shono to send a short write-up regarding the testing methods used in the factory acceptance tests
- Tony Seeger to check and ensure the SIPS definition is properly defined

## C-23: Coordination of Synchrophasor Related Activities

**Chair:** Anthony Johnson (anthony.johnson@sce.com)
**Vice Chair:** Allen Goldstein
.
**Assignment:**
The ongoing task force will provide three main functions:

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

**Attendance**: 9 Members and 9 Guests, Memphis, TN, Jan. 12, 2016

**Meeting Agenda**

1. Introductions
2. Approve of the Sept. 2015 meeting minutes
3. NASPI Update
    a. NASPI Meeting in Chicago Oct. 13-15, please check www.naspi.org for presentations and details of the meeting.
    b. Workgroup to examine: Impact of PMU Measurement Errors on Operational Applications
    c. Workgroup to identify: Synchrophasor security best practices TRC meeting
    d. Tutorial at Cigre meeting Oct 11 on the NASPI Synchrophasor Starter Kit
    e. Next Meeting International Synchrophasor Symposium, Atlanta Georgia, March 22-24, 2016
4. IEEE Workgroup Activity

| | Title | Status |
|---|---|---|
| **PSRC C19** | Standard for Phasor Data Concentrators (PDC) for Power Systems | In Progress |
| **PSRC CT28** | Guide for Synchronization, Calibration, Testing and Installation for PMUs | In Progress |
| **PSRC H11** | Revision of standard IEC60255-118-1 | In Progress |
| **PSRC H21** | Development of standard Mapping between C37.118 and IEC61850-90-5 | 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
    a. Discussion on C37.118.2 update. Asked NASPI to help identify Chair and Co-Chair for workgroup. Potential new task force in January to address

        Will Request that H set up a task force to evaluate C37.118.2. This may lead to 1 or may be 2 PARS based on the finding of the task force. The chair of the task force will be Vasudev Gharpure. Room for 25 and projector.
        There are known gaps
        The standard was primarily written to be communication from PMU to PDC. However it is used for other communications as well, for example PDC to PDC. However there are gaps for this and other applications.
        There are several people who have gap lists, these should be collated.
        Possibly also put together some use cases (may not be included in a revised standard) but helps to make a case and help identify some gaps that are unknown.
6. New Business
7. Adjourn

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

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

**Chair**: Sukumar Brahma (New Mexico State University)
**Vice Chair:** Evangelos Farantatos (EPRI)
**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.

Tuesday, January 12, 2016, 3:00 – 4:15 pm.
Venue: Memphis Cook County Convention Center, Room MCCC-L13, Memphis, TN.

The meeting started with introductions, short description of the scope of the WG, and then the September 2015 minutes were approved.

The questionnaire that was sent to WTG manufacturers with questions and data requests was described to the attendees. A few revisions were recommended.

Then the responses that the WG chair and vice-chair had received from WTG manufacturers were presented to the attendees as summarized below:

- Positive responses have been received from GE for Type III WTG. GE agreed that the tables in the questionnaire are appropriate, without any proprietary information issues. GE is working to generate and provide data to the WG within the next few months, in a format similar to the one in the questionnaire. Data will be made public.
- Positive responses have been also received from Siemens for Type IV WTG. The email conversations between Siemens and the WG chair and vice-chair were presented to the attendees. Siemens provided equations for the calculation of the short-circuit currents that can be used at the WTG short-circuit models. A few questions were asked by the attendees and the WG chair and vice-chair will follow up with Siemens to request clarifications on these questions.
- Partial data have been provided by Vestas for Type III WTG. The data were presented to the attendees. It was agreed that the data are not sufficient for developing a WTG short-circuit model. Additional Vestas representatives will be contacted to request more data.
- Senvion has been contacted but no response was received. It was suggested by the attendees that Clipper and Enercon with Type IV WTGs should also be contacted.

EPRI will work during the following months with Electrocon International and ASPEN to test the implementation of EPRI's proposed models in the corresponding commercial short-circuit analysis platforms.

Papers with information on international grid codes for fault response of WTGs will be emailed to the WG chair and vice-chair, and forwarded to the WG by Charles Henville.

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

## C-25: Protection of Wind Electric Plants

***Chair: Martin Best***
**Vice Chair: Keith Houser**

**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 C25 met in Memphis, TN on Monday, January 11, 2016 with 8 members and 20 guests. The Vice-chair conducted the meeting. Raluca Lascu agreed to take the meeting minutes. Copies of the agenda, September 16, 2015 meeting minutes and Draft 2.0 of the Report were distributed to Working Group guests.

After introductions, the September 16, 2015 meeting minutes were cited for comment, additions or corrections; none were made. The WG approved the C25 Meeting Minutes from the September 16, 2015 meeting in La Jolla, CA.

The WG then reviewed Report Draft 2.0 at a high level and it was noted that several of the previously assigned section writing assignments had not yet been received.

Dean Miller verified that his updated section transformer 2.6 was incorporated into Report Draft 2.0.

Aspects of system grounding were discussed as it relates to wind power plants. Generator characteristics, Generator Step Up (GSU) transformer connections and Interconnection Substation transformer connections, and their respective impacts on system grounding were discussed.

The Vice-chair then interjected a question/observation pertaining to similar system grounding issues related to other inverter-based generation (solar farms; similar to Type 4 WTGs). It was generally a consensus that the impacts of the GSU transformers and Interconnection Substation transformers (if applicable) were similar on system grounding.

In general, there was good discussion about the primary and secondary GSU connections, ground reference, and the need for insulation coordination during design.

It was noted that inverters (inverter-based generation) typically have no ground reference.

The WG discussion then moved to whether or not offshore wind plants (very different design considerations are anticipated) were being considered. The WG consensus was that only onshore based systems were being contemplated in this work.

The following assignments of Outline sections have been previously made:

1. Introduction
    a. Scope
    b. Purpose [Jim Niemira]
2. Differences Between Wind Electric Plant Substations and Conventional Distribution Substations and Generating Stations
    a. Wind Electric Plant Substation arrangements and voltage levels [Rene' Midence]
    b. Collector Feeder design and characteristics [Rene' Midence]
    c. Fault Currents (equipment ratings) [Sukumar Brahma]
    d. System grounding [Keith Houser]
    e. Wind Electric Generator characteristics [Yuan Liao; Rene' Midence]
    f. Transformer connections and characteristics
        i. Wind turbine generator (WTG) transformers [Dean Miller]
        ii. Main Substation transformers [Dean Miller]
    g. Harmonics and Sub-harmonics [Yuan Liao; Rene' Midence]
    h. Voltage and Frequency Control Requirements (LVRT) [Yuan Liao; Rene' Midence]
3. Typical Protective Relay Schemes at Wind Electric Power Plant Substations
    a. Collector Feeder Protection [Jim Niemira, Martin Best, and Jacob Lien to collaborate on this section; Jim to share a previously written paper with this collaborative group].
        i. Overcurrent Protection and Coordination with WTG transformer protective device.
        ii. Voltage and Frequency Protection and Coordination
        iii. Arc Flash protection
        iv. Removal of WTGs and Static VAR Devices from collector feeders under fault
    b. Grounding Transformer Protection [Keith Houser]
    c. Bus Protection [Dean Miller]
    d. Main Transformer Protection [Dean Miller]
        i. Transformer differential protection
        ii. Overcurrent Protection and Coordination with Collector Feeders
    e. Capacitor, Reactor, and Harmonic Filter Protection [Jim Niemira, Martin Best]
        i. Voltage protection
        ii. Overcurrent protection
        iii. Harmonic current and voltage considerations for protection scheme operation [Juan Gers]
    f. Transmission Tie Line Protection
        i. Typical pilot protection schemes [Charlie Henville]
        ii. Back-up protection schemes [Charlie Henville]
        iii. Voltage and frequency protection requirements [Charlie Henville]
        iv. Supervision requirements for transmission line breaker closing [Charlie Henville]
4. Conclusion
5. Bibliography

The Working Group [WG] leadership will be contacting writing assignment authors with outstanding assignments for status updates. WG members should plan on the completion and submission of the outstanding writing assignments no later than the end of the first week of April [April 8, 2016].

The group requests the May 2016 meeting **for C25 avoid conflicts with the meeting times for the C18 and C24 working groups, if possible**.

Meeting Adjourned @ 14:15 CST.

Respectively Submitted 1-11-2016,
Raluca Lascu

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

**Chair:** D. Ware
**Vice Chair:** M. Black

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

The C26 working group, chaired by Don Ware, met on Tuesday, Jan 12, 2016 with 22 members and 9 guests in Memphis, TN
.
It was noted that since this is the first WG meeting and the membership was unknown we were unable to approve minutes or verify Quorum.

A question was raised regarding the I25 commissioning report and whether or not we were duplicating efforts. It was decided that C37.233 is existing and is up for revision. Commissioning is largely procedural (NERC).

ITF33 – Make Suggestions to C37.233? Just be a subset of C26. Jim O'Brien (Chair of the C subcommittee) and Brian Mugalian (Chair of the I subcommittee) will be discussing whether ITF33 makes more sense in the C subcommittee or remaining in the I subcommittee. It was noted that the scopes may not both belong in C and that it may make the most sense to keep the WGs split as they are in I and C. It was also noted that ITF33 members could be brought in as corresponding members of C26 as they could contribute to the Guide, but would not be included in quorum requirements.

It was noted by Don Ware that Relay setting file management will likely be added to this revision of C37.233.

Matt Black has been tasked with resending previous minutes to WG members as well as a copy of C37.233 (2009).

Vahid Madani noted that the 2009 edition of this Guide took more than 4 years (probably closer to 6 years) to complete. We have a little over two years for our revisions.

The Projected date of submission to IEEE-SA for initial Ballot is 6/18. Projected date of final submittal to RevCom is 2/19.

The Body of the guide is existing and we are hopeful that this largely editorial work with newer technology being the major contribution is doable in this two-year timeframe. Volunteers were requested for the sections:
6.2 – Euginio Carvalheira
6.3 – Scott Cooper
6.4 – Brian Boysen
6.5 – Guillermo Weyer
6.6 – Guillermo Weyer
6.7 – Don Ware
6.8 – Nestor Castilla
6.9 – Sunghoo Kim
6.10 – Mike Stojak
7.1 – Jeff Brown
7.2 – Jun Verzosa
7.3 – Andre Uribe
Sections 8 & 9 – Mark Siira
Annex E – Jeff Brown

A suggestion was made to make a comment matrix. Mark Siira is a possible source of knowledge on this development.

A guide for Line Current Differential has been published and should be referenced in this revision of C37.233.

We will be adding Sections as necessary to account for changes to/additions to technology.

## 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
**Established:** September 2015
**Completion:** TBD

Tuesday January 12, 2016, 09:30 – 10:45
Location: Memphis Cook Convention Center, Room L13

**1. Introductions of officers, members, circulation of attendance list.**

There 22 attendees, 6 out of 9 members and 16 guests present for the meeting. A quorum was present.

The IEEE patent statements were noted.

**2. Review and approval of minutes of previous meeting:**

The minutes from the last meeting were approved electronically before the meeting.

**3. PAR / Assignments**

CTF28 Chairman Allen Goldstein reminded the group of the re-writing assignments for sections of the document they had volunteered to lead.

The following is a complete list:

.....Section 4. . . . . Bill Dickerson
.....Section 5. . . . . Harold Kirkham
.....Section 6. . . . . Ken Martin / Gustavo Brunello
.....Section 7. . . . . Allen Goldstein

Appendix B . . . . . Allen Goldstein
Appendix C. . . . . Allen Goldstein / Harold Kirkham
Appendix D. . . . . Bill Dickerson / Gustavo Brunello
Appendix E. . . . . Ken Martin / Gustavo Brunello

The Chairman asked for inputs to be sent to him as they became available. To assist with the process, he said he would get a copy of the existing document in MSWord to disseminate. For the meeting, we would work off a pdf version of the latest standard.

The group examined the pdf and discussed the need for changes. Section 6 was thought to be worthy of attention in the room because both the volunteers were present. “Sticky notes” were added to the document, indicating the outcomes of discussion.

It was noted that an evaluation of the cyber-security situation should be added to the pre-installation section.
Several figures were slated for removal.

The words “Delays are associated with dielectric constant” was thought unclear.

**4. Adjourn**

The meeting adjourned on time at 10:45.

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

**Chair:** Heather Malson
**Vice Chair:** Mike Kockott

**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.

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Tuesday, 9:30 AM January 12 2016
Attendance 35 people

Highlights:
Reviewed proposed assignment and continued discussion of J5 and D29 testing information that would be included in WG output.

Presentation from Jun Verzosa of Doble on various methods of testing.

Kevin Jones (Xcel Energy) reviewed his prior presentation for new attendees.

Revised WG title.
Consensus to create working group. Quick poll included 15 willing Members present.

Respectfully,
Heather Malson

---

Details:
Discussion of J5 and D29 testing information that would be included in this document. J5 is removing already developed material from their document and transferring it to the CTF29 document. D29 will not be addressing testing methods.

Presentation from Jun Verzosa of Doble. Excellent presentation from Doble. Shows examples of PSB and trip. Trip occurs at faster frequency. Difference 2.5 hz block was simulated at 1.5hz. Tripping on way in same time as inner trip. Showed 3-phase fault where block was removed and it tripped correctly. The whole point of his presentation was to show the continuous testing vs the discrete testing (typical) and show that in most cases the latter will work, but there may be cases were the continuous provides more thorough testing.

Question? Relay settings is actually in ohms. Relay settings in ohms and time dial. The presenter said this made sense to him because that is what the setting is in vs using HZ (slip freq).

Discussion about changing TF/WG title. Title was revised and settled on title as listed at the top of these minutes.

Kevin Jones (Xcel Energy) reviewed his prior presentation for new attendees.

Consensus to create working group. Quick poll included 15 willing Members present.

**NOTE:** C Subcommittee established this as Working Group C29 at the January 13 meeting, with Title and Assignment as noted above.

## C-30 Microgrid Protection Systems

**Chair:** Michael Higginson
**Vice Chair:** TBD

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

January 12, 2016
Memphis, TN

Our task force had a second meeting Tuesday morning at 8:00 with the purpose of exploring interest in microgrid protection. There were 23 attendees, 16 of whom were interested in membership. The attendance list is below.

After introductions, Michael presented on the practical experience working with microgrid protection, per the request of the task force at the prior meeting. This presentation sparked engaging conversation amongst task force members on potential items to cover in a report.

The task force voted to moving forward with a working group, and drafted the following assignment statement:

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

Michael Higginson volunteered to chair the new working group.

**NOTE:** C Subcommittee established this as Working Group C30 at the January 13 meeting, with Title and Assignment as noted above.

**D: LINE PROTECTION SUBCOMMITTEE**
**Chair: G.L. Kobet**
**Vice Chair: K.V. Zimmerman**

The Subcommittee meeting was called to order on Wednesday, January 13, 2016 with 33 members and 28 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (33 out of 42 members present).

Minutes from the September 2015 meeting in La Jolla CA were approved, after minor correction to D31 minutes.

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**

**Established: September, 2011**
**Expected Completion Date: September 2015**
**PAR Expiration Date: 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 Draft Guide (Draft 8.1)**

The D19 working group did not meet. The guide was approved in December 2015, and now is in editorial process by the IEEE SA Standards Board.

The WG will meet in May to discuss the possibility of a summary paper and/or presentation.

**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 Breaker Protective Relay Applications to Distribution Lines
**Draft :1.6**
**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 Memphis, TN on Tuesday, January 12, 2016, 1:30 pm CST. There were 17 members and 8 guests. The attendance list is attached. The patent slides were presented.

The meeting minutes for the September were presented and Don Lukach motioned to approve and Mike Meisinger seconded. The motion carried.

The meeting minutes for the October WebEx were presented. Michael Higginson motioned to approve and Mike Meisinger seconded. The motion carried.

Randy Crellin is going to look for the original figures from the previous version of the guide.
Brian Boysen did a short walk through of how to access the current draft in Central Desktop and passed out a handout for later reference.
The working group reviewed the comments submitted by the teams for starting with section 8. Sections 8.1 through 8.6 and through 8.14.

There was discussion of the need for additional discussion of coordination issues related to single phase tripping. It was decided that the current content of the document is sufficient and there is a need for a separate document to discuss this topic in detail. Bryan will present this during the D subcommittee meeting. Ratan had previously informed the chair that he would be unable to complete his assignment on RVDs. It was decided by the working group that the proposed inclusion of RVDs and other voltage sensors was unnecessary.

The reviewers have been asked to consider combining sections 8.7 and 8.9.

**Assignments:**
The following new assignments were made:

- Bruce Mackie will look at combining sections 8.1 and 8.5.
- Shalini Bhat will look at C37.117-2007 - IEEE Guide for the Application of Protective Relays Used for Abnormal Frequency Load Shedding and Restoration which will expire next year to see if there is anything that should be incorporated into this guide.
- Hugo Monterrubio will review and revise section 8.7.
- Randy Crellin will review and revise section 8.8.
- Chris Walker will review and revise section 8.9.
- Jack Wilson will review and revise sections 8.14 and 8.15.

- Michael Higginson will review and revise sections 8.16.
- Brian Boysen will review and revise section 8.17.
- Don Lukach and Jack Wilson will review section 5.1.4 for duplication of the bus protection guide. This assignment is due before the May meeting.
- Don Lukach will find original comments on section 6.1 and resend to Brian.

The following assignments are outstanding:

- Karl Zimmerman will provide a write up on Coordination Time Interval for section 7.2.
- Karl Zimmerman and Farajolla Soudi will review and revise 7.2. Working group identified that coordination figures and text referring them need to be reviewed to make sure that they show/explain coordination in a manner consistent with current industry practices.

**All assignments are due February 19th. Word format is preferred.**

**We plan to have a WebEx in March.**

**Old Business:**
It was decided that we will add a reference to PSRC report Cold Load Pickup Issues somewhere in section 7.
It has been noted that the existing guide is inconsistent in the use of terminology. It was pointed out that it uses both sense and detect. We will maintain a list these terminology issues and address them as we work through the guide.

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

We will address the use of pulseclosing and pulsefinding throughout the document per the guidance provided by Mike Meisinger.
We will need to confirm that all references are to valid/active standards and that the correct version is reference. This should be done before sponsor ballot.

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

**Chair:** Normann Fischer
**Vice chair:** Kevin W. Jones
**Assignment:**
The tutorial will focus on methods of setting impedance-based power swing blocking and out-of-step tripping functions. Specific relay setting examples will be provided. Other methods of detecting an out-of-step condition do exist but will not be discussed.

### Attendance
The group met with 13 members and 10 guests. (Members who have not attended three consecutive meeting without notifying the chair, will be converted from member to guest).

### General Items
Normann Fischer began the meeting by giving an overview of the agenda. Introductions followed the agenda overview. Meeting minutes from the September, 2015 meeting in La Jolla, CA were reviewed. Gene Henneberg made a motion to approve. Hearing no objections, the previous meeting minutes were approved by 13 members.

The writing assignment was reviewed. Additional assignments were made and documented in the master writing assignment document. Reviewers were assigned to review and provide comment on the sections already written. This document will be distributed to members and guests by Normann Fischer.

Normann will ask Jörg Blumschein with Siemens to give a presentation at the next meeting on the Siemens settingless power swing method. Normann will give a presentation at the next meeting on the Swing Center Voltage settingless method. Normann will also contact Brian Kirby with Alstom on their settingless method (Will also ask Ilia Voloh to see if he can contact Brian). Bonian Shi will report on Chinese vendors and their power swing detection methods.

Kevin Jones gave a presentation update on the test system model. System parameters were modified to align the short circuit program with the stability program. Successful stability tests were run on the test system using Siemens PSS/E. Additional studies will be performed by Kevin Jones and Phil Tatro 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 Memphis on January 12, 2016 with 16 members and 22 guests. Mike Kockott joined the working group.

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

Several WG members delivered presentations on Draft 0 of their sections. The purpose of the presentations was two-fold – to learn from and comment on the actual material and also to help determine the format for the tutorial output. Jay Gosalia presented on distance element design, Jorg Blumschein presented on faulted phase selection, and Tony Newman and Jack Wilson presented the impact of short lines on distance protection. We appreciate the efforts and expertise delivered by all of the presenters. We will make the material available to WG members only at this time, and comments and suggestions are welcome.

As for format, two ideas were discussed: A textbook style with figures imbedded in a “Word” document, and a powerpoint with notes. There are strengths in both, depending on the audience. We have not made a decision on whether to use one or both, but the WG homework assignment (aside from the writing assignments), is to consider and provide comments on the best possible format to use. We also learned of the new standard template from PES, and will adopt this, if available.

We received one volunteer to present at the next WG – Chris Walker will present

**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**

The working group met on Monday January 11, 2016 with 13 attendees and 7 members. Patrick Carroll chaired the session in Joe Mooney’s absence. The summary presentation based on the revised guide was developed prior to this meeting, was reviewed by the group and edited to provide clarity. The presentation was developed using the IEEE PES Power Point Template and includes 19 slides.

The Working Group Chairman will deliver the presentation at the May 2016 Main Committee Meeting to be held in Denver, Co.

WG D31 will 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:** 0

Working Group D32 met on Tuesday, January 12, 2016 at 3:00pm CST in a single session with 5 members and 2 guests.

After introductions, the assignment and previous minutes were reviewed.
Draft 1 of the paper was distributed and discussed. After the discussion the following assignments were made to review the document. The completion of the review is due April 15, 2016. The reviewer should document suggested revisions by using Track Changes in the Word document.
Ian Tualla Section 2 Current differential line protection applications Roy Moxley Section 3 Current differential operating methods Craig Palmer Section 4 Communication Scheme Design Bruce Mackie Section 5 Application Considerations Scott Cooper Section 6 Testing and Troubleshooting
Bruce Mackie will create an initial presentation document and send to the entire group for review and discussion at the next meeting

Additional discussion included suggestions on where the paper could be presented.

**DTF33: Coordination with CIGRE Working Group TOR-JWG C4_B5.41 Challenges with series compensated applications in power system when overcompensating lines**
**TF Chair: Luis Polanco**
**Vice Chair: NA**
**Assignment:**
**Expected Completion Date:**

DTF33 met on Tuesday, January 12th, 2016 with 15 attendees. 6 signed members. Chair and attendees proceed with introductions, and attendance sheet sign in. Chair discussed meeting minutes from previous DTF33 meeting in La Jolla, CA.

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.

Chair presented the CIGRE Working Group TOR-JWG C4_B5.41 Draft content of the Technical Brochure that was discussed on the CIGRE WG meeting.

Chair attended 2nd CIGRE WG meeting (Schenectady NY USA) and made initial contact with CIGRE, with the intent to see if there was a possibility of collaboration, sharing IEEE interest on the topic.

Chair discussed significant interest by the DTF33 attendees (1st DTF33 Meeting) on learning more about the key items that are major triggers for the series “over” compensation projects and that resulted on basis to create CIGRE group.

Chair shared a brief survey that was provided to CIGRE to understand main reasons on the actual/existing circuits that resulted on “over” compensated lines. Survey was had requested information related to existing protection, communication and system configuration, others.

DTF33 Chair and attendees had significant discussion about the possibility of IEEE PSRC working in collaboration with the CIGRE WG members on the development of their Technical Brochure, and it was agreed that a parallel approach was not practical. Major reason discussed, but most substantial, extended

CIGRE scope and delivery schedule timeline, since CIGRE is schedule to complete their work by end of 2017 and already well ahead on their work, it will be very challenging for IEEE PSRC to work in parallel.

Chair indicated that on existing IEEE Standards related to series compensation it was not found discussions in reference to “over” compensation applications in power systems. This was also discussed on DTF33 since the word “overcompensation” is not defined. Others suggested adopting/defining the “extreme” compensation for >80% compensation, or simple adopt “compensation” for all levels on series compensation. Open for discussion.

DTF33 chair proposed to keep IEEE DTF33 task force open, with a proposed assignment: “To provide comments to CIGRE working group TOR-JWG C4_B5.41 technical brochure related to challenges with series compensation applications in power systems when overcompensating lines.”

Russ Patterson a current member of the CIGRE Working Group TOR-JWG C4_B5.41 volunteers to discuss the proposed IEEE PSRC DTF33 scope to CIGRE WG on their scheduled meeting in April 2016.

DTF33 is tentatively not scheduled to meet on May, 2016, and chair will request a meeting on May 2016 (if necessary), pending inputs received from Russ Patterson after their CIGRE WG meeting on April 2016.

The Subcommittee agreed to create a Task force to explore a possible Report/Guide on Series Compensated Line Application challenges and experiences associated with Series Compensation Line protection, and DTF33 chair Luis Polanco agreed to be the Task force chair on the next IEEE PSRC meeting in May 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 on Tuesday with 5 members and 2 guests. No data with respect to the table of contents was received from the IEC working group prior to the meeting, therefor these was nothing for the WG to review
Dr. Murty Yalla gave everyone and update of the meeting that occurred in Biaritz in France this past November. Eric Udren with provide an update of this meeting to the joint committee on Wednesday afternoon the 1/13/2016.

A summary of IEC 60255-187-3 is given below:

**Oliver Lippert from Germany** introduced the preliminary work he had undertaken to form the document and also presented a small presentation highlighting areas of concern that would need to be addressed. Primarily these concerns were raised in two critical areas:

- Functional algorithm differences. Due to the large variety of techniques in use, it may be difficult to define the functional description and propose suitable test methods for assessing the accuracy of the element.
- Communication issues. Line differential protection is heavily influenced by the communications media, and it was discussed to what level the standard should cover testing of this critical component of the protection scheme.

To allow further progression, the group amended the wording of the scope as introduced by **Oliver** to provide initial clarification of what should, or should not be included. It is likely that some modifications to this will still be required as the standard develops and other issues become apparent.

Hopefully by the next meeting we will have a table of contents, on which we can comment.

**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.

One panel session is planned for the IEEE PES 2016 T&D Meeting in Dallas, TX:
'DMS Integration with DERMS & Microgrid Controllers', Chair Bob Uluski
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

The PAR for P1806 "Guide for Reliability Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment" was approved.

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.

**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 short single session on Tuesday, January 12, 2016.

A total of 20 attendees were present, all of whom volunteered to be TF members.

The actual purpose of this task force was unclear as the individual who proposed it was not present. But there was considerable interest in the subject with 20 attendees, all of whom indicated an interest. Discussion involved the fact that the IEEE C37.113 Guide for Protective Relay Applications to Transmission Lines has extensive material on the advantages and disadvantages of different schemes, especially the newly revised version to be published in Spring 2016.
It is not known if the scope of the proposal would involve both transmission and distribution lines, but the C37.230 Guide for Protective Relay Applications to Distribution Lines also has similar material.
It was also mentioned there are several technical papers available that evaluate line protection schemes.
The following assignments were made and accepted:

- Jeff Brown will send SERC documents that provide guidance on evaluating line protection schemes;
- Federico Lopez will send CIGRE documents related to this subject;
- All TF members will research and send citations (and where possible scanned .pdf documents) of related available technical papers;
- Gary Kobet will distribute all of the above to the TF as it becomes available;
- When the newly revised C37.113 guide is published, Gary Kobet will notify the TF who will secure a copy and review.

Over the next eight months, the TF will review all available information. The next TF meeting will be held at the September 2016 meeting where it will be decided whether there is a need for a WG and what the assignment will be.

**Old Business**

No old business to discuss.

**New Business**

No new business to discuss.

**General Discussion**

None

**Line Protection operations of interest**

None

The meeting adjourned.

## H: RELAYING COMMUNICATIONS SUBCOMMITTEE

**Chair: Eric Allen**
**Vice Chair: Marc Benou**

The Subcommittee met on January 13, 2016 with 33 members of 39 total, comprising a quorum. 42 guests were also present. Marc Benou acted as chair and Eric Udren acted as vice-chair. Minutes of the September 2015 meeting were approved without objection.

The Chair presented several announcements:

- There will be a new PES template for all Reports. PES will help convert Reports to the template for WG's about to complete their work.
- The O and P needs to be updated and approved. PSRC members will receive an email requesting your vote to approve and participation in the voting is encouraged and necessary.
- A full set of PSRC standards available at a discounted price of $495 through the end of October.
- 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:
None; see WG reports.

Old business:
None

New business:
H1 requested to be disbanded and the SC voted to approve.

Tony Johnson requested a Task Force to investigate revision of C37.118.2-2011 to identify gaps found in PDC standard development by WG C23, which Tony Chairs [suggested title – Revision Needs for C37.118.2-2011]. Allen Goldstein reported that the developers of C37.118.2 foresaw that this work might be needed in 2011. Proposed Chair is Vasudev Gharpure. There were no objections to creation of the TF. The TF has been assigned the number HTF36

Steve Kunsman requested a Task Force to look at extensions of serial or Ethernet communications into the switchyard and the cybersecurity issues for these communications. The suggested title is, Extensions to Cyber Security requirements for substation P&C systems. This would comprise a possible future addition to C37.240 on cybersecurity. The TF would also look at the security of data files work of WG H22 for incorporation in C37.240. There were no objections to creation of the TF, and significant interest in participation. Proposed chair is Steven Kunsman. The TF has been assigned the number HTF37

**Reports from the WG Chairs**

**H3: Time Tagging for Intelligent Electronic Devices (COMTAG)**
**Chair: W. Dickerson**
**Vice Chair: J. Hackett**
**Substations C4 Co-Chair: M. Lacroix**
**Output: Standard**
**Established: 2006**
**Expected completion date: December 2016**
**Assignment:** Develop an IEEE Standard for time tagging for power system IEDs. This will include common requirements for time tags, and show how to apply them to various classes of time sequence data. Requirements and methods for stating the resulting time accuracy will be included.

The WG met on Tuesday, with 9 members, one corresponding member, and 11 guests in attendance, with a quorum. After calling attendance and verifying a quorum, the meeting was called to order by Chair Bill Dickerson.

The patent policy slides were shown, and no issues were identified. Minutes from the preceding meeting in La Jolla were approved – Mark Adamiak moved approval; Benton Vandiver seconded; approved unanimously.

There was some discussion of minor remaining items in the draft. The WG agreed that minor edits to an informative annex could be taken care of in the comment resolution period, if it is required.

With that, the chair asked for a motion to go to sponsor ballot. Jim Hackett made the motion and Chris Huntley seconded. There was no discussion, and the motion passed unanimously. The chair will accept changes, fix any resulting Word bugs, and forward the document to IEEE-SA care of Sam Sciacca. SA has volunteered to migrate the standard to the current version of the SA standards template and bring it into accordance with SA guidelines. The WG is very thankful for this assistance.

Once business was complete, Chris Huntley moved to adjourn.

For the next meeting: a single session jointly with SubC4, for 30 attendees and computer projector. The existing slot (4:30 on Tuesday) worked out well with manageable conflicts.

At the PSRC Main Committee meeting, Marc Benou requested approval from the Main Committee members.

“Mr. Chair, the H SC requests approval for transmittal of PC37.237 to the IEEE SA for balloting. Provided the ballot is favorable, the proposal will be sent to the IEEE SA for approval and transmittal to ANSI for adoption as an American National Standard.” The motion was approved by the Main Committee.

**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 19 members and 13 guests present for the Jan 12, 2016 meeting.

The minutes from the Sept 2015 meeting were reviewed and approved with no comment.

The Chair asked for an update on any 61850 activities.

Christoph Brunner spoke about the current status of the Ed 2 edits and tissues, the document is in final edit and should circulate next month. (7-3, 7-2, 8-1, 9-2, and Part 6) These will be released as Ed2.1.

New items are an appendix (in all 2.1 releases and future releases) that addresses backwards compatibility to previous editions. Part 6 now reflects experience from the recent IOP’s and should be more usable. Going forward WG10 is focusing on using a UML model to generate the standard’s documents – most extensively it is first being used for Part 7 and this makes all documents more accurate since edits are only in one place. To the end user the generated PDF will appear the same as from previous Word files.

Part 9-3 will become 1588 compatible and the level one timing reference for IEC 61850 implementations.

Herb Faulk noted that 62351-11 (XML security) passed the CDV and ready for FDIS – the IOP in Oct – 35 companies/150 attendees - had good results for the devices in the IOP. The Red Box was found to be a potential issue in networks and should be carefully considered when applying them for IEC 61850 networks. The next UCA-IUG 61850 IOP will be in Oct 2017 and anyone (especially utilities) should contact Herb to participate. There will be a new event – 61850 Boot Camp prior to the IOP – learn the right and wrong ways to implement a 61850 system.

Alex Apostolov made a presentation on the testing topic related to new documents from CIGRE and from IEC 61850 10-3 work. Related CIGRE documents include B5.45 paper (Acceptance, Commissioning, and Field Testing Techniques for P&A Systems.) Also B5.53 report (Test Strategy for Protection,

Automation & Control (PAC) functions in a full digital substation based on IEC 61850 applications). It covers testing methods and definitions recommended for IEC 61850 systems including the modes of test handled by the isolation technique within the standard.

The Chair began a review of the report and solicited assignments for the missing parts of the outline. Jun Verzosa and Alex Apostolov agreed to provide new contributions to help finish the report. Updates are due February 28, 2016.

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

**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 Sunday, January 10, 8:30 – 17:30 and Monday, January 11, 8:00 – 10:45. The Sunday session had 9 members and 0 guests. The Monday session had 14 members and 22 guests. Neither session had a quorum. Both sessions started with attendee introductions and review of the IEEE patent rules.

The current status was reviewed:

> The updates proposed in the September meeting were drafted, circulated into the WG, and then edited into the document. A Working Group WebX was held on November 17 to review all edits and discuss additions. After this, a review was conducted on the fully edited document followed by a WG vote to accept (or reject) the current proposed changes. 22 of the 30 voting members voted to accept the changes. The remaining 8 listed members did not vote and there were 23 comments returned with the ballot. The changes in the draft were accepted and a few type and formatting errors were corrected. At this point all the proposed changes to the draft have been addressed (either accepted and added to the draft or rejected).

Since there was no quorum at either meeting, September minutes will be approved by Email.

Discussed the next steps—

IEC CD circulation in February, coordination with IEEE ballot, & looking for sponsor for meeting outside of N. America. Murty Y. will provide some suggested meetings outside on N. America that we may be able to co-locate with. Brian K. will look into some possible sponsors in London area.

We are on track for the CD circulation in February. In order to follow up in timely manner with IEEE circulation, will need to ask PSRC to go to ballot at May meeting. The CD circulation may be done by then (2 mo.) or may not (normal 3 mo.). IF CD circulation does not bring up too many comments, we will form IEEE ballot body then. We should be able to make CD requested revisions and go to ballot without another PSRC vote. Coordination depends on what comes back from IEC and IEEE ballots.

Resolving issues raised by vote comments—

Have a mix of formats in Word. The CD circulation will be in PDF, so the first circulation is no problem (check that conversion to pdf works). When goes to CDV, Word version will need editing, so maybe there will be problems at that time.

Terminology for measurand, reference, and “true value” is mixed and not consistent in reference documentation including GUM (guide to uncertainty in measurements). Also, our usage of phasor and synchrophasor and our definitions are un-clear. Decided to eliminate all definitions not used and note that synchrophasor is used synonymously with phasor. We will change the “reference” value name to something consistent with GUM. We will also change our notation for frequency and ROCOF estimate to be consistent with that of phasors. Harold, Allen, and Ken will look for appropriate terms to define and refer the measurand and reference quantities.

Several other sentences that were redundant or not really needed were removed or moved to better places. It was noted that the tables are not numbered continuously since table 2 was removed. Also,

many formulas were added and some removed, so these are not fully sequential. The numbering will be revisited when all other edits are complete.

After considerable discussion, it was decided to leave annexes H & I as normative but optional. These are new and thus untested, so we would normally make them informative. However, since they are optional they do not have to be used. Also, if optional, they cannot be used until the next revision. Straw poll of attendees favored leaving requirements normative. We will see what the comments say. We will add a line that makes it clear they are optional and that the PMU must pass the normative requirements for the class and reporting rate that is being used for qualification under the optional requirement.

For the next meeting - a single session with room for 30 people and a CP is requested.

**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 11 members and 10 guests present for the Jan 12, 2016 meeting.

Herb Falk presented a quick review of the recent IEC 61850 interoperability (IOP) test results which found a problem when applying more than one RedBox in a bumpless-redundancy PRP or HSR network. He also reminded attendees of the future IOP planned for the USA in Oct 2017. Those interested in participating should contact Herb. The organizers are planning an IEC 61850 Boot Camp for consultants.

Eric related that the report draft was circulated for comments after the last meeting and that he had received and integrated comments from Bob Beresh and Phil Beaumont, plus new content from Herb on PRP and HSR as described above , and new content on GOOSE tunneling. Sections 11 & 13 have been added to give relevance to those topics.

A longer discussion on section 10.3 provided insight to the definition of GOOSE “tunneling” within the context of the WAN implementation. A revised explanation or term should be used; Eric will edit this part and seek approval of Alex and Christoph. The “tunnel” may or may not “envelope” the GOOSE but does not “disassemble / re-assemble” the GOOSE message which would be what a gateway does.

Additional review of the comments and revised sections were performed. Minor revisions to sections 12.2 were summarized with Deepak, who will edit and resubmit it with some specific requirement numbers for environmental withstand capability.

Bob Beresh will perform a final editing review, and afterward Eric will send out the final draft for WG member approval.

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

**H17: Establishing links between COMTRADE, IEC 61850 and CIM**
**Chair: C. Brunner**
**Vice Chair: A. Apostolov**
**Output: Report**
**Established: 2010**
**Expected completion date: December 2013**
**Assignment:** Develop a standards approach to link IEC 61850, CIM and COMTRADE so that the COMTRADE channels can be associated to a node in the power network.

7 members and 1 guest were present.

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

The discussions focused on the use cases to be covered by the document. It was decided that the main focus should be on the Post-Fault analysis use case. The WG plans to spend no more than two additional meetings before publishing the report.

Christoph will send the EPRI/IEC Use case template to the members of the WG to use in their preparation of the use cases.

A room for 20 people and projector will be needed for the meeting in May 2016.

**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, January 12, 2016 in single-session chaired by Yi Hu with 9 people (7 members and 2 guests) attending.

The working group discussed the following topics:

- Time representation difference between IEEE C37.118.2 and IEC 61850
    - C37.118.2 use UTC that has leap second while 61850 use TAI which does not have leap second
    - C37.118.2 use 4 bits to indicate accuracy while 61850 use 5 bits
- Mapping digital bits from C37.118.2 to 61850 GOOSE
    - Herb: Need to make a statement “sending digital value through SV is not recommended”. In practical use, when digital data send to 61850 client, GOOSE is preferred then through SVs. Also, digital data do not change very often. Keep sending the same data is not very efficient

Next step actions:

- Mark Adamiak to complete the use case description based on the discussion at this meeting and send to WG Chair
- Allen Goldstein to arrange a conference call to introduce one colleague to the WG

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

**H22: PC 37.249 Guide for Categorizing Security Needs for Protection Related Data Files (Joint Working Group Substations Committee C19 & PSRC H22)**
**Chair: Amir Makki (Acting)** **Chair C19: Denis Holstein**
**Vice Chair: Rick Cornelison (Acting)**
**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 20 members and guests present. Discussions were held on how to best format the contents of the Guide for better flow and readability. Consensus was present that, for consistency, the Guide should follow the format used in C37.240.

The member volunteers tasked with completing the guide within the next couple of meetings will reformat their sections accordingly and complete their assignment by May 10th 2016.

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

**H23: Guide for Naming Intelligent Electronic Devices (COMDEV)**
**Chair: R. Cornelison**
**Vice Chair: Eric Allen**
**Secretary: Amir Makki**
**Output: Guide**
**Established: January, 2013**
**Estimated Completion Date: January, 2017**
**Assignment:** Develop an IEEE Guide for naming Intelligent Electronic Devices (IEDs) based on the report of Working Group 10.

The Working Group met on Monday January 11, 2016 with 9 members and 6 guests. Draft 3.2 was sent to members prior to the meeting.

The following items were discussed:

- Definitions. The group decided to add Line Groups. **Amir Makki** volunteered to define that term.
- Parameters of the device name. The group decided to add to Company Name and Station Identifier which is reflected in draft 3.3.
- Delimiter. Underscore has been selected as the delimiter. **Amir Makki** volunteered to rewrite section 6 to better state the intent of the Guide.
- CIM and IEC 61850. Herb Falk provided the section on IEC 61850. **Christoph Brunner** volunteered to review and update this section.
- Use Cases. The various devices for CIM and IEC 61850 applications are incorrect. **Christoph Brunner** volunteered to correct the Use Cases for IEC 61850. **Rick Cornelison** volunteered to review the section on CIM and use this information to correct the Use Cases for CIM. **Herb Falk** will assist as needed.

Assignments are due February 1.

Plans are to get draft 4 to the members by mid-February for WG balloting.

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

**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 January 11, 2016 in Memphis, TN, in a double session with 32 attendees in the first session (9 members, 23 guests) and 8 attendees in the second section (5 members, 3 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 achieved in the first session. Minutes of May 2015 and Sept 2015 meetings were approved.

Project update was provided.

- Christoph Brunner delegated an update on Level 1 (base) profile – IEC/IEEE 61850-9-3 to Roman Graf:
  - September 2015 CDV comments resolution (both IEC and IEEE) done jointly
  - Comments resolutions worked in and draft FDIS prepared end of October
  - January 11, 2016 FDIS was finalized by IEC CO
  - IEC CO will send FDIS to IEEE-SA for IEEE editorial check (Jodi / Catherine)
  - Plan to circulate FDIS to NCs beginning of February, 2016, end end of March, early April
  .
- Galina Antonova updated the group on Level 2 (extended) profile – IEEE C37.238:
  - Recirculation 1 completed
  - Comments resolution is in progress

Erin Spiewak of IEEE-SA confirmed that submitting both standards to the same REVCOM meeting is suggested. March 22 is a deadline for May 2 meeting, and May 20 is a deadline for June 29 meeting.

Discussion on comments resolutions followed. Comments by Yi Hu were discussed. It was agreed to replace “extended profile” with “the profile that extends the capabilities of IEC/IEEE 61850-9-3 profile” throughout the document. Roman Graf’s comment on moving C37.238 content to IRIG-B standard was discussed. H24 Vice chair shared on behalf of Working Group officers that this comment is out of scope of this Working Group and to be bought up higher levels. The same applies to two comments on discontinuation of C37.238. As request on incorporating C37.238 features into 9-3 FDIS cannot be fulfilled, the C37.238 work to be continued. Christoph Brunner commented that C37.238 features could be added as a 9-3 amendment at a later date.

Herb Falk gave an update on interoperability testing. 7 participants supported 238, 7 participants supported 9-3. Both worked together with only one issue found: domain number. Domain number and slave operation to be discussed further. Mark Adamiak reported on mapping time inaccuracy into 61850 timestamp. This is required for synchrophasor applications. Tissue 1429 was submitted on this to IEC TC57 WG10. This topic is out of scope for C37.238 (so this action item is closed), and will be discussed in TC57 WG10.

Remaining open comments were discussed in the second session. It was agreed on Jan 7 teleconference meeting not to require support for C37.238-2011 features. Annex A discussion included review of a proposal to modify Annex A text (Tim to provide), and table modifications provided at the meeting. Note to section 6.2 was reviewed and revised, no objections were raised. PICS were discussed, as an extension to 9-3 PICS. Bruce Muschlitz agreed to work with Herb Falk and Hubert Kirrmann on 238 PICS extensions. New Annex B proposal provided on Dec 31, 2015 by Hubert Kirrmann was presented. Chris Huntley and Bill Dickerson agreed to work with Hubert Kirrmann on incorporating what is missing in the current Annex B version. Christoph Brunner agreed to provide IEC 61850-7-3 Ed. 2.1 Annex F to be used as a model for description of compatibility. Other changes proposed by Hubert Kirrmann were presented. These require review. Chris Huntley suggested to keep to comments resolutions and not get side tracked to discussing other changes proposed.

The meeting was adjourned at 5:48pm. A teleconference meeting will be scheduled in next couple weeks.

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

**H25: <u>Review of C37.94</u>**
**Chair: M. Benou** **PSCC Co-Chair: Roger Ray**
**Vice Chair: D. Jenkins**
**Output: Standard**
**Established: September 2013**
**Estimated Completion Date: December 2015**
**Assignment:** Revise IEEE Standard C37.94-2008, *IEEE Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment*.

H25 met with 6 members and 3 guests. Introductions were made. The WG did not meet in September so there were no minutes to approve. A quorum was present. The WG spent the session reviewing the 18 comments received during balloting. Many of the comments were due to formatting errors when the document was converted from Word to a pdf. All the comments were addressed and the WG voted to submit the comments and prepare for recirculation.

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 9 members and 4 guests in attendance.

IEEE Pre-PAR / Guidelines slide shown to the meeting.

PAR Draft Status:
- PAR Draft has been approved by PSRC.
- Pending NESCOM approval.

SCOPE of the standard defined again by chair.
- No comments received.

Initial Goals
- Contents: What must a COMSET file contain?
- Organization of SCL file
  - Define logical device organization (nodes organized by device?)
  - Should a hierarchy be mandated?

- Format: How should COMSET extend 61850 SCL?
  - Private sections, dataNs (data namespace), lnNs (logical node namespace)
- COMSET schema

- No attendee comments

Assignments
- Vendors to go through the CID files for non 61850 settings in the private extensions.
  - Basler - Chris volunteered
  - ABB – Bharat

All the CID files will be uploaded to the imeet central desktop.

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.

Attendance: 12 Members + 18 Guests

Following two major utility concerns on IEC-61850 technology were discussed:

1. Backward compatibility with revisions/versions
   - The primary concern & burden on utility staff with revisions/interoperability was mentioned.
   - Some members mentioned that it is necessary for utility staff to understand what is added in the new editions and what is deprecated with regard to their specific implementation.
   - One of the recommendation to circumvent the problem is by creating a North American Profile which would act as a base for accessing the impact for different versions.
   - There was suggestion by IEC working group chair to use IEC-61850 task force's template for seeking feedback.
   - Some attendees asked to provide the feedback details down to logical node level where improvement is needed.
   - Some of the members suggested to mention the difficulties from utilities as-it-is and not try to change/defend what is right & what is wrong.
   - Another suggestion was to segregate and the feedback only to IEC-61850 working group and to manufacturers. One of the members also mentioned that the feedback forum should be limited only to IEC-61850 standard as what was missing.
2. Cyber security issues implementing IEC-61850 technology
   I. Recommendations were made on blocking ports, services.
      - There was suggestion include these requirements in IEC 62351 standard.
      - There was recommendation from to the group to create a new task force to further analyze the impact of cyber security with IEC-61850 standard. The new task force would work with IEEE C37.240 committee and NERC members.

   II. An idea of Layer-1 serial GOOSE was proposed.

**HTF31: <u>Common Protection & Control parameters for COMSET</u>**
**Chair: D. Maragal**
**Vice Chair: A. Apostolov**
**Output: Standard**
**Established: September, 2014**
**Estimated Completion Date: September, 2015**

**Assignment:** Develop generic models and parameters of protection functions.

Attendance: 6 Members + 10 Guests

Previous minutes were reviewed

PIOC (ANSI 50) element was considered for modeling & identifying the parameters. Following aspects of PIOC function were discussed:

1. Setting Reference:

   - The group decided that the reference should always be primary system in accordance with IEC-61850 convention.

   - However, some members & manufacturers were concerned that there exist possibilities such as in differential functions (87L, 87T) wherein it becomes important to identify the CT ratios, inaccuracies at secondary side. The group decided that these cases will be considered in detail when working on 87L & 87T functions.

2. Measurement quantity:

- The group decided to include Fundamental, RMS, True RMS, Instantaneous values as the measurement quantities

3. Drop-out to Pick-up ratio :
    a. Fixed : Manufacturer specific or User settable
    b. Dynamic : Manufacturer specific or User settable conditions
        i. Condition 1 : If I > x% (or pu or pri/sec amps) – ratio = y
        ii. Condition 2: If I < a% (or pu or pri/sec amps) – ratio = b
    - I measured in Fundamental RMS, Instantaneous
- Group decided to make these parameters as optional & not mandatory as these parameters are dependent on implementation. It will in the specific profiles where specific parameters are made mandatory.

4. 1φ & 3φ Blocking
    - Group referred to use IEC-61850 logical node conventions where these blocking elements are defined.
5. Pick-up delay
6. Drop-out delay
7. Operate delay
8. Output : Latched/Unlatched
    - Group decided latch is not part of function
9. Reset latch operand
10. Function enable/disable : ON, OFF, Dynamic (<Operand>)
    - Operand could be binary input, internal IED signal, 61850 signal
11. Trip command
    a. Fixed
    b. Manufacturer specific
    c. User defined duration
    d. Other models of trip command representations
    - On discussion, some manufacturers supported these model representations. However, group decided to investigate these models further and represent them as a standalone entities common to many protection functions.
12. Direction : Forward, Reverse, Not forward, Not reverse, Not directional
    - There was comment that Not reverse could be same as Forward and hence, it the characteristics of each of those functions have defined clearly in the writeup.
13. Other Supervising Elements : Ex : Over Voltage - SOTF
    - Members mentioned SOTF is specific implementation of PTOC function and not an independent function. Hence, it should not be included in common models & parameters arena.
14. Dynamic Blocking

a. Inrush Restraint

b. Block until inrush is active & reset functions operate delay

c. Block until inrush is active & trip immediately if function remains picked-up after pick-up delay has expired

d. Specify restraint characteristics

i. Greater than %x 2nd harmonic

ii. % calculated with RMS / Fundamental

15. Cold load pickup

16. Auto-reclosure / Manual close

17. Logs

- Group decided logs is a separate logical node and should not be mixed with standard models of protection & protection related functions.

➔ Group decided to setup sharepoint site on IEEE's centraldesktop site for monthly online discussions with members to progress faster.

**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 1/12/2015 with 22 people in attendance. 15 of which are 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:

Writing tasks have been received, compiled and reviewed. The draft reviewed at this meeting is now version 0.1.

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

**H35: XML Translation for COMTRADE**
**Chair: M. Adamiak**
**Vice Chair:**
**Output: Report**
**Established: May, 2015**
**Estimated Completion Date:**

H35 Recommendations for the Update of COMTRADE and creation of an XML version

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.

Attendees: Mark Adamiak (Chair), Shengen Chen (G), Matthew Leyba (G), Greg Rzepka (M), Bruce Muschlitz (M), Jim Hackett (G), Jalal Gohari (G), Charlie Childs (G)

This was the first meeting of this group and, at present, only 2 people signed up to be members. Additional members are solicited – especially users.

The results of the COMTRADE Task Force were handed out, reviewed, and discussed. The people in attendance questioned many of the proposed updates and others received a lukewarm reception. The one item where there was agreement was on the addition of the 61850 Quality Flags in COMTRADE data files. The chairman hopes to be able to prioritize the upgrades by a larger group in order to get a representative consensus.

Draft: 0.0

Next meeting: 25 people; projector

***Liaison Reports***

**PES Substations Committee**
**C. Preuss**

C0: DATA ACQUISITION, PROCESSING, AND CONTROL SYSTEMS SUBCOMMITTEE
**Chair: C. Preuss**
**Vice Chair: Vacant**
**Secretary: Vacant**

A. Substations C0 is working with the PSR Committee AdCom to coordinate activities related to the PES reorganization.
B. The C37.2 standard is being revised, which defines standard IEEE function numbers and acronyms. If anyone knows of edits required to existing numbers/acronyms or needs a new number/acronym defined, please come join the working group so that can be accomplished.
C. Substations C0 will be working to propose adjustments in the proposed PSCC Committee Scope and the complementary portions in the proposed PSRC Scope. This will focus primarily on the last paragraph in the PSCC scope, which tries to explain where the PSCC and PSRC proposed scopes meet. Any proposed changes to the complementary portions of the PSRC scope will be forwarded to the PSR AdCom.

**PES Communications Committee**
**D. Nordell**

No report

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

An additional ***IEC 61850 IOP***, Interoperability testing session hosted by the UCA international users group took place in September 2015. We had more than 30 participating companies and more than 100 peoples testing GOOSE and Sampled value message exchange, client/server communication, the SCL engineering process, Time synchronisation as well as PRP/HSR communication. Feedback from the IOP could directly be discussed in the WG10 meeting which took place the week after and many issues could be solved and will be integrated in the next update of the standard.
The next IOP will be in October 2017 in the US. We are looking for members from utilities that are willing to act as witness.

***IEC TC57 / WG10*** will meet in February in Cathedral City, California, US. WG10 has currently the following projects:

1. Finalisation of Edition 2 of IEC 61850:
All parts except part 2 (Glossary) have been published as second Edition. The work on part 2 has only started.

2. Preparation of an Edition 2.1 of IEC 61850 for some of the major parts
The work to create the Edition 2 based on the UML model of the IEC 61850 logical nodes and data is finished. Based on that, an Edition 2.1 of the standard will be produced that integrates as well TISSUES and feedback from the Interoperability testing. Publication of Ed 2.1 will be in the form of Amendment as well as the Ed 2.1 document.
The Amendments for parts 6, 7-2, 7-3 and 7-4 are ready for official circulation by IEC as CDV. Work on parts 7-1, 8-1 and 9-2 is in preparation.
Ed 2.1 CDV of part 7-3 will have a new Annex that identifies in details aspects of backwards and forward compatibilities with older versions of the standard. This is planned to be added to all other parts as well.
Ed 2.1 of part 6 will include many improvements to support an efficient engineering process.

3. Technical reports that are under preparation
- IEC 61850-90-3 – using IEC 61850 for condition monitoring is ready for circulation as TR.
- Work on IEC 61850-90-11 – modelling of logics, IEC 61850-90-14 – Using IEC 61850 for FACTS data modelling, IEC 61850-90-17 – Power Quality and IEC 61850-90-18 is ongoing.
- A technical report on functional testing is in preparation.
- Work on revision of report IEC 61850-7-500 about the usage of the Logical Nodes to model applications for substation automation based on comments received on first DC and on the report IEC 61850-7-5 explaining the more generic concepts is in ongoing.

4. A few technical specifications for mappings between IEC 61850 and other protocols are worked on. Mapping with DLSM/COSEM (TS IEC 61850-80-4) has been circulated as CDV, mapping on Modbus data (TS IEC 61850-80-5) is ongoing and for the mapping on 60870-5-101/-104 (TS IEC 61850-80-1), a revision has been started to be in line with Ed 2 of IEC 61850-7-3.

5. New work has been started to create a guideline how to define basic application profiles for IEC 61850.

6. IEC 61850-9-3, precision time protocol profile for power utility automation is ready to be circulated as FDIS.

***IEC TC57 / WG17*** will meet in Houston, Texas, US in February and is working on the following topics:

1. Technical reports that are under preparation
- IEC 61850-90-8 – use of IEC 61850 for modelling of Electrical vehicles is ready to be published as TR
- IEC 61850-90-10 – modelling of schedules, will be circulated as DTR. The model has already been integrated in IEC 61850-7-4, Ed 2.1 drafts
- IEC 61850-90-6 – use of IEC 61850 for distribution automation, IEC 61850-90-9 – Storage batteries and IEC 61850-90-15, Modelling a generic electrical view of DERs: First WG drafts are available.

2. Mapping on web technologies

The TF agreed on the approach to use MMS/XER over XMPP. Work on the part 61850-8-2 is in the finalisation stage.

***IEC TC57 / WG18*** is working on the following topics;

1. Extension of IEC 61850 information models to also include logical nodes and data models for steam and gas turbines as an amendment to IEC 61850-7-420 is in CDV stage.

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

3. Communication network structures for hydro power plants

***IEC TC57 / WG19*** with regard to IEC 61850 works on the preparation of IEC 61850-90-2 – Use of IEC 61850 for communication towards the control centre. The document is ready to be circulated as TR.

WG19 is as well working on a harmonized model of IEC 61850 and CIM.

## 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: J. Long**

The I Subcommittee met on January 13, 2016 with 21 members in attendance – a quorum was achieved.

- Minutes of the I Subcommittee meeting held in La Jolla, CA in September 2015 were approved with changes
- Coordination & Advisory Committee Meeting Items of Interest:
  - Working Group Chairs should provide their pertinent information to Brian Mugalian and Jeff Long. Russ Patterson and Rick Gamble will post information for your working group. Email your content to: webmaintenance@pes-psrc.org
  - Future PSRC Meetings
    - May 2016 – Denver CO
    - September 2016 – Cincinnati OH
  - Working Group Chair training scheduled for May 2016
  - PSRC is looking for presentations for the May and September 2016 Main Committee meetings
  - For new reports, we will be using the new IEEE template (to be issued at a later date)
- Administrative items:
  - WG Agendas and Minutes: ***"The 14-calendar-day rule"***
    - Send WG agendas out 14 days prior to meetings
    - Send in minutes to I-Sub Vice chair Jeff Long within 14 days after the meeting.

- Email WG and TF Minutes *including membership list* to Jeff Long: jeff.long@kiewit.com
- Email items to post on the I web pages to Brian Mugalian and Jeff Long which will be reviewed and forwarded to: webmaintenance@pes-psrc.org
- Central Desktop used for IEEE Guide/RP/Std. documents with a PAR

**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 Tuesday, January 12, 2016 with 6 members and 1 guest.

Minutes from the September meeting in La Jolla, CA 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.

All working group chair are reminded the database is available to them for use during their document development. The IEEE staff reviewed the new process for accessing the database. All IEEE members have access to the dictionary database through their MyProject account (click on "Dictionary Database" from the dropdown menu).

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 accepted for review and comment upon request.

**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 January 12, 2016 with 6 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 the status of active projects.

Dr. Murty Yalla is the Chair of TC 95 (internationally). He updated the attendees on status of MT4 projects, and other issues under discussion in TC 95. First, Murty gave an update from the meeting of the maintenance team MT4 meeting held in Biarritz, France on October 27-30, 2015:

- 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. A few benchmark cases are provided for standard users to validate their testing models before running the thousands of required test cases. The WG reviewed Draft 9; they expect to send a CD for National Committee comments in late January.

- 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 Norman 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 in Macau, China, April 11-14. The following 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.

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.

- 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.

Other discussion items:

- Jay Gosalia is the only US participant in MT4 other than Convenor Murty. He reported on the effectiveness of MT4 work.
- Sam Sciacca, member of Standards Management Board (SMB) representing IEEE, reported on efforts to raise IEEE status at IEC, for the sake of avoiding duplicated work or divergent directions. Current example is resolution of gap between IEEE C37.238 (PSRC WG H24) and IEC 61850-9-3 driven by certain individuals.
  IEC and IEEE sell standards competitively – they are working through this challenge. IEC and IEEE SA continue having joint participation. How does each group meet the needs of its constituents as they achieve cordial cooperation? Working for close coupling at the organization level, to fix issues at lower levels.
  IEEE also participates through USNC of IEC, which tends to make IEEE look more US-centered than international. Working on a fix for this. Also, IEC can adopt an IEEE standard, but only ANSI can adopt an IEC standard.
- IEC, IEEE, ISO, and ITU are holding a new joint World Smart Cities Forum and Exposition, July 13 in Singapore.

**I7: <u>Revision of C37.103 Guide for Differential and Polarizing Circuit Testing</u>**
**Chair: Gary Kobet**
**Vice Chair: Alex Lee**
**Output: IEEE Guide**
**Established: May 2012**
**Completion date: December 2016**

***Assignment***: Revise and update the IEEE Guide C37.103 – Guide for Differential and Polarizing Circuit Testing

Working Group I7 was approved to disband during the January 2016 I Subcommittee Meeting.

**I11: <u>PC37.241 – Guide for Application of Optical Current Transformers for Protective Relaying</u>**

**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"

The Working Group met on January 11, 2016 in a single session. The session was chaired by Farnoosh Rahmatian. There were participation from **8 members and 16 guests**. We had quorum (8/14).

All participants introduced themselves.

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

The minutes of the last two WG meetings were approved (moved by C. Henville, seconded by B. Mugalian).

We had a presentation by Peter Grossman of IEEE PES Substations Committee WG K16 on use of non-conventional instrument transformers (NCIT) in GIS. There were discussions about possible future collaborations between the two WGs or the technical committees.

The WG members briefly re-reviewed the Chair's request to approve Draft-5 of the Guide to initiate the balloting process. The WG agreed (unanimously) to request the I subcommittee and the main PSRC committee to support (approve if necessary) the initiation of the sponsor ballot process.

It was noted that the PAR expires at the end of 2016.

Actions:

- The chair to initiate the sponsor ballot process

A request for motion to form the IEEE-SA balloting body was entered by I11 working group member Charlie Henville at the I Subcommittee meeting. The motion was entered by Mal Swanson and seconded by Jim Niemira. Motion approved.

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

"Mr. Chair, the Relaying Practices Subcommittee requests approval for transmittal of Application of Optical Instrument Transformers for Protective Relaying PC 37.241 to IEEE-SA for creation of a ballot body and subsequent ballot." The motion was approved by the Main Committee.

**I21: <u>Analysis of System Waveforms and Event Data</u>**
**Chair: Jerry Jodice**
**Vice Chair: George Moskos**
**Output: Report**
**Established: 2012**
**Expected Completion Date:**

***Assignment:*** Prepare a report that will define a process for identifying and analyzing a fault incident. The process will include data collection, analyzing techniques, and methods of reporting.

The working group did not meet in January 2016. The Analysis of System Waveform and Event Data report from the I21 working group was reviewed and voted on by the Relaying Practices Subcommittee.

The report received the required 75% majority vote. There were two negative ballots and many comments submitted. The working group will meet in May 2016 to resolve the negative ballots and generate a revised report.

Vote was:

Approved: 25

Approved w/comments: 3
Not approved: 2
Abstain: 1

**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 Memphis Convention Center, Memphis, TN, on January 11, 2016 at 1:30 pm. 9 members and 2 guests were present and a quorum was met. 17 members as of this meeting.

Patent Conflict slides were shown.

1. Minutes of last meeting were read and approved.
2. Comments on Draft 5 were discussed.
    a. Points of interest:
        i. Need equation numbers
        ii. Will send Gordie Holt an email on clarification test results described in paragraph below Figure 17 regarding the "Second Decimal point"
        iii. Jeff Burnworth will add examples on Flux Density equations.
3. Bruce will incorporate suggestions from Heather into the Draft 5 R1, which Jeff Burnworth provided and was discussed and edited at the meeting. Bruce will issue as Draft 6.

**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, January 12, 2016, in Memphis in single session chaired by Jim Niemira with a total of **16 attendees** (5 members and 11 guests). Quorum was met.

Meeting was brought to order at 3pm. The IEEE patent slides were presented and reviewed.

Motion by Amir Maki to approve the minutes from the September 2015 meeting; second by John Buffington; minutes were approved.

It was noted that writing assignments are still missing from Jeff Long (intro and background) and Jim Niemira (summary).

Open Action Items are:

1) Jeff Long to incorporate additional theory information into the report using the presentation from Vincent Mosser as a reference document.
2) Jeff Long to include a refresher on Lenz's Law and Ampere's Law when expanding the Theory section of the report.

The group reviewed the present Draft 8.0 of the report with comments from Jeff Burnworth. Edits were made to the report and additional writing clarifications are to be made by the respective authors of the sections.

The report is nearing completion. Still needs addition of a few outstanding writing assignments noted above and overall editorial revision.

The Working Group Members agreed that final writing assignments shall be submitted to the WG Chair by March 7, 2016. The Chair will incorporate the comments and send out the next and final draft to the WG Members for final review and balloting by the WG Members by April 22, 2016 with response required by May 6, 2016. Comments and negative ballots will be discussed at the May 9-12, 2016 PSRC Meeting in Denver, CO. This is an aggressive schedule to completion, but the WG membership feels it is attainable and is resolved to it.

New Action Items:

1) Jeff Long expand introduction and add background information
2) Jeff Long to add section in the report titled Definitions, Acronyms & Abbreviations.
3) Jim Niemira to add a Summary Section
4) All WG members make final edits to their sections and send to WG Chair by March 7.
5) Jim Niemira put together final draft for WG balloting.

I24's plan is to have report ready by May meeting and will request I-Sub to circulate for ballot after the May meeting.

**I25: Commissioning of Substation Protection and Control Devices**
**Chair: Rafael Garcia**
**Vice Chair: Kevin Donahoe**
**Output: Report: Provide guidance in the commissioning of power system protection systems**
**Established: January 2014**
**Expected Completion Date:**

Working Group I-25 met Tuesday, January 12, 2015, in Memphis, TN with 23 members and 14 guests. All writing contributions were submitted and they were briefly discussed. The group also discussed some comments that were submitted for consideration. Don Ware and Tony Seegers volunteered to review the entire document one more time to see if we can condense the wording in the document so that it is not so lengthy. The plan is for them to be done with their review by the end of January. Once this review is complete we will continue the reviews by others.

Addition reviews by sections:

| Section | Reviewer |
|---|---|
| 1 | Andre Uribe |
| 2 | Mike Stojac |
| 3-4 | Bruce Mackie |
| 5-7 | Tony Newman |
| 8-13 | Mark Siira |
| 14, 16 | Angelo Tempone |

**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.

Working Group I26 met on time with 12 members and guests present. The discussions focused on the benefits of using modeling software with real life fault and disturbance data records (case studies) to challenge the accuracy of the various mathematical models including the Jiles-Atherton model. The group agreed that including such case studies in the report will benefit the industry at large.

A team of volunteers was assembled to define and perform the case studies over the next few meetings. Among others, the volunteers include a software modeling team (Dean Ouellette, Yue Chen) and a fault and disturbance data team (Amir Makki, Steve Turner), and Harold Kirkham to help comment on accuracy (goodness of fit).

**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.

Met with 12 members and 11 guests.

Received anecdotal and statistical information on relay misops caused by undetected relay failures as well as a relay block diagram and manufacturer monitor information.
Assignments given to get similar relay failure data from other regions.

We will circulate a draft to agreed reviewers by April to have final draft ready for review at May meeting with final release by the September meeting.

**I29: Revision of C37.110 Guide for Application of Current Transformers for Protective Relaying Purposes**
**Chair: Joseph Valenzuela**
**Vice Chair: Jeff Long**
**Output: Revision of the Guide**
**Established: September 2014**
**Expected Completion Date: January 2018**

The Working Group meeting was canceled, but will meet again in May 2016.

**I30: Revision of C37.235 Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes**
**Chair: Ljubomir Kojovic**
**Vice Chair: Robert Frye**
**Output: Revision of the Guide**
**Established: September 2014**
**Expected Completion Date: December 2018**

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

Working Group I30 held its meeting in a single session on Tuesday, Jan 12, 2016.

There were 11 participants attended the meeting.

Main aspect of the Guide revision is harmonization with the IEC 61869 standards.

Initial review of the existing guide was performed and required changes indicated.
Also, review of the IEC 61869 standards (that are under development) was performed and sections that will be implemented in the IEEE new guide were presented and discussed.

For the next meeting, Draft 01 will be completed that will have all material implemented in a single document.

Robert Frye accepted to serve as the Vice Chair of I30 WG. This will be important help for the WG successful work.

**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**

I31 met on January 11, 2016 with nine members and two guests. This was the first meeting of the working group where members volunteered to participate. The PAR is on the January 2016 NESCOM agenda for approval. We discussed the harmonization of including IEEE 1613.1 into IEEE 1613, along with a comparison of standards provided by Craig Preuss. The working group will start on Draft 1 at the May 2016 meeting.

**I32: <u>Review Survey of Relaying Test Practices (2001 report)</u>**
**Chair: Andre Uribe**
**Vice Chair: Joe Uchiyama**
**Output: Review**
**Established: January 2015**
**Expected Completion Date:**

***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 for the first time on Tuesday, January 12th, 2016, Memphis, TN in a single session chaired by Andre Uribe with a total of **18 attendees**.

1. Introductions were held.
2. September meeting minutes were reviewed.
3. Assignments were made to various members to convert the current survey into a questionnaire. The WG will decide which questions are appropriate for today's environment during next session in May.
4. Assignments were made to various members to develop questions around new topics such as NERC, work force characteristics and human performance.
5. Unsolved issue came up and will continue discussion during next session.
    a. Should the survey include all industries, specifically the industrial sector?
    b. Should the survey be broaden around overall protection or confine to protective relay practices

Title change: Keep "*A Survey of Relay Test Practices*" or change to "*A Survey of Protective System Test Practices"*

**<u>Task Force reports</u>**

**ITF33: <u>Review of Relay Testing Terms</u>**
**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 11 members and guests present. Discussions were held on whether or not the Task Force should disband and have the work picked up by the C26 Working Group. The discussions where further coordinated with C26 and agreement was reached that the work should be completed by the Task Force and that the output should be a report to the subcommittee (I).

By the end of the meeting the following purpose statement was prepared:

"There is a whole family of relay testing terms that are not defined in the IEEE dictionary. Furthermore, relay testing terms are not uniformly used and mean different things to different organizations, manufacturers, and

users. Harmonizing the definitions for these terms will help eliminate any confusion. The resulting definitions should also be submitted to C26 to be available to I2 for inclusion in the IEEE and IEC dictionaries."

**Liaison Reports**

Instrument Transformer Subcommittee:

The spring meeting of the Instrument Transformer Sub Committee will be in Atlanta, GA, 20 – 24, March 2016 at the Sheraton Atlanta.

There are three active working groups of interest.
PC57.13 Standard Requirements for Instrument Transformers recirculation 4 ballot closed Oct – Comment Resolution.
PC57.13.7 Standard for Instrument Transformer with max output of 250ma is being developed – Draft 2+.
PC57.13.8 Standard for Station Service Voltage Transformers is being developed – Draft 1+.

**Coordination Reports**

None

**Old Business**

None

**New Business**

1. New Business
    a. New Task Force Recommendations, WG group training session suggested. Setting up a Powerpoint to be on the web site.
    b. Brian Mugalian discussed a summary or Subcommittee activities.
    c. Brian Mugalian presented a template to use for proposing new Task Forces
    d. New members of the I Subcommittee
    i. Joe Uchiyama welcomed as member.

**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.

The J Subcommittee met on Wednesday, Jan 13, 2016 with 22 members (achieving quorum 22/36) and 17 guests. There was a call for the approval of the minutes of the September 2015 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: 9th 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 double session with 17 members and 9 guests present.

It was agreed that the Swing Center Voltage and Rate of Change of Impedance schemes should be annotated as possible future schemes if the original authors are unable to identify any generator relays that actually have these schemes implemented.

Phil Tatro agreed to review any remaining comments on Section V, Stability Studies.

It was agreed that the Section VIII, NERC Technical Reference should be revised to reference updated wording from Revision 2 of the NERC document (which has been renamed to Considerations for Power Plant and Transmission System Protection Coordination).

A pending comment on Appendix B – Frequency Deviation of Voltage method will be assigned to Rama Gokaraju and Normann Fischer to resolve.

Draft 10 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 May 2016 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 will be presented at Georgia Tech, April 2016 conference.

WG reviewed and discussed the draft slides

The chairman and vice chairman will update the slides based on the comments listed above.
The paper will also be submitted to WPRC. Dale F. will be a co-presenter.

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
Tenth Meeting Expected Completion 2016
Status Draft 4.0

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

The working group met with 7 members and 11 Guests on January 12, 2016 at the Sheraton in Memphis, TN. Membership of the WG stands at 23. Quorum was not achieved

The meeting minutes from the September meeting were not approved, vice chair will call for email approval. The chair discussed the changes incorporated into Draft 4.0,

The chair will edit the roster and address those who have been infrequent attendees in order to aid in conducting WG related tasks

New material added to the conclusion included a discussion on TSR (Torsional Stress Relaying) and Turbine Control aided ROCOF systems. After some discussion it was agreed to relocate the information into the body of the document rather than the conclusion as this is new information.

The WG plans to present the report at the May meeting at the main committee meeting. The chair will distribute the slides to the WG prior to the May meeting.

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: 8th Meeting

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

The Chair presented the agenda and reviewed each section in the report draft R2.0, including the completed assignments received to date.

Hasnain Ashrafi asked whether the report should include the practices of grounding PTs to repress ferroresonance effects. The group felt that this could be covered by a section on isophase bus protection, which the group decided to add.

Normann Fischer agreed to write the section on failure and damage potential from ground fault evolving from broken stator bars. The Chair offered to help.

Luis Polanco discussed his work so far at modeling CFE's accelerated tripping scheme using sequence voltages. The Chair offered to provide his analysis of sequence network to assist in this effort, and Murty Yalla offered to review.

The WG agreed that the material on Adaptive 100% Stator Ground Fault based on Third Harmonic Voltage Scheme should be made concise.

The working group will need for a single session, computer projector and seating for 35 people in May.

**J13 : <u>Modeling of Generator Controls for Coordinating Generator Relays</u>**
Chair: Juan Gers
Vice Chair: Phil Tatro

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

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

Charlie Henville presented a report on generator tripping and considerations for delaying tripping of the excitation system. The presentation included simulations of various scenarios with or without field voltage reversal, and for various time delays of tripping the field ac circuit breaker. The working group identified two questions for ESCS: what level of level of excitation voltage is necessary for the rectifier to sustain commutation, and to confirm whether field voltage reversal is achievable with IGBT or MOSFET rectifiers.

Juan Gers presented a summary of requirements in NERC Reliability Standard PRC-019-1, which is effective July 1, 2016. Juan pointed out differences between PRC-019-1 and IEEE C37.102-2006. Discussion focused on coordination of the loss-of-field zone 2 characteristic with the generator capability curve, and the role of excitation limiters. Murthy Yalla volunteered to review the two documents and report back to the working group.

Juan Gers reported the report will also address issues related to NERC Reliability Standard PRC-025-1. Murty Yalla suggested the voltage ride-through requirements in PRC-024-1 are also relevant. Manish Das is chairing a task force (JTF2) looking into PRC-024-1. Murty recommended asking Manish to review whether the working group should address PRC-024-1 in this report.

Juan Gers provided a brief review of the draft report, highlighting the recent additions. Juan requested submittal of the remaining assigned sections – generator dynamic response modeling, and coordination checks of the timing and sensitivity of protective elements with generator control characteristics – by the end of March. The section on governor control systems and relationship with generator protective systems remains unassigned. Mahendra Patel agreed to research availability of resource material on this subject.

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: May 2016
Status: 4th Meeting

Several assignments and several reviews were completed

Other assignments are pending and the chair will follow up on these

Dale Finney volunteered to provide a new write up on 25
Bob Pettigrew volunteered to prepare an updated write up that addresses black start considerations on 78

NERC standards – Dale Fredrickson volunteered to review the standards for applicability and Dale Finney will review PRC-025 and report back to the working group.

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

**J15: Investigation of the Criteria for the Transfer of Motor Buses**

**Chair: Wayne Hartmann**
**Vice Chair: Joseph Valenzuela**
**Established: 2015 (1/15)**
**Output: Report**
**Status: 3nd Meeting**

***Assignment:***

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

Produce a Report to Subcommittee with findings of the above

Neither the chair and vice-chair could attend so the meeting was canceled. In the future we need to try to have the meeting.

Next Meeting:Single session; projector, 30 people

New Business:
Motion was passed to have a closed meeting of J to consider a name and scope change. This will be conducted before May PSRC meeting.

## K: SUBSTATION PROTECTION SUBCOMMITTEE

**Chair: Don Lukach**
**Vice Chair: Bruce Pickett**

The K-Subcommittee met on January 13, 2016 in Memphis TN, with 22 of 28 members and 20 guests in attendance. A quorum was achieved. Don Lukach motioned to approve the Sept, 2015 subcommittee meeting minutes. Steve Conrad 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: 6.1a**

**Expected Completion Date: Dec.2016 - - - PAR extension was requested and Brandon and Lubo to follow up on submitting that. [PAR Extension Request was submitted 1-21-16]**
**Assignment: To write a guide for the application of Protective Relaying for Phase Shifting Transformers (PSTs). The protection methods for different types of PST and operating conditions of PSTs will be reviewed. Representation of PST models to determine short circuit currents for relaying considerations will be considered. Protection CT sizing and location issues will be considered. Relay application and setting examples will be provided.**

The K1 working group met in a single session. Nine members and four guests were present. After the introduction, a call for quorum was made, but quorum was achieved. A ballot for approval of the minutes from the Sept. 2015 meeting were approved.
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 after the previous meeting in Sept.
Current draft of the document is 5.3a, The draft for the next meeting will be 6.1a (clean draft).

The following was discussed:

- A motion was made and approved to delete the two (presently blank) sections on control and commissioning.
- The group discussed the need for a PAR extension and agreed that a 1-2 year extension will be needed to complete the guide. Brandon and Lubo to coordinate the PAR extension.
- Examples of actual settings calculations will be added. Mike Thompson and Brandon Davies agreed to provide numerical examples (one each). Two of the existing example applications in Annex 3 will be removed.
- A review of the use of words like "should" and "shall" and "recommended" will be conducted and modified as required. Charlie Henville volunteered for this task.
- The "purpose" section of the guide was reviewed and modified.
- Tony Seegers became a member of the WG and is the group's liaison to the definitions and terminology working group of PSRC. He agreed to review the draft document for the possible need for some definitions (presently none).
- Charlie Henville agreed to add some figures showing example PST installations. Dean Miller, Mike Thompson and Brandon Davies agreed to send him example installations.
- Brandon Davies agreed to add some words to Section 10.3 regarding the issue as to whether or not the PST might be a source of ground currents.
- New Section 7.0 (on inrush) will be revised to remove any discussion on impact to protection systems, and a new section 11.2.5 will be added to discuss the impact of inrush on some protection systems.
- It was agreed to have a webex meeting about middle of March, to discuss the present draft.
- Draft 6.1a will be posted shortly after this meeting and should be used for the review.

Steve Conrad agreed to standardize the figures (majority) before the web-x meeting.
Request for next meeting is a room for 30 attendees single session and a projector.
Conflict Avoidance: none noted

**K5: <u>(PC 37.119.2005): IEEE Guide for Breaker Failure Protection of Power Circuit Breakers</u>**

**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: 4**

**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 and affiliations were presented, patent slides shown, sign-up sheet circulated, and Quorum was achieved in both sessions. 13 members attended the first session. Quorum met, 16 members attended the second session/meeting, Quorum was also met.
31 total people (guests and members) attended between the 2 sessions.
2. Approval of Sept. 2015 LaJolla minutes- Motion – Brian Boysen, 2nd – Ian Tualla
The La Jolla minutes were approved.
4. SA Ballot, Draft 2- 80% participation 98% approval, 67 comments, 1 DNA ballot
5. Comment resolution methodology: discuss/make-changes/approve draft3

Roger presented proposed resolutions to the must-have do-not-approve ballot comments. The workgroup made changes to the comment responses and these were then recorded and the recirculation draft 4 was

updated. This process was continued for all ballot comments received and the draft 4 was updated to comply with workgroup decisions.
At the end of the second meeting session Roger was able to meet with Jay Anderson and they discussed the workgroup decisions/proposals of how to resolve his do-not-approve vote. Jay was in agreement with the K5 workgroup decisions.
Roger will draft the changes on draft 3 and call it draft 4 and Adi will send a new draft to the workgroup indicating that the new draft is the version that we will recirculate for ballot.
Workgroup K5 will be asked to vote to recirculate the version. Adi will keep track of the count.
6. Call for Breaker failure events ……..Adjourn
Single Session, room for 30, PC Projector
Conflict Avoidance: none noted

**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.**

Working group K10 met on Tuesday 1-12-16, there were 12 members and 11 guests.
The group discussed some of the challenges with the layout of 1547 Central Desktop website. Bill Ash of IEEE was in attendance and was kind enough to point out that the main SCC21 home page had a more straightforward layout and was properly updated on a more regular basis. The family of 1547 standards was reviewed as well as the 1547 subgroups, which are referred to as folders. The group reviewed the meeting minutes from the Oct 1547 meeting. We discussed that Draft 3 of 1547 is due to be out soon, possibly as soon as next week. A request will be made to the 1547 chairperson to obtain and distribute copies of the draft 3 document, to the K10 working group for review and comment which will then be reported back to the 1547 working group. The next 1547 meeting will be held March 8-10 at the NextEra Energy facility in Juno Beach, FL.
Mark Siira has agreed to become the K10 vice chair and the working group supported this measure. The request to confirm Mark as vice chair was emailed to the K working group chair on 1-13-16.
Single session, 20 people with a PC projector.
Conflict Avoidance: conflicts 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: 4**

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

K11 met on 1-12-16.
Introductions were done after a welcome by Chairman Charlie Sufana. There were 6 members and 9 guests in attendance for the January 12, 2016 meeting.
The minutes from the September 15, 2015 K11 meeting were read and approved.
Wayne Johnson provided an update on NEI and the NRC.
The working group then reviewed the revision of the entire document by Wayne Johnson. Wayne re-sequenced the document to provide a better flow. The working group also did some review of an entry by Sankar Subramanian. Charlie will be incorporating Sankar's suggestions into the draft.
There was also discussion reducing the present draft so as to condense explanations about the various relay schemes and to just indicate why or why do not work. Charlie will work on seeing what can be done.
An editorial committee will be formed once Charlie gets the report in better shape.

Charlie suggested finishing this by the May 2016 meeting and publishing the initial version on web after the May meeting.
Single session, for 30, PC projector.
Conflict Avoidance: none noted

**K12: P1032 Guide for Protecting Transmission Static Var Compensators.**
**Chair: Satish Samineni**
**Vice Chair: Martin Best**
**Established: May 2013**
**Output: Guide for Protecting Transmission Static Var Compensators**
**Expected Completion Date: December 2016**
**Draft 11**

**Assignment: To work jointly with Substations WG I9 to write a guide for protecting transmission static var compensators. PSRC WG K12 will provide guidance and review on topics that are already covered in other IEEE guides to prevent overlap and identify areas where interpretation of existing guides is necessary to meet the specific application challenges unique to transmissions static var compensators.**
PSRC K12 had a joint meeting with Substations WG I9 on Monday, January 11, 2016 for six sessions lasting all day. K12 had 3 members and 1 guest present. Quorum was not met. The K12 meeting minutes from last September meeting will be approved after the meeting through email.
Section 7.6 and 12 were reviewed.
WG K12 plans to have a series of web meetings before the May meeting to review K12 comments.
(Patent slides were shown and patent issues solicited).
Single Session for 20, PC Projector.
Conflict Avoidance: none noted

**K13 PC37.116 IEEE Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks**
**Chair: Ilia Voloh**
**Vice Chair: Joshua Park**
**Established: September 2013**
**Assignment: Revise IEEE C37.116 "Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks".**
**Draft: 1.6**

1. WG met on Tuesday, September May 15th, 2015 with 6 members and 10 guests.
2. WG Vice-Chair Joshua Park was not able to attend this meeting.
3. IEEE Patent slides were introduced.
4. We had a quorum to approve September Meeting Minutes.
5. Review of Prior Assignments:
   - Group reviewed comments on the Appendix A about SSR. This section used and referred to the Goldworthy and corrected equations in the previous revision. Sakis pointed out that some statements have to be clarified and improved.
   - Satish Samineni informed just before the meeting that he was not able to attend meeting to present changes to section 5.3. Group agreed that his changes so far are in the right direction.
   - Luis Polanco presented his proposal for the section about impact of the SCB to the line protection-group agreed with this proposal. Luis will continue work on this section.
   - Discussion was around improving section 5 "Protective function" to let 824 standard give just reference to our standard rather than giving another view.
   - Don commented that we have to aim for the final draft ready for ballot at September 2016 meeting.
6. New Assignments
   - Satish Samineni to complete review of section 5.3 Capacitor Protection.
   - Galina Antonova and Ilia Voloh will take another look at section 5.1 Protection and Control Philosophy and section 5 in general.
   - Luis to continue with his write-up on impact of the SCB to the line protection (21, 87, 67 etc.).
   - Adi volunteered to review and improve some parts of the section.
   - Ilia to send Mark McVey from Capacitors subcommittee some sections for the review.
7. Current draft is 1.6+

Single session, room for 25 persons, PC Projector.
Conflict Avoidance: none noted

**K15: Centralized Substation Protection and Control**

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

Meeting # 7 (Jan 12, 2016), Final Report: December 2015, Published

The working group met on Jan 12, 2016 with 35 participants (8 members and 27 guests). Did not have Quorum. Minutes of the September 2015 meeting approved by email and it stands final without any correction.

Chair informed the members and guests that the working group report has been published and thanked all the members for their timely contribution in getting the work completed within two years. Chair informed the participants about the protocols involving the IEEE Transactions paper and a summary paper for conferences – these papers submission require a change in scope of the WG assignment. Chair informed the working group members that these requests have been conveyed to the H-subcommittee officers already and H-subcommittee officers informed to request this approval during January 2016 K-subcommittee meeting. Chair also established liaison with WG I2 for terminology review of the IEEE Transactions paper following the WG K15 meeting.

K-subcommittee chair present in the WG meeting informed the working group members that H-subcommittee will expedite the approval process for the papers. Following members volunteered to present the paper at the various conferences, if accepted:

2016 Georgia Tech: Mital Kanabar and A.P. (Sakis) Meliopoulos
2016 PAC World (International): Paul Myrda and Alex Apostolov
2016 PAC World (Americas): Rich Hunt and Alex Apostolov
2016 WPRC: Vahid Madani and Mohammad DadashZadeh
2016 CIGRE Grid of the Future: Qun Qiu and Rich Hunt
2017 DistribuTECH: Mital Kanabar and Rich Hunt
2017 Texas A&M: Mohammad DadashZadeh and Vahid Madani

In addition, A.P. (Sakis) Meliopoulos and Vahid Madani / Ratan Das will present the summary paper at the 2016 i-PCGRID workshop if invited.

WG does not have a plan to meet during May meeting at this point.
No meeting request for May 2016; No Conflict Avoidance request.

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

**Chair: Will English**
**Vice Chair: Steve Conrad**
**Output: Revised IEEE C37.91 Standard -Guide for Protecting Power Transformers**
**Established: May 2014**
**PAR Expires: December 2018**
**Draft: 4**

**Assignment: To revise and update C37.91, IEEE Guide for Protecting Power Transformers to correct errors and address additional protection related topics.**
The working group met with 21 members and 18 Guests on 11 January, 2016, at the Sheraton-Memphis, TN. Alexis Mezco and Brandon Davies joined the WG. Membership in the WG stands at 39.
Minutes from the September 2015-LaJolla meeting were approved, later in the meeting once quorum was achieved.

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.
The chairman led discussions on submitted assignments. Discussion focused on submitted revisions/comment incorporated in Draft 4.
Clause 3.1 and 3.2 definitions clause were reviewed and edited. Mark Schroeder is our WG's representative for Terms and Definitions.
Clause 5.0 is to be reviewed by Mike Thompson to ensure availability and content of the references cited.
Clause 7.3.1 is to be reviewed by Mike Thompson to consider the use of symmetrical and unsymmetrical designations.
Clause 8.0 was reviewed with the following edits

- 8.2.1 delete item c
- 8.2.2 add reference paper by M Thompson on restraint
- 8.2.3.3 Mike Thompson to request revision by Bogdan Kazstenney
- 8.2.3 Alexis to review pp 30-37
- 8.3.1 Remove instantaneous, second paragraph to be reviewed by Meyer

Discussed the relay input and logic for use of relays associated with FPR. Also to include discussion to alarm for contact disagreement due to moisture etc.
Annex-A refer to KTF20
Annex C to be reviewed by Randy Crellin, Brandon Davies and Guillermo Weyer.
Brandon Davies and Alexis Mezco by taking on assignments became WG members.
All writing assignments are due to chair/vice chair by April, 15, 2016
Motion to adjourn
Next meeting: Single session, room for 50, PC projector.
Conflict Avoidance: Avoid WG conflicts with K16, K1 and J7

**K17 <u>Geomagnetic Disturbances (GMD)</u>**

**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: 0.5**
Meeting Date: January 12, 2016: 13:30-14:45; Memphis, TN
1. K17 met on Tuesday January 12th with 20 participants (9 guests and 11 signed members).
2. Meeting minutes of the K17 September 2015 meeting in San Diego, CA, was previously approved via email.
1. The group discussed the request for reviewing C57.163 - Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances. A few volunteers were willing to provide the review to make sure a) if any topic in C57.163 should be covered/incorporated in the K17 WG report, b) no conflictions between the K17 WG report and C57.163 standard and c) if any related information should be referenced in the K17 report
2. The WG members and guests were actively engaged in the discussion on the WG report outline and assignments. It was suggested to combine a few related sections. It is nice to see more than 7 volunteers to take on assignments either to review some draft sections or to provide write-ups for incomplete sections. We will contact absent members for additional assignments. The goal is to get each member involved in the WG report development.
3. It was suggested that the chair contact members who signed in previous K17 meetings but haven't been able to participate the last two K17 meetings to find out whether they intent to continue to actively participate in the WG, if not, they could become K17 guests or correspondent members.
4. We will continue promoting open discussions to define a report outline with more inputs and involvement from members/future members and guests.
5. The WG report draft # is 0.5.

For next meeting: Single session, for 30 persons, with PC Projector
Conflict Avoidance: none noted

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

**Chair: Adi Mulawarman**
**Vice Chair: Surarat Pavavicharn**
**Assignment: To revise and update C37.108-2002 – ~~IEEE Guide for the Protection of Network Transformers.~~ *Revised title* Guide for the Protection of Secondary Network Systems**
**Draft: 0**
Established: May 2015
1. Introductions/ Sign up sheet/Patent slides/ 50% Quorum?
4 Members out of 17 members attended (no Quorum); 2 guests; total of 6 attendees
0 new members added

2. Approve LaJolla, CA Sept 2015 meeting minutes (no quorum met so meeting minute was not approved)
Poom will send the meeting minutes via email to get it approved. Results will be included in May meeting agenda.

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://ieee-sa.imeetcentral.com/psrcktf18/folder/5770883/#folder:6721181
- Adi per suggestion from Ed Bertolini contacted Vic Mohl, the head of ETI.
is reviewing C37.108 and that we get in contact with him to see if he has any comments/inputs. He is willing to review it.
- We asked Mal Swanson for liason to be assigned to this WG to help with the definition section.
  - Mal said he will assign one at January 2016 meeting.
  - Roger Whittaker is assigned as our I2 liason for our WG. He will be added into our mailing list.

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

7. Other updates:

- Adi to add another figure after existing figure 1 but using microprocessor relay symbol.
- Ed want to add a definition for microprocessor relay into the Definition section.
- Request Russ Paterson to schedule K18 always on the first day of the meeting in the afternoon. Try not to conflict with J12, K16
- Resend the link to the central-desktop.
- https://ieee-sa.imeetcentral.com/psrcktf18/folder/5770883/#folder:6721181
- At the next meeting we will try to concentrate on section 4 and section 5.
- Adi will contact Russ to make sure that Robert Fry, Bruce, Raluca and George other WG conflict.
- Mark Carpenter attended the meeting and will help find someone from Oncor to be in the WG.

- Joe Cultrera from Coned. Get contact info from Ed. Adi to invite Joe to correspond with the WG on revision of this standard.
- Adjourn

- There are several conflicting meetings with other working group that if possible we want to avoid. We didn't have quorum and from I heard is that a lot of people have conflicts with K16 being held at the same time. I know it is hard to schedule people's need but if possible, we would like K16 and J12 not to be scheduled at the same time as K18.

Single Session, for 20 people, and PC Projector;
Conflict Avoidance: Request First day afternoon meeting and no conflict with K5, K16 and J12

**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 3 members and 3 guests. An overall review of the latest draft of the standard was made. A CD (Committee Draft) document will be shortly circulated by the IEC to the national committees that the Chair will forward to members and interested people to comment for the May meeting.

Single Session, for 20 people, and PC Projector;
Conflict Avoidance: None

**KTF20: Review and comment on C57.21 and C57.109**
**Chair: Jim Niemira**
**Vice Chair: none**
**Established: Jan, 2016**
**Expected Completion Date: May, 2016**

The Task Force met for the first time on Tuesday, January 12, 2016, in Memphis, TN, in single session chaired by Jim Niemira with a total of 7 attendees (7 members and no guests).
Meeting was brought to order at 8:02 AM. The IEEE patent slides were presented and reviewed.
The group discussed the Task Force 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] and C57.109 [IEEE Guide for Liquid-Immersed Transformers Through-Fault-Current Duration].
Both working groups for C57.21 and C57.109 seem to have just started their work on revising the equipment standards.
The group discussed anonymous comments that PSRC has already sent to the C57.109 Working Group. This group questions its purpose and whether there should instead be direct liaison between the K16 WG on Transformer Protection Guide and the Transformer WG on revision of Guide on Transformer Through-Fault duration. Most of the comments earlier sent to the transformer committee were straightforward requests for clarification but there was one significant issue of interpretation of the impedance to use for calculation of through-fault current for Class VI transformers: the maximum short circuit is limited by the system impedance plus transformer inherent impedance, but the graph in the C57.109 guide seems to neglect system impedance, implying that only transformer inherent impedance is to be used. If a formal interpretation is required from Transformers, what is the process and who should make the request?
Group decided to request copies of latest standards (equipment and protection guides) and review for conflicts between the equipment standards and the protection guides.
Group is requesting direction from K Subcommittee regarding review of C57.109 and C37.91 whether this should be done by PSRC WG K16 to avoid having two different groups working on the same standards.

Group questions when the C37.109-2006[R2012] Reactor Protection Guide is up for renewal. If there will be a WG formed soon, maybe it should part of their charge to work with the Transformer Committee directly.
Open Action Items are:
3)Jim Niemira to request copies of latest draft standards from WG chairs or IEEE-SA (C57.109 [Jason Varnell WG Secretary], C57.21 [Sanjib Som WG contact], C37.91 [Will English K16 WG chair], and C37.109 [request latest from IEEE SA]).
4)All members will review relevant sections of the standards.
5)Need guidance from K Subcommittee whether review of C57.109 and C37.91 should be by K16 WG.

Group will meet again in May to discuss review comments and whether there is any need to continue.
The following members were in attendance.

| Member | Company |
|---|---|
| Jim Niemira (Chair) | S&C Electric Co. |
| Paul Elkin | TRC Engineers |
| Hillman Ladner | Southern Company |
| J. Gosalia | Doble Engineering Co. |
| Bruce Pickett | ECF |
| Brian Boysen | WE-Engergies |
| Alla Deronja | American Transmission |

Brian Bosen moved to adjourn the meeting and Paul Elkin seconded.
The meeting adjourned at 9:07 AM
Single Session, room for 15, Computer Projection
Conflict Avoidance- none

**Liaison Reports:**

**T&D Committee, Capacitor Subcommittee**
**Pratap Mysore**
This group met at the JTCM. Key items of importance are: A new task force was formed to review the maximum discharge capability. A paper on GMD effects on shunt capacitors is under editorial review and will be submitted as a transaction paper. IEEE 1036, Application Guide for Shunt Capacitors is under revision.
**TX Committee**
**Fred Friend**
A brief discussion was held about applicable standards. The summary draft report from the TX committee is attached.

**IAS Arc Flash**
**Suparat Pavavicharn**
A report was not given at the subcommittee meeting but a summary of the IAS October 2015 Report- Arc Flash is attached.

**Old Business:**

No Old Business was discussed.

**New Business:**

Ratan Das motioned to expand the scope of K15 to include a Transactions Paper and a summary paper. After a second the Subcommittee voted unanimously for the motion.

The C37.112-1996 - IEEE Standard Inverse-Time Characteristic Equations for Overcurrent Relays, is due for revision. Gustavo Bruenello suggested coordination with IEC dual banner. Motion to form a task force was made by Mike Thompson, seconded by Gene Henneberg.
Further discussion was made from Charlie Henville regarding whether this belongs in K SC. Since the standard is on the K list, it is in the K scope at this time.
A vote was called and passed to form Task Force KTF21. Randy Crellin will be the Chairman and Mike Thompson to be Vice-Chair. Charlie Sufana will be sending information from the last reformation Randy. .

The IEEE-SA description of this standard: The inverse-time characteristics of overcurrent relays are defined in this standard. Operating equations and allowances are provided in the standard. The standard defines an integral equation for microprocessor relays that ensures coordination not only in the case of constant current input but for any current condition of varying magnitude. Electromechanical inverse-time overcurrent relay reset characteristics are defined in the event that designers of microprocessor based relays and computer relays want to match the reset characteristics of the electromechanical relays.

Single Session, room for 20, PC Projector
Conflict Avoidance: none noted

**General Discussion:**

No general discussion.

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