



**POWER SYSTEM RELAYING COMMITTEE
OF THE IEEE POWER and ENERGY SOCIETY
MINUTES OF THE MEETING
May 14, 2015
San Antonio, TX
Final Approved**

I. Call to order/ Introductions Mike McDonald

Chairman Mike McDonald called the meeting to order at 8:00 am

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

II. Approval of Minutes & Financial Report Pratap Mysore

Motion to approve Minutes of the January 2015 meeting in Garden Grove, CA was moved by Steve Conrad and seconded by Gene Henneberg and was approved unanimously.

The financial status of PSRC is in good standing.

III. Chairman's Report Mike McDonald

"We had a well-attended and very successful meeting in San Antonio. While the weather was warm and occasionally damp, the Hilton Palacio del Rio hotel and staff was excellent.

New Awards and Recognition Chair Hugo Monterrubio's enthusiasm has re-energized the group which is again very active. Mal Swanson has agreed to join in the effort as the vice-chair.

In recognition of his long term service to the PSRC including being the Chair in 1989-1990, AdCom has voted to award John Boyle Honorary Membership. We wish John well and hope he can find time to join us at future meetings.

Work is continuing on the framework for the new technical committee involving grid communications and cybersecurity. At the PES General Meeting in Denver there will be a Town Hall meeting where the PES will seek to create wide spread interest in the new Committee. As part of this process, the PSRC is evaluating our existing structure to see if any changes would be beneficial to make us an even better Committee. It is hoped that we will have some ideas ready by the September PSRC meeting.

There are two candidates running for an At Large position on the IEEE Standards Association Board of Governors: Chuck Adams and the PSRC's Phil Winston. The election will be in the August-October time frame. Everyone is encouraged to exercise your right to vote.

I look forward to seeing everyone at the September meeting in La Jolla, CA.

Best regards,
Mike"

IV. Reports of Interest

A. Report from the Vice- Chair – Pratap Mysore

a. Technical Paper Coordinator’s Report.

The 2015 PES General Meeting will be in Denver from July 27- July30, 2015.

The PSRC received 57 Conference papers and 11 transaction papers. 21 conference papers and all 11 transaction papers were accepted.

Thanks to all of those that reviewed papers.

b. Future Meetings

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

B. CIGRE B5 Activities Report – Rich Hunt

No information available.

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

C. IAS Power System Protection Committee - Suparat Pavavicharn

No information available.

D. IEC Report - Eric Udren

No information available.

E. Standard Coordinators Report – Adi Mulawarman

The status of standards activities that have taken place since the January 2015 meeting of the PSRC are as follows:

RevCom Activity: (revision)

Standards Approved

None_

Standards submitted for approval

| | |
|----------|-----------------------------------------------------------------------------------------------|
| PC37.234 | Guide for Application of Digital Line Current Differential Relays Using Digital Communication |
| PC37.110 | Guide for the Application of Current Transformers Used for Protective Relaying Purposes |
| PC37.235 | Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes |
| PC37.238 | Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications |

Standards due for 10 year review

None

Ballot Activity:

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

| | |
|----------|---------------------------------------------------------------|
| PC37.103 | Guide for Differential and Polarizing Relay Circuit Testing |
| PC37.113 | Guide for Protective Relay Applications to Transmission Lines |

PC37.238 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications

NesCom Activity: (new Standard)

PARS approved:

New or Modified PAR submitted; PAR Extensions (applied for); PARs Requested for Withdrawal; or PARs Administratively Withdrawn

P61850-9-3 Communication Networks and Systems for Power Utility
Automation -Part 9-3: Precision Time Protocol Profile for Power Utility
Automation

Ballot Activity

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

PARS expiring at the end of 2015

C37.232 Standard for Common Format for Naming Time Sequence Data Files (COMNAME)
C37.232 is published and the standard expires in 2021. The PAR to complete the project expired in 2015, but they finished early and there is currently no active PAR to revise the document.

PC57.13.3 Guide for Grounding of Instrument Transformer Secondary Circuits and Cases
C57.13.3 is published and the standard expires in 2024. The PAR to complete the project had an extension for 2015, but they finished early in 2014 and there is currently no active PAR to revise the document

C37.244 Guide for Phasor Data Concentrator Requirements for Power System Protection, Control, and Monitoring

C37.244 is published and the standard expires in 2023. The PAR to complete the project was set to expire in 2015, but they finished early in 2013 and there is currently no active PAR to revise the document.

PC37.113 Guide for Protective Relay Applications to Transmission Lines

PARS expiring at the end of 2016

PC37.103 Guide for Differential and Polarizing Relay Circuit Testing
PC37.119 Guide for Breaker Failure Protection of Power Circuit Breakers
Standard Requirements for Time Tags Created by Intelligent Electronic Devices -
COMTAG(TM)
PC37.237
PC37.241 Guide for Application of Optical Instrument Transformers for Protective Relaying
PC37.243 Guide for Application of Digital Line Current Differential Relays Using Digital Communication
PC37.245 Guide for the Application of Protective Relaying for Phase Shifting Transformers

PARS expiring at the end of 2017

P60255-118-1 Measuring relays and protection equipment - Part 118-1: Synchrophasor for power system - Measurements
PC37.116 Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks
PC37.238 Standard Profile for Use of IEEE 1588 Precision Time Protocol in Power System Applications
PC37.246 Guide for Protection Systems of Transmission to Generation Interconnections

| | |
|-----------|----------------------------------------------------------------------------|
| PC37.247 | Standard for Phasor Data Concentrators for Power Systems |
| PC37.248 | Guide for Common Format for Naming Intelligent Electronic Devices (COMDEV) |
| PC57.13.1 | Guide for Field Testing of Relaying Current Transformers |

PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:

| Submittal Deadline | Meeting Date |
|---------------------------|---------------------|
| April 24th, 2015 | June 5th, 2015 |
| October 16th, 2015 | October 16, 2015 |

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

Chair: C. Preuss
Vice Chair: Vacant
Secretary: Vacant

No information available.

G. NERC Report - Eric Allen

System Protection & Control Subcommittee (SPCS) Activities

- Power Plant and Transmission System Protection Coordination
 - Updating Technical Report – based on input from stakeholders and IEEE PSRC J3
 - Version 2 to be presented to NERC Planning Committee in June for approval
- Single Point of Failure (FERC Order 754)
 - NERC SPCS & SAMS reviewing the protection system single point of failure data for facilities 100 kV and above
 - Report on survey results to be presented to NERC Planning Committee in June for approval

Protection-Related Standards Activities

1. Standards Applicability for Dispersed Power Producing Resources
 - Distributed Generation (resources) – Generally connected at distribution level (covered by IEEE PSRC Standard 1547)
 - Dispersed Power Producing Resources – aggregated small-scale resource technologies such as: wind, solar, fuel cells, flywheels, geothermal, energy storage, & micro-turbines
- Standards modifications underway
 - PRC-005-5
 - PRC-001-1.1ii
 - PRC-019-2
 - PRC-024-2
 - VAR-002-4
2. Protection System Maintenance and Testing
 - PRC-005-3 – FERC approved under Order No. 803
 - Requirements 1, 2, and 5 become enforceable April 1, 2016
 - Reference document: SPCS report, Sudden Pressure Relays and Other Devices that Respond to Non-Electrical Quantities: SPCS Input for Standard Development in Response to FERC Order No. 758
 - NERC working with the IEEE PSRC I25 working group to develop guidance on protection system commissioning
 - PRC-005-4 – Version filed with FERC, NOPR pending
 - NOPR issued April 16, 2015 with directive to include to include supervisory devices for auto-reclosing
 - NOPR proposes to approve PRC-005-4 posted for a 60-day comment period

3. Protection System Misoperations
 - PRC-004-3 – Approved by NERC Board in November 2014
 - Additional changes made to included UVLS relays in the standard
 - Ballot ended April 27, 2015
4. System Protection Coordination
 - PRC-027-1 – Posted for formal comment period and ballot on April 1 through May 15, 2015
 - Replaces R3 and R4 from PRC-001 concerning coordination of protection systems
 - Added language on Dispersed Generation Resources
 - PRC-001-1.1ii – System Protection Coordination
 - Requirements 1, 2, 5, and 6 to be moved to other standards
 - Adding change in terminology for new definition of Remedial Action Schemes
5. Generator Relay Loadability
 - Projects completed
6. Coordination of Generator Voltage Regulator Controls with Unit Capabilities and Protection
 - PRC-019-1 – Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection
 - Added applicability to exempt on Dispersed Generation Resources
7. Generator Performance During Frequency and Voltage Excursions
 - PRC-024-1 – Generator Frequency and Voltage Protective Relay Settings
 - Added applicability to exempt on Dispersed Generation Resources
8. Disturbance Monitoring
 - PRC-002-2 – Disturbance Monitoring and Reporting Requirements
 - Filed with FERC December 15, 2014 – pending regulatory approval
9. Stable Power Swings (Phase III of Relay Loadability)
 - FERC directive in Order No. 733 – NERC establish a standard addressing protection system response to stable power swings
 - PRC-026-1 – Relay Performance During Stable Power Swings
 - Filed with FERC December 31, 2014
10. Special Protection Systems
 - Revise the definition of Special Protection System (SPS)/Remedial Action Scheme (RAS) and revise several SPS/RAS-related Reliability Standards
 - PRC-012-2 – Remedial Action Schemes
 - Posted for informal 21-day comment period through May 20
11. Undervoltage Load Shedding
 - Project to consolidate four existing standards into one – PRC-010-1, with a definition for Undervoltage Load Shedding (UVLS) Program
 - Clarifying language to coordinate with PRC-004
 - Posted along with PRC-004

Question to PSRC: How Long is Long?

- 2008-02-26 FRCC South Florida Disturbance – 1.7 sec
- 2006-03-29 NPCC IESO-NYISO St Lawrence Disturbance – 5 sec
- 2004-06-14 WECC APS West Wing Disturbance – 38.9 sec
- 2013-07-03 NPCC HQT James Bay – 4 min
- What was your longest fault?
 Send to: bob.cummings@nerc.net
 Subject – Longest Fault

V. **ADVISORY COMMITTEE REPORTS**

Chair: Mike McDonald
Vice Chair: Pratap Mysore

B1: Awards and Technical Paper Recognition

Chair: Hugo Monterrubio
Vice Chair: Solveig Ward

No information available.

B2: Fellows Awards

Chair: C. Henville

No information available.

B3, Membership Activity Report
Chair: M. Swanson

Assignment: Assist in searching for new attendees, Requesting support from attendees' employers.

Attendance during the San Antonio meeting was 220, which is considered a healthy number for us.

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

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

No Service Awards were presented.

B4: O & P Manual and WG Training

Chair: M.Sanders: O&P Manual:

Did not meet.

Chair: R Hunt: WG Training:

No information available.

B5: Bibliography and Publicity

Chair: T.S. Sidhu
Vice Chair: M. Nagpal

No information available.

B8: Long Range Planning

Chair: Bob Pettigrew

No information available.

B9: PSRC Web Site
Chair: Russ Patterson

No report.

VI. Items from the Main Committee meeting:

- A. There were no new Main Committee members announced
- B. There were no new Fellows announced
- C. Motions from SC chairs to the Main Committee
 - a. “Mr. Chair, the K subcommittee requests approval for transmittal of the IEEE Guide for Breaker Failure Protection of Power Circuit Breakers, C37.119-2015, 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” – this motion was made by Mike Thompson to the Main Committee, seconded by Rich Hunt, and was approved by the Main Committee.
 - b. “Mr. Chair, the H Subcommittee requests approval for transmittal of Revision of Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment, C37.94, 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.” – this motion was made by Eric Allen to the Main Committee, was seconded by Gene Henneberg, and was approved by the Main Committee.
 - c. “Mr. Chair, the H Subcommittee requests approval for transmittal of Precision Time Protocol Profile for Power Utility Automation, IEC/IEEE 61850-9-3, to the IEEE SA for balloting, contingent on PAR approval. Timing of this request is critical to align with the dual-logo process between IEEE and IEC.” – this motion was made by Eric Allen to the Main Committee, was seconded by Gene Henneberg, and was approved by the Main Committee.

VII. SUBCOMMITTEE REPORTS

C. SYSTEM PROTECTION SUBCOMMITTEE

Chair: J. O’Brien

Vice-Chair: G. Henneberg

Systems Protection Subcommittee Scope

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

Meeting Minutes

The Systems Protection Subcommittee of the PSRC met May 13 in San Antonio, TX in conjunction with the PSRC. The participants introduced themselves. A quorum was achieved and the January 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 Wednesday, May 20 to both himself and Gene Henneberg.

All WG chairs were reminded to not leave computer projectors unattended following WG or TF meetings. If another WG chair is not present to use the projector at the next session, please return it to the PSRC Secretary.

All WG chairs who are doing Standards work are reminded to provide the meeting agenda to WG members at least two weeks ahead of the meeting

Working Group Reports

The minutes of the Working Groups are attached.

The C17 Working Group did not meet and has completed its support activity for the Joint Working Group (with T&D and EM committees). C17 was disbanded.

CTF26 will remain as a Task Force for the September 2015 meeting, with work toward a PAR (C37.233).

CTF27 met and concluded to let the C37.117 Guide for Underfrequency Load shedding expire. This is the second TF to reach this conclusion. We will let the guide expire (2018).

New Business

Heather Malson proposed formation of a new Task Force to study common system and application testing instructions for PSRC tutorials, guides and reports. Two current examples are D29 and J5, which address out of step relay setting calculations for lines and generators respectively. These settings then need testing, but development of those tests is beyond the scopes of both D29 and J5 WGs. The TF is proposed to gauge interest in the subject of out of step testing methods and related calculations. If converted to a WG this proposed work would fill in a gap that is also briefly addressed in C37.233, but not in enough detail to provide sufficient guidance to test personnel. Heather will chair this new TF at the September meeting. There needs to be additional coordination with the I subcommittee to determine the proper assignment to “C” or “I” subcommittees. The TF will need room for 30 in a single session with a computer projector.

Michael Higginson proposed investigation of micro grid protection systems. These systems include small scale, often non-traditional generation which often has significantly different characteristics than synchronous generators. Michael will chair this CTF30, which will need a single session with room for 25 and a computer projector.

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

Detailed Minutes 5/13/15

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.

11 Members and 7 Guests attended

The draft document was reviewed for changes to remove imperative words such as “shall”, and “must”. Also reviewed were changes recommended by Jay Anderson to remove “unsubstantiated claims”. After a new draft is produced incorporating changes made, Paul Myrda will arrange to produce a “final” draft with consistent formatting.

This final draft will be circulated for ballot, first to the working group, then if approved to the subcommittee.

If necessary we request a room for 30 with projector for the next meeting.

C-17: Joint Working Group: Fault Current Contributions from Wind Plants

Transmission and Distribution Committee (T&DC): Reigh Walling, Chair
Electric Machinery Committee (EMC): Ron Harley, Chair

Established: 2008 Output: Report Completion date: 2013 Final Report

Joint WG Assignment: To characterize and quantify short circuit current contributions to faults from wind plants for the purposes of protective relaying and equipment rating, and to develop modeling and calculation guidelines for the same.

C-17 WG Assignment: To support the activities of the Joint Working Group on Fault Current Contributions from Wind Plants.

C17 did not meet during the May 2015 PSRC meeting.

Since the January meeting the report "Fault Current Contributions from Wind Plants" has been presented at the Texas A&M Relay Conference by Raphael Garcia and at the Georgia Tech Relay Conference by Russ Patterson. Marion Cooper had prepared the presentation for the Georgia Tech Relay Conference but was unable to present it due to an illness.

A tutorial based on the report will be presented on July 26 during the PES General Meeting in Denver.

The C17 working group has asked to be dissolved since the group has completed its assignment.

The next and most likely the final meeting of the Joint Working Group will be on July 28 during the PES General Meeting in Denver.

C18: 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 May 13, 2015, with 17 voting members, 1 corresponding member, and 17 guests present. Two guests joined the WG as members.

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 motions to approve four meeting minutes as follows.

- January 2015 meeting minutes: Motion: Jeff Barsch; Second: Abu Bapary; Vote: Approved.
- February 19, 2015 webcast meeting minutes: Motion: Yuan Liao; Second: Joe Uchiyama; Vote: Approved.
- April 16, 2015 webcast meeting minutes: Motion: Jerry Johnson; Second: Rich Young; Vote: Approved.
- April 30, 2015 webcast meeting minutes: Motion: Rich Young; Second: Nathan Gulczynski; Vote: Approved.

The WG chair then proposed having monthly webcast meetings, beginning on June 18, 2015, with a plan to schedule for third Thursday of each month, with the purpose to continue addressing the comments for clauses 5 and 6 received from the editing sub-teams.

The new reviewing assignments were made as follows.

The review sub-team for sub-clause 4.3:

Jerry Johnson [Lead] (geraldjohnson@basler.com)
Abu Bapary (asbapary@aep.com)

The review sub-team for Clause 7:

John Miller [Lead] (john.miller@gatrans.com)
Rene Midence (rmidence@erlphase.com)
Randy Cunico (r.w.cunico@ieee.org)
Dominic Fontana (fontadg@nu.com)
Joe Valenzuela (joseph.valenzuela@kiewit.com)

The WG reviewed Heather Malson's revision of 4.2.1.1.2 *Specific protection considerations to coordinate with generation facility*. Dean Miller expressed a concern that the loadability issue is not mentioned in Heather's addition and will revise/add in material concerning it.

The WG then reviewed a proposed revision of 4.2.1.2.2 to remove the Monitoring and Power Quality portion and agreed to remove it.

An updated definition of Point of Interconnection from the webcast meetings was reviewed and approved.

An addition to sub-clause on one-line diagrams was ruled to be duplicating the information provided in 4.2.1 and agreed to be removed.

A couple of the new topics were proposed to be addressed in the Guide. Rene' Midence will contribute to new sub-clause 6.4 *Sub-synchronous resonance* and Galina Antonova will write new sub-clause 7.10 *Synchrophasor applications*.

Action Items (including outstanding ones from the previous meetings):

1. **Mike Jensen** will propose a solution to his concern about performing a generator interconnection study to determine how much generation is needed in sub-clause 4.1.
2. **Mike Jensen** will update one of figures 3, 4, or 5 to include the 87B and 67N functions.
3. **Mike Jensen** will review the figures for consistency with existing IEEE standards to assure ANSI designations are used correctly and consistently.
4. **Mahendra Patel** will re-write paragraph ***Voltage and Reactive Power Requirements***, to clarify its need to address protection coordination with generation unit capability.
5. **Mike Jensen** will grammatically revise the proposed replacement in 4.2.2.1.1: Once the contract is in place, the selected point of interconnection is essential from a protective relaying standpoint, given that the fault and transmission system data is provided with respect to the specific location in the transmission system.
6. **Keith Hauser** will revise 4.2.1.1.3 (formerly, 4.2.1.1.3).
7. **Joe Valenzuela** will add a paragraph on high-voltage ride-through capability to sub-clause 4.2.2.2.1.
8. **Dean Miller** will revise/add in material concerning loadability in 4.2.1.2.2 on page 4, lines 10-16.
9. **Rene Midence** will write new sub-clause 6.4 *Sub-synchronous resonance*.

10. **Galina Antonova** will write new sub-clause 7.10 *Synchrophasor applications*.

11. **Alla Deronja** will post new draft (3.3) of the Guide on the Central Desktop by May 31, 2015.

The Review Teams are requested to consolidate their comments and the writing contributors to complete their work and submit comments/writing assignments to Chair (aderonja@atcllc.com) by August 15, 2015.

The writing contributors of the first 7 action items are requested to submit their contributions by July 1st, if possible, to review them at one of the webcast meetings.

Requirements for the next meeting: Wednesday 9:30 – 10:45 am single session, meeting room for 35 people with a computer projector.

C19: 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.

15 Attendees: 7 members, 5 corresponding members & 3 guests attended. The meeting roaster is attached.

- Patent/IP related IEEE slides were shown
 - New revised IEEE policy slides are to be used from the next meeting
- We had 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 WG started with the functions in the PDC Guide. The WG has taken the approach that the essential data transfer / validation type functions are to be included in the standard. Application dependent data processing functions and system / site dependent functions are to be excluded.
 - The WG expects the function description to be completed by end of June.
- Function Update: The status of some of the functions has undergone a change since the last meeting. These were described.
 - Data Latency Calculation – This function has been subsumed into the System monitoring function.
 - System monitoring – This function was originally named Performance monitoring, but has been changed thus, to indicate a more general function.
 - Data retransmission requests – This is intended to be an informative annex. No work has been done on this function as yet.
 - Duplicate data handling – This had been an independent function. It will be moved as a footnote in the time alignment section, since it seemed to be a minor function.
- Data forwarding
 - The WG had debated whether this should be a separate function, as requested by several users, or can it be achieved as a special case of one PMU output in the Time Alignment function
 - It was pointed out that the need is for data forwarding to be performed without requiring to open a different communication port due to limits imposed by Cyber security issues. The WG should take this into account into the standard.
- Cyber Security / Access Control
 - The WG had debated these and concluded that these are not synchrophasor specific functions, and therefore should not be required functions.
 - Similar concerns apply to environmental related requirements as well.
 - Requirements may vary based on location (distribution or transmission substation; or even if it is distribution substation but important substation, e.g. Military or Hospital supply) or communication configuration

- It was decided to add a separate section for user to make aware of such function and decide based on the project necessities. A section for “User to Specify” and it may include items such as: Environmental and Access control.
- System level requirements are part of Cyber security; however, PDC “device or box” level requirements can be limited to Access control
- Not only PDC “box” access should be controlled, but also Synchrophasor “Data” access should be controlled too. Meaning the access control of the data streams from the PDC. This is due to the fact that only authorized synchrophasor client/subscriber should be able to connect to the secured network.
- IEEE/IEC standard can be referred in this PDC standard, e.g. IEEE C37.240 and IEC 6235. However, it was suggested to not include any regional regulatory documents, e.g. NERC CIP, due to the fact that they may revise/change fast and may differ regionally.
- Communication / Configuration Merge
 - We need to differentiate two types of configuration: 1) PDC device/function settings, e.g. Wait time, number of PMUs per aggregated stream, etc.; 2) configuration frame exchange/communication, e.g. CFG-2
 - The configuration frame exchange between PMU and PDC can be merged into the communication section, however, there should be a separate section under each relevant function for the setting/configuration of a function
 - For example under Time Alignment function, add sub-section on “Configuration”, and specify Wait time, number of PMUs per aggregated stream, etc. related settings.
 - The communication function to include how CRC checks would be performed on “Encrypted data frames”
- Monitoring
 - It was clarified that this function includes “PDC System Monitoring”
 - Syslog
 - Setting/config change logs can be part of above proposed “Configuration” subsection under a PDC function
 - Access logs are part of cyber security (system level) and it should be under a new section on “User to Specify”
 - Data attributes change log (e.g. STAT bit change by PDC to be logged) should be eliminated as it can generate too many logs and fill the entire log memory, besides it should not be mandatory as basic PDC requirements
 - Latency
 - Chart/graph to plot pattern of latency over the time may be very useful for the user. However, it is question whether this should be part of basic requirements for a PDC

C20: Impact of VSC HVdc Transmission on AC Protective Relaying

WG Chair: Joe Mooney

Vice Chair: Ian Tualla

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 35 attendees; 9 members and 26 guests.

Since there were so many guests, the WG chair discussed the background and purpose of WG group. WG chair discussed presentation by Dr. Brian Johnson during the Milwaukee meeting. The WG reviewed and discussed writing contributions on Reasons for Using HVDC, Converter Technology and AC System Protection. A guest, who will become a member, discussed developing a short circuit model for VSC HVdc systems that is nearly complete. This material will be included in the report in the AC System Protection section.

Report Outline

1. Introduction to HVdc Technology
2. Reasons for Using HVdc
3. VSC Description/Technology

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

Next meeting: one session, 40 attendees, computer projector.

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, May 12, 2015 in San Antonio, Texas in a single session chaired by Yi Hu and Gene Henneberg with 13 members and 3 guests attending. The meeting was started by introductions and display IEEE Patent Policy slides to inform all attendees and the WG of any known potential patent issues (none were identified).

The January 2015 meeting minutes were not reviewed due to lack of a quorum. WG Chair Yi Hu reviewed the requirements for maintaining WG membership according to “IEEE Standards Association (IEEE-SA) Baseline Policies and Procedures for Power System Relaying Committee Standards Working Groups – Individual Method.” The WG chair may still use his/her judgement regarding individuals who have not attended or contributed to WG activities. Potentially acceptable reasons for not attending WG meetings may be scheduling conflicts with other PSRC WGs; individuals with such conflicts should discuss these instances with the WG chair or vice-chair in advance.

The most recent draft 0.7 was distributed via email to WG members last week. Several comments have been added by Yi and Gene, with some additional editing by Gene. It was noted that the section authors have tended to use different terms for the same functions; a Glossary is proposed to acknowledge the various terms, but a single term will be used within the Guide.

Yi reviewed the present draft for sections which still need authors, resulting in the following volunteers for several sections, which completes the sign-up of remaining sections that were not assigned:

- 5.2.1 – Dean Miller, Mahendra Patel
- 5.2.2 – Manish Patel, Phil Beaumont
- 6.2.1, 6.2.2, 6.2.3 – Fernando Calero
- 6.2.4 – Heather Malson

Yi led a discussion of the limits on the types of SIPS included in the Guide. Part of the original Scope discussion was to use multi-site communication as flag for this Guide. This may not be quite desirable, since it may steer the discussion more toward communication requirements, to the exclusion of more general factors. The general principles of the SIPS are more important than specific scheme type. The contents of the present section 4.3 SIPS Covered in this Guide will be moved to Scope in section 1.1. The SIPS types listed in 4.2 (from the 2009 PSRC SIPS survey) are stated primarily as types of SIPS actions, which does not seem to be the right method to distinguish covered schemes. SIPS which the WG intends to exclude from coverage by this Guide are primarily distributed, locally controlled schemes

that take local action such as UFLS, UVLS, out of step relaying, and shunt device switching for local voltage control. It was concluded that criteria for exclusion should be clearly stated and the scope description should be up-front so readers will have a clear understanding of what this guide covers. WG Chairs will revise the current section 1.2 "Scope" based on the above discussion and conclusion.

WG members are asked to provide input regarding any prior IEEE standard and report work that they are aware of, such as published standards/guides/recommended practices, which may need to be excluded from the scope of this guide but provide a proper reference.

All WG members are asked to look into the coordination aspect of SIPS with protective relays and among SIPS, and send in your thoughts to WG Chair and Vice Chair for discussion at the next meeting.

WG Chairs will send the May 2015 meeting minutes to WG members for electronic approval. The updated draft 0.08 will be sent to WG members and corresponding members for adding comments / contributions.

Requirements for September meeting in San Diego, CA – Room for 30 people, double session, projector.

C23: Coordination of Synchrophasor Related Activities

San Antonio, TX, May 12, 2015

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

Vice Chair: Allen Goldstein

Established: 2013

Assignment:

The ongoing task force will provide three main functions:

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

Meeting Agenda

1. Introductions
2. Approved of the January 2015 meeting minutes
 - a. Approval of Jan 2015 minutes: Motion to approve: Allen Goldstein Second: Jim O'Brian Approved unanimously.
3. NASPI Update
 - a. Short review of March 23-25 in Burlingame CA
4. IEEE Workgroup Activity

| | Title | Status |
|-----------------|----------------------------------------------------------------|-------------|
| PSRC C19 | Standard for Phasor Data Concentrators (PDC) for Power Systems | In Progress |

| | | |
|-----------------------|---------------------------------------------------------------------------|-------------|
| PSRC CTF28 | Guide for Synchronization, Calibration, Testing and Installation for PMUs | In Progress |
| PSRC H11 | Revision of C37.118 Synchrophasor Standard Joint with IEC | 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 | Deferred |

5. Discussion on Assurance of Protective Functions in a relay-based phasor monitoring unit
 - a. Request from NASPI: Discussion of Protective Functions in a relay-based PMU. How should a relay be tested to ensure that the Relay function is not compromised by the PMU function? What about other functions such as event recording, fault location, etc? What about changing settings for anything that is non-protective (PMU or otherwise)? Discussion of C23's duty to elevate this to the subcommittee C and / or I to bring this up. We shall bring it up in C and/or I sub.
6. Discussion on Revision of C37.118.2 Imitated by Status word enhancements
 - a. Discussion of revision of C31.118.2 limitations of Status word. Vasudev: we are working on PDC standards and some items will be coming out of that WG that also may recommend revising the .2 standard. Some discussion about why we did not make these changes in 2011. C21 discussions earlier today implied changes to .2. This would be brought to H subcommittee if the committee agrees. PDC standard is planning to create a list of needs next month. Alternative, if we know that .2 will be revised then we could work closely with C19 PDC standard work and H21 Standard Mapping to make sure a good, concise list of potential revisions can be brought to H subcommittee in September.
7. Other updates
 - a. NASPI has published a Guide of PMUs in multifunction devices. Choose not to pursue IEEE Industry connections
8. Future work
 - a. Grid Protection Alliance developed another protocol for gateway communication doing signal-level communications.
9. Adjourn

Requirements for next meeting: Single Session, Meeting room for 30 people with a computer projector. 12 Members and 8 Guests

C24: 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.

Agenda

1. Introductions
2. Approval of minutes of the January 2015 meeting.
3. Based on the presentations made in the January 2015 meeting, discuss the course of action.
4. Adjourn

The WG met on Tuesday, May 12, 2015, 3:00 – 4:15 pm. The meeting started with introductions and then the January 2015 minutes were approved. The meeting continued with discussions to identify course of actions related to the objective of the WG which is the modeling of wind turbine generators (WTG) in commercial fault calculation programs. The following were discussed:

- The short circuit response of inverter connected wind turbines differs from the typical response of synchronous generators. It highly depends on the inverter and WTG controls.
- It was decided to contact WTG manufacturers and inquire for data that will be useful for the WTG short-circuit model development.
- The group started drafting a document with specific data that will be requested by the manufacturers for modeling WTG Type IV. The manufacturers will be asked to provide data for different control schemes of the WTG, different time frames and different WTG sizes.
- For WTG Type III modeling it was discussed that machine data will be also needed. Evangelos Farantatos (EPRI) and Sherman Chan (ASPEN) will coordinate to propose data to be requested by the manufacturers by the next meeting in September.
- It will be emphasized to the manufacturers that the goal of the WG is to develop generic models.
- The need for model validation was also discussed. Fault response data will be needed for the validation.
- The accuracy of modeling a wind park as an aggregate WTG was discussed.
- Several participants in the WG volunteered to help with establishing contacts with manufacturers for the data inquiries.
 - Mansour Jalali (Kinectrics) and Amin Zamani (Kinectrics) - Siemens
 - Manish Patel (Southern Company) - SMA
 - Sherman Chan (ASPEN) - ABB

For the next meeting in September 2015, we need a room with capacity of 30, and a computer projector. Please avoid conflict with WG C25.

C25: Protection of Wind Electric Plants_

Chair: Martin Best

Vice Chair: Keith Houser

Established: 2014

Completion: TBD

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 San Antonio, TX on May 13, 2015 with 10 members and 13 guests. The vice-chair conducted the meeting. One guest (Juan Gers) has requested membership to the Working Group. Quorum was achieved; though not necessarily required.

An overview of the current outline was presented and reviewed.

After introductions, the WG approved the C25 Meeting Minutes from the January 2015 meeting in Garden Grove, CA.

The WG reviewed the outline in more detail and added a few notes for reference when writing assignments are undertaken. The WG made the following updates/revisions: 2.c. was updated to Fault Currents [equipment ratings]; 2.g. was updated to Harmonics and Sub-harmonics; and 3.a.iv. Removal of WTGs and Static VAR Devices from collector feeders under fault was added to the outline.

In general there were several good discussions about what was considered in this work and what might be added for clarification of the plant coordination with: the interconnection facilities, WTG units (not covered but expectations of WTGs in order to coordinate with the collector/substation systems), etc.

The next step for the C25 WG is to begin writing assignments. To that end, the following assignments of Outline sections have been 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
 - i. Overcurrent Protection and Coordination with WTG transformer protective devices
 - 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
 - c. Bus Protection
 - d. Main Transformer Protection
 - i. Transformer differential protection
 - ii. Overcurrent Protection and Coordination with Collector Feeders
 - e. Capacitor and Harmonic Filter Protection
 - i. Voltage protection
 - ii. Overcurrent protection
 - iii. Harmonic current and voltage considerations for protection scheme operation
 - 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

We expect the remainder of the unassigned outline sections of the report will be discussed and assigned for writing during the September meeting in La Jolla, CA. The updated draft outline (with writing assignments) will be circulated among WG members to assist with the completion and submission of writing assignments by August 31, 2015.

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

Submitted 5-13-15,

Raluca Lascu and Keith Houser

CTF26: Revision of C37.233, IEEE Guide for Power System Protection Testing

Chair: Gene Henneberg
Established: January 2015
Completion: TBD
Assignment: TBD

The CTF26 Task force met in San Antonio, TX on Tuesday, May 12. This was the second TF meeting and attended by 8 people who were interested in being members plus 18 guests. One of these guests signed up as a member after the meeting

After introductions, Gene Henneberg took notes.

The existing C237.233, IEEE Guide for Power System Protection Testing was approved in 2009. It will be withdrawn unless revised (as needed) and approved through the normal IEEE standards process prior to the end of 2019. If necessary a PAR can be extended. But if the Guide has not been approved by the expiration date, it would be withdrawn pending completion of the scope of the PAR.

The purpose of the CTF 26 is to explore the interest in carrying a re-ballot or revision of the Guide through the development and approval process. With sufficient interest, the Task force would be converted to a Working Group to accomplish this task.

C37.233 SCOPE

This guide covers suggested test requirements for power system protection scheme testing, system application tests, the scope and level of tests based on the application, and benefits of the overall protective schemes testing. This guide encompasses overall system testing procedures (generators, line, line reactors, transformer, capacitors, special protection schemes, end-to-end testing, distributed application within substation, etc.) and data collection requirements, as well as the test procedure definitions. This guide describes the methods, extent, and types of system tests for protection applications at various voltage levels. Control functions inherent to the protective systems are included. Importance of line testing, indirect trip applications, open/closed-loop tests, and dynamic/nonlinear tests are also covered.

It was noted that the Guide's intent was to provide an overview of protection scheme testing, rather than a detailed manual of how to perform testing for individual relays or functions.

At the first TF meeting several people volunteered to review parts of the Guide and provide a review at this meeting.

Phil Winston noted that the Introduction / Overview read more like an executive summary. The general flow could have been smoother. Lots of testing details were provided early before discussing specific schemes.

Gordie Halt was not able to attend, but provided written comments, summarized by Gene Henneberg. Several schemes had good descriptions, but not much on testing those schemes, a couple of sections

seemed to be slanted toward a particular testing software. Overall, the guide seemed most useful to people new to the field.

Sunghoo Kim summarized his comments on section 6.5-6.10. A specific test interval was recommended for generator relays; this may be better left to individual company policies or regulatory requirements.

Kevin Donohoe thought section 9 was generally fairly well done, though often not much detail was provided.

An observation was made that the Guide had little to say about commissioning testing. The FERC has shown a significant interest in this subject. The present I-15 WG is developing a report on this subject.

The thought was expressed that the intent of the Guide should be to describe something like best practices rather than an outline for compliance with specific regulations.

A show of hands indicated about 12 people interested in forming a WG to revise C37.233. The first order of business will be to select a chair and vice chair, and develop a PAR at the September meeting in San Diego, CA.

Afterward: The C Subcommittee concluded that additional work by the TF toward developing a draft PAR was desirable before converting to a WG. The TF will meet again at the September meeting in San Diego, CA.

The task force will need a room for 30 with a computer projector.

CTF27: Status of C37.117 Guide for Abnormal Frequency Load Shedding

TF Chair: Joe Mooney

Vice Chair: NA

Output: NA

Expected Completion Date: NA

The task force met with 12 attendees.

After introductions Joe Mooney provided some background the status of C37.117. The guide expires in 2018. This Task Force is to determine what action to take concerning the future of the guide.

The Task Force met at the last PSRC meeting and proposed reviewing the guide to determine if the content was worth converting to an Industry Connections report. Joe Mooney, Jack Wilson, and Matt Black recommended that although the guide has some good material, much of it is dated and updating the guide would require a significant amount of work.

The attendees discussed the options open to them and decided that the guide should not be revised and to let it expire in 2018. Note that this is the same recommendation submitted by a previous Task Force on this topic.

| Attendees | | |
|------------------|----------------------|----------------------------------------------------------------------------------------|
| Name | Company | Email |
| Joe Mooney | POWER Engineers, Inc | joe.mooney@powereng.com |
| Rich Hunt | GE | Rich.hunt@ieee.org |
| Jim O'Brien | Duke Energy | Jim.o'brien@duke-energy.com |
| Shalini Bhat | We Energies | Shalini.bhat@we-energies.com |
| Matt Black | Sargent & Lundy | Matthew.l.black@sargentlundy.com |
| Jack Jester | Delaware Electric | jjester@decoop.com |
| Randy Hamilton | Basler Electric | randyhamilton@basler.com |
| John R. Boyle | PSA | Boyle114@comcast.net |

| | | |
|----------------|----------------------|--------------------------------------------------------------------------------|
| Caitlin Martin | BPA | cjmartin@bpa.gov |
| Addis Kifle | GA Transmission Corp | Addis.kifle@gatrans.com |
| Iliia Voloh | GE | Iliia.voloh@ge.com |
| Brian Boysen | WE Energies | Brian.boysen@we-energies.com |

CTF28 for the status of C37.242 Guide to the Synchronization, Calibration, Installation and Testing of PMUs

TF Chair: Alan Goldstein
Established: May 2015
Completion: TBD
Assignment: TBD

First meeting 9:30 am on May 12, 2015: 28 attendees, 16 members, 12 guests.

Introductions

Patent slides

Task force introduction: Why are we reviewing this Guide so soon:

- Guide first published 6 March 2013. Since then, IEEE Std. C37.118.1a-2014 changed the synchrophasor standard. NASPI published a report on testing and certification in October of 2013, IEEE SA published the Synchrophasor Measurement Test Suite Specification (TSS) in 2015.
- The TSS is in direct conflict with the test plans in section 7.5.
- Additional lessons learned about PMU Synchronization, Calibration, Testing, and Installation since the Guide was completed in 2012.

What are our options:

- Do nothing (disband this task force)
- Full revision of the Guide (requires a PAR)
- Corrigenda (requires a PAR) (a separate document from the Guide which would need to be found and purchased separately)
- Errata to the Guide (also requires a PAR)

Discussion of these three options: Corrigenda and Errata would be finished much more quickly. There is some disagreement about the urgency of the changes. It is generally agreed that people doing official testing will be aware of the standard amendment and the TSS however there is some antidotal information about university students who are not aware of and may not have access to the other documents. On the other hand, we may want to open the document for full revision because there may be other sections that will benefit from new understanding of PMUs. Full revision opens the entire document to comment, which may take additional time in ballot resolution but may result in a better document overall.

A straw poll of attendees (including guests) showed 3 for no-change, 6 for corrigenda or errata, and 12 for full revision.

Discussion for the options for the section on testing:

- Remove section 7.5 entirely and replace it with a reference to the TSS
- Revise 7.5 to match the TSS (not recommended due to possibility of divergence). TF agrees this should not be done.
- Addition of more information taken from the NASPI guide and other experiences and sources.

Discussion of options for other sections.

- no changes.
- take advantage of lessons learned and other new NASPI reports on synchronization and installation of PMUs.

Members want to do more study of the existing Guide. However some TF members do not own a copy. Question arose if a TF is allowed to distribute documents to TF members or only to WG members.

Possible next steps:

- Form a working group
- Remain a TF and study the options further.
- Disband and do nothing.

A motion was made (Tony Johnson) and seconded to propose the formation of a Working Group with the assignment to develop an appropriate PAR to change the Guide.

Discussion included consideration of timeline, some further discussion of doing nothing, whether it is appropriate to form a WG if we are not yet certain if we want to do a full revision, errata or corrigenda. Also, the impact if not able to distribute the document to members of a TF.

Vote was held: out of 16 members, 12 voted for forming a WG, 1 against and 3 abstentions.

CTF28 proposes to C subcommittee to form a working group for the purpose of developing an appropriate PAR to change C37.242 Guide for Synchronization, Calibration, Testing, and Installation of PMUs.

Request single session, room for 30, and a projector, please do not conflict with other PMU related sessions.

- (Afterword) At the C subcommittee meeting, we were asked not to form a WG but remain a TF until we have a PAR. We will be given a copy of the Guide with the appropriate disclaimers to be distributed to Task Force Members.

D: LINE PROTECTION SUBCOMMITTEE

Chair: G.L. Kobet

Vice Chair: K.V. Zimmerman

The Subcommittee meeting was called to order on Wednesday, May 13, 2015 at 3:00 p.m. with 28 members and 29 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (28 out of 44 members present).

Minutes from the January 2015 meeting in Garden Grove CA were approved.

The Chair reviewed items of interest from the Advisory Committee.

Working groups gave reports on their activity.

Reports from the WG Chairs:

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

Co-Chairs: Rick Taylor and Don Lukach

Vice Chair: Jeff Barsch

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 7.3.1)

The D19 working group met in a single session on Tuesday, May 12, with 15 of 20 (75%) balloting members present. Also in attendance were 3 corresponding members and 23 guests.

A motion was made by Mike Thompson to approve the January 2015 meeting minutes. Joe Mooney seconded the motion. The minutes were approved by the working group.

A motion was made by Joe Mooney to approve the WebEx meeting minutes from January 28, February 11, March 4, and March 18, 2015. Phil Tatro seconded the motion. The minutes were approved by the working group.

The IEEE SA patent slides were reviewed.

All of the ballot comments have been either incorporated into Draft 7.3.1 to the extent possible, or were rejected, with most of the more critical comments discussed with the balloters. Some of the revisions to the guide were reviewed in the meeting. The following is a list of items that were discussed and resultant action items for WG members.

- Many of the definitions (Clause 3.1) have been revised or restored to their dictionary definitions based upon work in the WebEx meetings.
- Mike Thompson is to review the echo logic clauses (6.2.4.7 and 6.2.5) to verify that the echo logic revisions are correct. Mike will evaluate if clause 6.2.5 should be renumbered to 6.2.4.8 and if 6.2.6 should be renumbered to 6.2.4.9. If these clauses are renumbered, then clause 6.2.7 will also need to be renumbered.
- In the first paragraph of Clause 4.7.6, the WG agreed to remove the following sentence because it is incorrect: "These systems also have the advantage that they are not required to be set for a specific reach."
- In Clause 5.4.5, the formula was changed per a ballot comment. It was also changed in Table 4. Phil Tatro will do a peer check on this calculation change to verify it is correct.
- It was noted that drafts of other guides can be referred to in this guide. However, a copy of the draft must be provided to the IEEE SA during balloting so that it is available to a balloter if requested. The line current differential guide referred to in Clause 6.2.1 and the transformer guide referred to in Clauses 5.8.5 and 5.8.6 are examples of references to draft guides.
- Jeff Barsch will review Annex A to ensure that recent revisions were properly transposed to this latest draft.
- Mike Thompson will review Clause 6.6.1.1 to see if his comment i-215 has been adequately addressed.
- It was noted that Clause 6.4.5 was moved to Clause 5.12.
- Many of the figures in the document have been redrawn by John Miller to make them more clear and legible. The figures were reviewed during the meeting, and John will make some corrections based upon comments received. In addition, Jim O'Brien and Alexis Mezco will perform a peer review of the figures that John has drawn. It was discussed that what is presently shown as Figure 60 should be removed. In other figures where polarities are shown on CT's, the polarity markings should be removed. Also, CT connections will be shown connected to the ends of the CT's as opposed to the middle of the CT's.

Webinars will be set up to continue discussion of ballot comments on the following Wednesdays at 10AM CDT: May 27, June 10, and June 24, 2015.

The goal is to have a draft approved by the WG by July 1, 2015 so that it can be recirculated for ballot by late July to early August 2015.

The status of Rick Taylor attending subsequent PSRC meetings is doubtful. Thus, the current vice chair will move into a co-chairman status and Jeff Barsch will assume the role of the vice- chairman.

D27: Guide for the Application of Digital Line Current Differential Protective Relays Using Digital Communications PC37.243

Chair: Solveig Ward

Vice Chair: Bruce Mackie

Established: September 2010

Output: IEEE Guide PC37.243

Assignment: Write a “Guide for Line Current Differential Protective Relay Applications” to present practical line current differential schemes including operating principles, synchronization methods, channel requirements, current transformer requirements and external time reference requirements; provide specific guidelines for various application aspects including multi-terminal lines, line charging current, in-zone transformers and reactors, single-pole tripping and reclosing as well as channel and external time sources requirements; include backup considerations, testing considerations and troubleshooting.

Scope: This guide presents practical line current differential schemes using digital communication. Operating principles, synchronization methods, channel requirements, current transformer requirements, external time reference requirements, backup considerations, testing considerations and troubleshooting are included. It also provides specific guidelines for various application aspects including multi-terminal lines, series compensated lines, mutual coupled lines, line charging current, in-zone transformers and reactors, single-pole tripping and reclosing, as well as, channel and external time source requirements.

Par expiration date: Dec 31, 2016

Draft: 4.2

WG D27 met on Wednesday, May 13, 2015 at 11:00am CDT in a single session with 7 voting members and 14 guests. A quorum was not achieved so the past minutes will be approved via email. The September meeting and October webinar minutes were approved via email.

After introductions, the patent slides were shown and reviewed. The minutes for the January meeting will be sent to members via email for approval.

The scope of the PAR was reviewed.

The status of the document was discussed. The recirculation produced no additional comments so the document is complete.

The remainder of the meeting discussed the process to publicize the document. A task force will be requested at the sub-committee meeting to produce a summary document to be used at relay conferences. Bruce Mackie has agreed to be the chair of the working group. At the meeting, Phil Beaumont, Roy Moxley, and Nef Torres volunteered to be a part of the task force.

Gary Kobet discussed IEC and their plans to create a standard on line current differential relay. He stated a task force will probably be created to produce comments regarding the standard.

Due to the completion of the guide, the working group is requesting to be disbanded.

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 met in San Antonio, TX on Tuesday, May 12th 2015, 1:30 pm CDT.

There were 18 members and 8 guests. The attendance list is attached.

The patent slides were presented.

The working group minutes from the January meeting were presented and approved.

The working group reviewed the comments submitted by the review teams for section 6.3, 7.1, and 7.2. Discussion on 7.1 will be resumed at the next meeting after the working group members have had a chance to review the changes.

Assignments:

Assignments were made to add or revise the following sections:

- Claire Patti will address the use of pulseclosing and pulsefinding throughout the document per the guidance provided by Mike Meisinger.
- Ratan Das will provide section on sensors, focusing on RPDs.
- Hugo Monterrubio will revise figures 6-4, 6-5, and 6-6 per Joe's comments.
- Joe Mooney will revise section 6.3.3 to address his comments and the need for the resistor.
- Don Lukach will finalize and send the group comments on section 7.1 to the chair.
- Shalini Bhat and Bruce Mackie will review and revise 7.4.
- Ratan Das will review and revise 7.5.
- Juan Joe Xavier will review and revise 7.6 and 7.7.
- Joe Mooney will review and determine need for 7.8. May combine with fuse saving discussion in section 6.
- David Aldrich will provide a new section on sequence coordination.

All assignments are due July 1st. Word format is preferred.

WebEx:

July 15, 11:00 am EDT. Claire will send out email invitation next week.

Old Business:

Mike Meisinger recommended adding a section on intentional miscoordination. It is suggested that it be included in section 7. This section will be assigned at a later date.

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

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

26 Total with 17 Members and 9 Guests,

Review of outline and assignments

Added missing assignments, added out of step tripping swing center voltage to section 6 and Siemens Z-based, will we reference PRC 026?

Discussion

Demetrious – model system has some time constant issues. He does not have the most up to date model yet.

Everyone that is a member will have an assignment. Volunteer or Normann will assign something. Everyone should receive the outline. If not, get in touch with Normann.

Major discussion over the need for a smaller system and testing of settings. This document will not be addressing except, perhaps, to indicate the need to test settings and preferred method(s). Suggestions

made about another WG created to create a system for testing to benefit D29 and J5 for system testing of settings as a discussion piece.

Tasks

Heather

Look for someone will PSLF access with people to add to the system models for future distributions to universities for students.

Find out about ABB and GE zero setting schemes – email sent to Roger Hedding and VM left for Terrance Smith @ GE. Roger replied and said there was not a zero setting capability available.

Kevin

check on referencing PRC 026

Normann

Request updated model from Kevin to send out to group

Add the reference to C37.233 – for testing and COMTRADE

Will need a simpler two bus/line/generator system – Maybe a new WG?

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 San Antonio on May 12, 2015 with 18 members and 20 guests. Several new members joined the working group: Luis Polanco, Heather Malson, Roy Moxley, Nathan Gulcynski, Alex Lee, Christopher Walker, Alexis Mezco, Vijay Shanmugasundaram, Claudine Pascal and Zhiying Zhang.

After introductions, the WG Chair reviewed the minutes, and restated the working group assignment. The purpose of this meeting was to develop an outline and to begin the process of writing the tutorial.

The Chair presented a preliminary outline for the working group to discuss. After some deliberation, the WG adopted a version of the outline and several members accepted writing assignments. Two authors were assigned to most of the sections.

As a process for developing the best tutorial, the authors will present their sections to the Working Group at future WG meetings. This will give an opportunity to teach and learn from the other members during the process of creating the tutorial. The Chair gave a short presentation on setting ground distance elements on lines with zero-sequence mutual coupling.

Rene Midence offered to send the Chair an IEEE template for tutorials, which we will distribute to the WG members. Assignments are due September 1, and we hope to have two to three sections presented at the next WG meeting.

DTF31: Determine if summary presentation and/or presentation is needed for the C37.114 Fault Locating Guide

TF Chair: Joe Mooney

Vice Chair: NA

Output: NA

Expected Completion Date: NA

The task force met with 18 attendees.

After introductions, the TF Chair explained that the purpose of this Task Force is to determine of a

summary paper and/or presentation should be developed from the material added on the latest revise to the guide. The TF Chair provided information to the TF on what changes had been made on the latest revision. Much of the material that was added was derived from previously published material. In addition, there is a large amount of material published on the topic of fault locating. Given that, the chair recommended that a summary paper not be published. The chair also recommended that a presentation would be a good refresher for many that do not routinely work in the fault location area and it would also highlight the new additions.

After some discussion the TF attendees agrees that a summary paper is not needed but a presentation would be good for delivery at a PSCR Main Committee meeting and for posting on the PSRC website. Of the 18 attendees, 12 expressed interest in developing the presentation. The TF will seek approval at the D Subcommittee meeting to create a work group for development of the presentation on the C37.114 Fault Location Guide latest revision.

Coordination Reports

None

T&D Committee / Distribution Subcommittee

The T&D Committee / Distribution Subcommittee next meeting will occur during the PES General Meeting in Denver, CO, 26-30 July 2015.

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.

The 'Smart Distribution Systems' tutorial (1/2 day version working with the IEEE PES IGCC) is to be performed on Tuesday, February 17, 2015 at the ISGT meeting in Washington, DC. A panel session on 'Smart Distribution Applications', Chaired by Shay Bahramirad is also planned for the ISGT meeting on February 18, 2015.

The '*Smart Distribution Systems*' tutorial (Full day, 8-hour course) is to be performed on Sunday, July 26, 2015 at the GM in Denver, CO. The tutorial is an update of the 2010-11 presentations of the SDS Tutorial.

The Smart Distribution Working group is sponsoring 3 invited panel sessions at the 2015 GM in Denver, CO. The 3 panel topics are '*Role of DERMS/DMS in managing Distributed Energy Resources (DERs)*', Chair: Bob Uluski; '*Volt/VAR Control in the Era of the Smart Grid*', Chair: Le Xu; and '*Protection design for Smart Distribution*', Chair: Nouredine Hadjsaid and Georges Simard.

Volt-VAR Control Task Force

Work continues on P1885 'Guide for Assessing, Measuring and Verifying Volt-Var Control Optimization (VVO) on Distribution Systems'. There is a desire and/or need to add more VVO topics. Content volunteers are needed. The Measurement & Verification section has not been written and needs an author.

A tutorial on Distribution Volt-Var Control and Optimization is planned for the 2015 GM in Denver. The tutorial will cover basic principles, approaches, challenges, results as well as case studies from GA Power, BC Hydro, and Duke Energy.

Distribution Management System (DMS) Task Force
Continued discussion regarding DMS issues and the output for the Task Force.

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.

The Switching and Overcurrent Protection Working Group is sponsoring a panel session in collaboration with the Reliability Working Group at the 2015 GM in Denver, CO on the topic of '*Placement of Automated Distribution Protective and Switching Devices for Reliability*'.

Working Group on Voltages at Publicly and Privately Accessible Locations
<http://grouper.ieee.org/groups/td/dist/stray/>
Chuck DeNardo, Chair Jim Bouford, Vice Chair Scott Kruse, Secretary

P1695, "Guide to Understanding, Diagnosing and Mitigating Stray and Contact Voltage" is being balloting.

Old Business

No old business to discuss.

New Business

The Subcommittee discussed and agreed to create Task Force DTF32, with Bruce Mackie as Chair, to create a summary paper and presentation for the just completed C37.243, "**Guide for Line Current Differential Protective Relay Applications**".

Also, CIGRE Working Group TOR-JWG C4_B5.41_Challenges with series compensation application in power systems when overcompensating lines, has requested coordination with the PSRC. The Subcommittee agreed to form Task Force DTF33 to review and provide input to CIGRE on this activity. Luis Polanco will Chair the task Force.

Murty Yalla, who is now the Chair of IEC Technical Committee TC95, asked the Subcommittee to create a Working Group to coordinate activities with an IEC Maintenance Team MT-4, which is creating a functional standard for line current differential protection, IEC 60255-187-3. The Subcommittee agreed to form a Working Group, D34, with Normann Fischer as the Chair.

General Discussion

None

Line Protection operations of interest

The meeting was adjourned at 4:30 p.m.

H: RELAYING COMMUNICATIONS SUBCOMMITTEE

Chair: Eric Allen

Vice Chair: Marc Benou

H: RELAYING COMMUNICATIONS SUBCOMMITTEE

Chair: Eric Allen

Vice Chair: Marc Benou

The Subcommittee met on May 13, 2015 with 26 members of 38 total, comprising a quorum. 24 guests were also present. Minutes of the January 2015 meeting were approved without objection.

The Chair presented several announcements:

- WG Chairs or any person running a meeting were asked not leave projectors unattended. Please wait for the chair of the next meeting to arrive or if there is no session after your session or if it lunchtime or the end of the day, please return the projector to the registration desk.
- When sending emails to a WG please do not list all the members in the To or CC field but rather use the BCC field so that when a reply all is sent, it will not be sent to the entire working group or possibly be rejected by a spam filter.
- Starting July 6, public review procedure for balloting will begin.
- 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.
- WG chairs were warned to make sure that extensions are becoming difficult to come by, so every attempt should be made to finish their work on time.
- Double sessions are discouraged due to scheduling difficulties.
- The formation of a new technical committee, Power System Communications and Cybersecurity committee. Some of the H SC WG's will be transferred to this new committee.
- The WG chairs are reminded to review the latest policy and procedure manuals on the PSRC website, in the knowledge base section. It is under the heading, Manuals.
- The standard format for vote mailings by the SC was shown. Working groups are encouraged to use the same format. It was pointed out that voters should not change the subject line of the email when they respond or risk not having their vote counted.

WG business:

None; see WG reports.

Old business:

None

New business:

H9 requested to be disbanded and the SC voted to approve.

Marc Benou requested that H25 be permitted to go to ballot.

H26 requested to be disbanded and the SC voted to approve.

Deepak Maragal requested for HTF30, IEC 61850 User Feedback, become a working group.

Deepak Maragal requested that two new working groups be formed. Deepak has volunteered to chair both working groups. Working group H33 will develop a report on designing / modifying substation automation system utilizing 61850 technology. Working group H34 will develop a report on development of architectures of protection schemes utilizing IEC-61850. Both working groups will require 1 meeting session with a room for 40 people at the September 2015 PSRC meeting.

Ken Fodero requested that H32, Teleprotection over Ethernet, become a working group.

Mark Adamiak requested to form a new working group, H35, to develop a report on XML translation for COMTRADE. Such a task force would need a single session for 30 people at the September 2015 PSRC meeting.

Reports from the WG Chairs

H1: PC37.236 Guide for Power System Protective Relay Applications over Digital Communication Channels

Chair: Marc Benou

Vice Chair: Ilia Voloh

Output: Guide

Established: 2006

Expected completion date: December 2013

Assignment: Develop a summary paper of C37.236.

The H1 working group did not have an official meeting.

The goal remains to add a real world case involving problems using audio FSK over digital lines. If progress is not made before the September 2015 PSRC meeting, the working group will ask to be disbanded.

No requirements for the next meeting.

Status: Draft 1

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 8 members, 2 corresponding members, and 7 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 Garden Grove were approved – Allen Goldstein moved approval; Chris Huntley seconded; approved unanimously.

Old Business: The current draft was discussed and the working group is preparing to vote on the status of all sections: (1) should be included and ready to publish as written; (2) should be included but requires work; and (3) (for annexes) should not be included. The WG will review the documents over the next 6 weeks and we will have an email vote at the end of June.

New Business: We discussed a proposal from Chris Huntley to modify the earlier TDM extensions annex to the IRIG-B timecode, to the standard. The earlier version proposed to re-purpose the CTQ bits (which

are now in use); the new proposal uses the SBS bits instead (these are not to our knowledge used in the power community). This provides support for newer data elements needed by current applications. Allen Goldstein volunteered to contact IRIG to discuss the nature of changes in their revision to the IRIG-B standard and how that might relate to our plan to re-use the SBS bits.

There was also a discussion of the proper 'home' for this new proposal: here, a stand-alone standard, or in the Synchrophasor standard. A decision on this is out of scope for our WG, though the subcommittee may have an opinion. So long as it is published and accessible, our objective will be met.

Once business was complete, Ken Martin 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.

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 22 members and 9 guests present for the May 12, 2015 meeting.

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

The Chair asked for an update on any 61850 activities. Alex submitted an update on WG10 in testing applications and CIGRE B5 discussions on digital testing – topics of interest concerning remote testing by RTE is driving the CIGRE WG for defining these test procedures. A pilot project is underway.

HTF-30 had their first meeting Deepak Maragal reports. The task for discussed design testing and maintenance of 61850 substations, developing profiles or templates for utilities to follow but would believe this would require two different WG's to develop.

The Chair reviewed the report outline with the group and solicited any new updates and past writing assignments. The group discussed the merits of trying to finalize the report with the existing contributions. This was accepted by verbal consensus.

The group moved to form an Editorial Review Group to review the report and combine any sections lacking a contribution. Volunteers are Joe Perez, Farel Becker, and Mansour Jalali; Benton will coordinate the edits received and produce a consolidated report. Once the report edits are finished – target of July 1st – it will be circulated to the WG for approval. If approved it could be submitted to the SC at the September meeting.

No other writing assignments were provided so the missing sections will be removed or combined during the editorial process. It was noted that the H6 title was not changed – the Chair will follow up with the SC to verify it has been officially changed before submitting the report.

New members added were Jay Gosalia, Deepak Maragal, Joe Perez, and Chan Wong.

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

Monday, May 11, 9:30-3:00 Central Standard Time, 2015

The meeting was initiated and called to order by the convener, Ken Martin. Attendees introduced themselves. The governing body patent and copyright involvement rules were reviewed. There were 12 members and 5 guests present (in total).

The chair summarized the current state and reviewed the current plan:

Review and discuss proposals for changes to synchrophasor definition and introduction (Kirkham & Martin)

Review and discuss issues with ramp test.

Review and decide on considering an additional noise test

First the proposed change from 15 to 16 samples/cycle was discussed. The reason to make the change is to support higher data reporting rates. The reason not to change is the testing required. The WG voted 10-0-2 to make the change. Dean, Ken, and Dan will run the tests and confirm compliance. Also discussed taking the annex out of the standard; the straw poll was 4-4-4, so tabled and agreed to consider later. It was also agreed that if the annex is removed, then we need to capture the contents in an archival paper.

Discussed the ramp test. Ken & Allen introduced the topic. The C37.118.1a amendment does not make explicitly clear whether the end points of the exclusion interval are included with the interval (and thereby not used in the performance evaluation) or not. It was moved to accept that this is an ambiguity can be resolved for the purposes of the TSS testing by the TSS WG. After discussion, WG voted 10-0-2 to accept the proposal. This further accepts the position that the standard does not need to be amended or otherwise modified at this time.

Discussed the proposed changes to the synchrophasor definitions. In the existing standard the phasor and synchrophasor is developed heuristically then adds the Frequency and ROCOF measurement afterwards. New proposal is to define phase and frequency/ROCOF as functions of time all together rather than developing phasors first, including the phasor parameters as constant values.

Harold asserts that the defining equation (4 in draft) is too complicated. He believes the phasor representation needs to be introduced as a formula with the measurand clearly indicated. Discussion of Harold's proposal. Generally the WG did not agree with the proposed change, but also did not understand the thesis that is being presented. Task team (Harold, Bill, Ken, Mahendra, Jerry) will work on a proposed change to the draft.

Discussed the addition of noise tests for PMUs (Dickerson). There is internal noise generated in PMUs as well as noise on the signals. When we simulate and perform tests, we do not generate this noise. The noise affects FE and RFE more than TVE. There is also noise in actual power systems especially in distribution systems primarily generated by variations of the load. This noise causes jitter in phase, frequency and ROCOF measurements (especially ROCOF). Dr Yilu Liu has done some studies of the effects of this noise. Should we put something into the standard to test PMU handling of noise? What would such a test do? Where do we put in? What should the limits of error be? No current answers on this. A task force of Bill with anyone who wants to participate will investigate this and make a recommendation.

Adjourned at 15:06

Wednesday, May 13, 8:00-10:15 Central Standard Time, 2015

The meeting was initiated and called to order by the chair, Ken Martin. Attendees introduced themselves. The governing body patent and copyright involvement rules were reviewed. There were 17 members and 15 guests present (in total).

The chair summarized the current state and reviewed the current plan:

Review and discuss proposed annex for testing with digital inputs.

Report on updating the F & ROCOF requirements—adding limits where they are suspended.

Report on changes required by adding more reporting rates to acceptable list for testing.

Report on issues for adding impedance requirements.

Proposed annex for fault or dead-bus recovery in measurement (test extreme changes to input)

Discussion of the proposed WG schedule: CD #1 in October. If we are not ready by October, we should revise the schedule sooner than later. The current schedule has 2 CDs to coordinate better with IEEE. The 2nd CD will be at the same time as the IEEE sponsor ballot. We probably won't make the schedule, so options are: move them all back, hit the first one as a trial even though the standard is not really finished, or eliminate one CD. Jay Murphy moved to delete CD #1 but do not change the rest of the schedule (so the scheduled CD2 becomes CD1 and CD2 deleted). Seconded Harold. Discussion:

Allen--that would slip the schedule by at least 6 months because we should expect a lot of comments no matter how polished we think the document is. It takes 3 months to get comments. Motion is revised, move the CD #1 to February (from March) and IEEE sponsor ballot along with CD.

Vote: 12 in favor, 2 opposed. Motion carried.

The new schedule is:

CD #1: February 2016 (IEEE sponsor ballot)

CDV: December 2016 (Committee Draft for Vote)

FDIS: July 2017 (Final Draft International Standard)

IS: December 2017 (International Standard)

Discussion on meeting with IEC. Mentioned difficulty in getting a venue that will attract enough members to attract a wide range of members. The next TC 95 meeting (France) 27-30 October is possible but we do not have current work that may be ready to deal with there. We will continue to target resolution of the CD for an international meeting.

Motion to approve the minutes from January: Bill Dickerson, Dan Seconds, Approved unanimously.

Reviewed the ramp test issue that was resolved on Monday.

Discussion of proposed annex for synchrophasors having sampled values used as inputs: (Review of text in the annex).

Discussion of using only IEC standards as a means of acquiring and transmitting sampled values to a PMU function. There are other means and may be ones we are not aware of. Annex should state the requirements rather than just standards that have their own specifications.

Limits are reduced for PMU output and the merging unit manufacturers must declare specifications below recommended limits.

PMU performance: Tony Johnson - the performance of the system must comply with the PMU performance requirements. This should include the merging units. Discussion about the difficulty in trying to establish this—it depends on the elements of the system. Q: Who would be responsible to ensure the right components are chosen? A: the engineer responsible for designing the system.

Discussion of the latency requirement given the delay in the MU and the communication system. Ken: for testing purposes, you can specify the latency of the merging unit and the communication shall not exceed a limited period of time. Tony: We need to determine a realistic number for latency and put it into the annex.

Ken: we need a clear indication of the requirements of the PMU given that there are digital inputs.

Updating the F and ROCOF limits: No real work has been done in this area. Allen did send out a report showing the performance of 10 PMUs and the reference model. What are the applications of ROCOF? We need to know more.

Adding more reporting rates: only simple changes are required to add reporting rates in the list of "approved rates", the rates at which the PMU can be qualified as a compliant device. We have already added 2xf0 reporting rates, so some changes should be introduced.

Report on adding PMU input impedance requirements -- still under evaluation.

Proposed Annex for fault and dead-bus recovery in measurement not yet available.

Meeting adjourned 10:45

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.

The Chair welcomed 7 members and 16 guests to the May 12, 2015 meeting.

The Chair presented the finished report Version 8.1, needing only one contribution, two figure edits, and reference alignment. Chris Huntley and Tony Johnson, and Eric Udren had performed thorough editorial reviews. This report is being coordinated with Substation C8 – IEEE 1615. The next step is to re-circulate the report with above completions to the WG for a straw vote and comment response by May

27 with a month response time. This is to be followed by an official WG electronic vote, the results of which can be discussed in San Diego in September.

Eric gave a quick review of Section 10 on security, which was reworded and shortened – we seek for the WG to approve or augment those changes.

The Chair asked Ken Fodero to explain the scope of his new WG on specification of performance for packet-based communications for relaying or other fast critical applications. They are investigating issues that may arise when existing deterministic TDM services are replaced with wide-area Ethernet solutions. The language of the H12 report was adjusted in the last edit to emphasize the early state of Ethernet communications for wide-area protection, and to suggest caution as users transition from Ethernet over TDM solutions to Ethernet WAN solutions.

Request for the Fall 2015 meeting - single session for 30 attendees.

H17: Establishing links between COMTRADE, IEC 61850 and CIM

Chair: C. Brunner

Vice Chair: A. Apostolov

Output: Report

Established: 2010

Expected completion date: December 2013

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

The working group met on May 12, 2015 at 9:30. The meeting was attended by 11 members and 7 guests.

After the introduction of attendees, the discussion focused on the issues related to using XML for COMTRADE files.

Mark Adamiak made a presentation based on the conclusions of task force HTF28 and the group discussed its relationship with IEC 61850, substation configuration language files, topology, status information, etc.

The issues identified by HTF28 will be distributed to the Chairman of WG H17 for consideration of the relationship between the proposed XML additions and IEC 61850.

For the September 2015 meeting we need a room for 25-30 people and a projector.

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

Chair: Yi Hu

Vice Chair: A. Goldstein

Output: Report

Established: September 2012

Expected completion date: December 2016

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

Working group H21 met on Tuesday, May 12, 2015 in single-session chaired by Yi Hu and Allen Goldstein with 21 people (11 members and 10 guests) attending. Due to error in meeting agenda, many of the same group of people attended another session on Tuesday, May 12, 2015 Chaired by Allen Goldstein with notes for discussions but no recorded attendance. The meeting minutes included discussion notes for both sessions.

The working group focused the discussion and work on revising the preliminary conceptual architecture for the two use cases that should be used for developing standard mapping between the IEEE C37.118.2 and IEC 61850-90-5. The working group was able to reach the agreed conceptual architecture drawing for both use cases. The agreed conceptual architecture illustrates that the mapping should be extended from IEEE C37.118.2 – IEC 61850-90-5 to IEEE C37.118.2 – IEC 61850 (SV/R-SV and GOOSE/R-GOOSE).

The following working group members agreed to provide the initial contributions for the following tasks:

Mark Adamiak: draft the text description to use cases and the conceptual architecture, and add the descriptions of use case B (IEEE C37.118.2 PMU data to IEC 61850/90-5) mapping based on the IEC 61850-90-5 implementation agreement

Alex Apostolov, Mahendra Patel, Tony Johnson: draft the descriptions of use case A (IEC 61850 to IEEE C37.118.2) mapping

WG Chair will follow-up with the above WG members in gathering the initial inputs and may organize conference calls and web meetings to review and discuss the initial inputs. An updated draft report will be distributed to WG members and guests before next face-to-face meeting.

For next meeting, WG H21 requests a single session, a room for 30 people and a PC projector
Draft # D0.04

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

Chair: Caitlin Martin

Chair C19: Denis Holstein

Vice Chair: Dylan Jenkins

Output: Guide

Established: September 2012

Expected completion date: January 2019

Assignment: Develop an IEEE Guide on security for data files used for configuration, management, and analysis of protective relaying systems.

Working group met with 11 members and 10 guests.

After introductions the minutes from the previous meeting were approved. Caitlin Martin began the meeting by explaining the Central Desktop system.

Erin will work with Caitlin offline to invite members who are not currently included in the Central Desktop mailing group, and how to change the mailing frequency of the updates.

Several presentations were then made by Working Group members reporting summaries of how various industry reports could apply to our project:

Dylan Jenkins - NIST SP 800-30 Guide for Conducting Risk Assessments

<http://csrc.nist.gov/publications/PubsSPs.html>

Dylan recommended that its clearly defined risk assessment process is used by the Working Group.

Chris Chelmecki - NIST FIPS 199 Standards for Categorization of Federal Information and Information Systems.

<http://csrc.nist.gov/publications/PubsFIPS.html>

Chris showed how this standard could be used for both systems and data files. The group agreed that this should also be used by the WG, but some harmonization with NIST SP 800-30 will be required.

Question was raised how to assess the compromise of several files at once (i.e. one file compromised on its own might not be a risk but several together could pose a risk). There is a need to evaluate the complete system at risk.

Dennis Holstein - Cryptographic Protection Report

(Presentation placed on Central Desktop as Dennis could not attend the meeting).

Didier Giarrantano – Security Techniques

Didier outlined what the potential cybersecurity issues are, and what issues we need to consider in our document.

Explained that in Operational Technology (IED centric) availability is much more important than confidentiality; which contrasts to the requirements of an IT system.

Explained some key concepts such as authentication, integrity and confidentiality.

Presented a process for file management, and asked the group whether this should be in scope. General consensus from the WG was that it should not apply as it is not for data at rest.

Through discussion the Working Group recommended splitting the risk in terms of Confidentiality, Integrity and Authorization (for example one file type may have low risk if confidentiality is compromised, but high risk if an un-authorized person creates the file). The Working Group also agreed that use cases will be important.

Caitlin presented the work plan for the WG between now and June 2018.

Working Group members are encouraged to read C37.240.

Assignments and actions for next meeting:

Define what actually is a “protection and automation related data file” (refer to IEC 62351 to see if it is already there) - John Miller.

Presentation on NERC CIP v5 – Mike Dood.

Summary of C37.240 – Steve Kunsman (January 2016 JTM).

Requirements for the next meeting: 1 session, meeting room for 25 people, and a projector.

H23 Minutes, May 13, 2015 San Antonio, TX

H23: Guide for Naming Intelligent Electronic Devices (COMDEV)

Chair: R. Cornelison

Vice Chair: Eric Allen

Secretary: Amir Makki

Output: Guide

Established: January, 2013

Estimated Completion Date: January, 2017

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

The Working Group met on Wednesday May 13, 2015 with 9 members and 2 guests.

Draft 2 was distributed prior to the meeting.

The January 2015 minutes were approved.

Recent completed assignments were reviewed. Questions were discussed and some answered. The group will work over the summer to try to complete a near final draft before the September meeting. A room for 20 people is requested for the September 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 May 13, 2015 in San Antonio, TX in a single session with 18 attendees (6 members, 1 corresponding member, 11 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. The quorum was achieved. Mark Adamiak moved to approve January 2015 meeting minutes. Jay Murphy seconded. There was no discussion. January 2015 meeting minutes were approved unanimously.

The H24 co-chair provided an update on project's status:

Progress has been made on Level 1 profile.

IEC National Committees supported moving Level 1 profile forward as a dual-logo standard – IEC/IEEE 61850-9-3.

IEC / IEEE 61850-9-3 CDV was distributed to National Committees for vote, completing on July 17, 2015.

To move forward per IEEE processes and align with IEC timing the following steps were suggested:

Plan A (preferred): Submit a new PAR for joint development of IEC/IEEE 61850-9-3, and move IEC/IEEE 61850-9-3 CDV draft to sponsor ballot.

Plan B (contingency only): Modify existing C37.238 revision PAR for joint development of IEC/IEEE 61850-9-3, if Plan A fails to be approved.

Discussion on Plan A and Plan B followed. The co-chair explained that the IEC/IEEE 61850-9-3 CDV draft contains technical material agreed by the H24/SubC7 Working Group in December 2014.

Mark Adamiak made a motion to submit a new PAR to IEEE-SA for joint development of the IEC/IEEE 61850-9-3 standard. Jay Murthy seconded. There was no additional discussion. The motion was approved unanimously.

Bill Dickerson made a motion to take the IEC/IEEE 61850-9-3 CDV draft to IEEE sponsor ballot, contingent on PAR approval. Mark Adamiak seconded. There was no additional discussion. The motion was approved unanimously.

Discussion on next steps: presentation to the H Subcommittee and the Main Committee followed. The following text was agreed for the motion to be made at the Main Committee:

Mr. Chair, the H Subcommittee requests approval for transmittal of Precision Time Protocol Profile for Power Utility Automation, IEC/IEEE 61850-9-3, to the IEEE-SA for balloting, contingent on PAR approval. Timing of this request is critical to align with dual-logo process between IEEE and IEC.

Plan B was discussed next. It was explained that it is only needed if Plan A fails to be approved. Chris Huntley made a motion to modify the existing C37.238 revision PAR for joint development of the IEC/IEEE 61850-9-3 standard, if Plan A fails to be approved. Mark Adamiak seconded. There was no additional discussion. The motion was approved unanimously.

Ravi Subramaniam provided an update on IEEE ICAP test plan development for the IEEE 1588 profiles. This group plans to meet in September 2015 and would appreciate suggestions and participation.

The meeting was adjourned at 12:15pm.

Requirements for the next meeting: double session, meeting room for 30 people with a computer projector.

H25: Review of C37.94

Chair: M. Benou

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*.

PSCC Co-Chair: Roger Ray

H25 met with 7 members and 1 member was made available by phone. A quorum was present and the minutes from the January meeting were approved. All members were reminded to review the PSRC patent policy. Introductions were made.

The chair circulated draft 4 for approval of the WG to go to ballot. Several changes were made during the meeting and a vote was taken by the 8 members. All 8 members voted to proceed to ballot.

The chair will work with IEEE to prepare the document, draft 5, for ballot. The goal is to have the revision submitted before the new balloting procedures go into effect in July.

At the previous meeting it was suggested that a small transactions paper should be prepared to explain why changes have been made to the existing standard. The WG has now decided that such a paper will not actually be required.

Requirements for the next meeting: 1 session, meeting room for 15 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 on May 12, 2015. There were 11 members and 14 guests present.

Chris began the meeting by explaining the progress on building the WG PAR, and the activities of the new task force (HTF31) which will run in parallel to H27. The division of work between H27 and HTF31 will be as follows:

H27 – will define the COMSET file format.

HTF31 – how protection and control settings will be represented, and define the standard logical device structure for the COMSET modelling.

It was raised that the UCA spent a lot of time in the past defining protection setting models (GOMSFE) which could be used by HTF31.

Alex Apostolov led a discussion on whether logic could become part of the COMSET file. The group agreed that it could, but again this should be within the scope of HTF31 to look into.

The group then discussed how H27 will coordinate with IEC TC95. TC95 has expressed an interest in participating in both H27 and HTF31. Request for this participation has to come from IEEE for this to occur.

Alex then gave a presentation on how IEC 61850 SCL files can be used to represent protection and control settings and argued for a standardised hierarchy and standardised logical device structure.

Dylan Jenkins then gave a presentation on CID file formats; the conclusion of the presentation was that this format could be used for COMSET for all relay types including those that do not support IEC 61850.

Requirements for the next meeting: 1 session, meeting room for 30 people

HTF30: IEC 61850 User Feedback

Chair: D. Maragal

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.

Attendee: 8 Members + 23 Guests

Minutes:

Feedback was obtained from over 10 utilities located in US and Canada.

High priority challenges for considering/implementing IEC-61850 substation automation system were discussed.

Committee requests two new working groups to be formed.

Develop a report on

Designing / modifying substation automation system utilizing IEC-61850 technology

Testing IEC-61850 based substation automation system

Maintenance of IEC-61850 based substation automation system

Training and new skill set requirements & tools necessary to implement IEC-61850 technology

Business cases for implementing IEC-61850 technology based substation automation system.

Justification: The current practices/procedures established and followed in utilities are not applicable for IEC-61850 based substation automation system. Implementation of IEC-61850 standard poses significant challenges to utilities in design, testing and maintenance domains. The proposed working group intend to address these challenges by develop systematic guidelines.

End User: This report will be a guide for utilities for implementing IEC-61850 technology in substations.

Development of typical architectures of protection schemes utilizing IEC-61850 technology: Report

Justification: There are several ways to design substation automation system utilizing IEC-61850 standard. Each design approach has specific advantages and dis-advantages. Currently, there is no document available for reference to evaluate these aspects. For this reason, each implementation of IEC-61850 technology in North America is customized and unique. This working group intends to develop typical architectures of protection schemes utilizing IEC-61850 technology. Protection schemes would include bus-differential, line protection, transformer differential, capacitor/reactor bank protection schemes. The emphasis would be on the high level architecture with initiating inputs and tripping outputs, and not on the details of protection function. The typical protection schemes developed as part of this report will be the set of used-cases with configurations for each protection scheme. This would act as a basis for implementing IEC-61850 substation automation.

End User: The subject report would be a guide/reference for utilities to implement IEC-61850 technology in substations.

Future meeting request: 1 session with 50 people.

HTF31: Common Protection & Control parameters for COMSET

Chair: D. Maragal

Output: Recommendation on formation of a Working Group

Established: September, 2014

Estimated Completion Date: September, 2015

Attendees: 6 Members + 1 Guest

Minutes

- The group discussed the scope of work and the possibilities to model protection functions.
- Request renaming of taskforce to Models of protection functions and their parameters
- Group also discussed possible alignment with:
 1. Other PSRC subcommittees : K, I, J, C, D
 2. IEC WGs when this effort becomes Guide or Standard

Future meeting request: One session with 20 people.

HTF32: Report on Teleprotection over Ethernet

Chair: K. Fodero

Output: Recommendation on Formation of a Working Group

Established: September, 2014

Estimated Completion Date: September, 2015

The group met on Tuesday with 19 people in attendance. 17 of those have agreed that the scope is good and that a working group should be formed.

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:

Performance expectations

Considerations and differences for Ethernet vs current TDM transport

A discussion on performance requirements for Teleprotection and line current differential protection. To include but not be limited to propagation delay, channel asymmetry, jitter, restoration and equipment initialization times.

Performance monitoring techniques

General discussion and explanation of various technologies in use today and the pros / cons of each.

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 protective relay communications schemes for the IT / Telecom departments. This has also been referred to as a Service Level Agreement (SLA).

Pilot protection schemes have evolved based on the communications systems they are intended to be applied over. The group will explore if changes to current pilot scheme philosophies will need to be addressed for this new transport technology.

MPLS, Carrier Ethernet, SDN and TSN Time Sensitive Networks???

Next steps are to pick a vice chair for the group. We will start right away collecting and distributing white papers on the subject with the group and provide a proposed outline for the document via email. Next meeting will require a room for at least 25 and an overhead projector.

Liaison Reports

PES Substations Committee

C. Preuss

No Report

PES Communications Committee

D. Nordell

No report

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

C. Brunner

IEC TC57 / WG10 will meet in June in Regina, Canada. 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 in the final stage. We expect to have drafts of the Amendments for parts 6, 7-2, 7-3 and 7-4 officially circulating following the meeting in Regina this June.
3. Technical reports that are under preparation
 - IEC 61850-90-3 – using IEC 61850 for condition monitoring is ongoing some revision of the model consistency and will then be circulated as TR.
 - IEC 61850-90-12 – Wide area network engineering guidelines is in the final process to be published as TR.
 - Work on IEC 61850-90-11 – modelling of logics, IEC 61850-90-14 – Using IEC 61850 for FACTS data modelling and IEC 61850-90-17 – Power Quality are 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. Additional task forces address issues of Alarm handling (this will be a TR IEC 61850-90-18) and function modelling in SCL.
5. A few technical specifications for mappings between IEC 61850 and other protocols are worked on. Mapping with DLSP/COSEM (TS IEC 61850-80-4) has been circulated as CD, 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.
6. New work has been started to create a guideline how to define basic application profiles for IEC 61850.
7. IEC 61850-9-3, precision time protocol profile for power utility automation has been accepted as PAS and the New Work Item proposal for a joint development with IEEE with the PAS attached as CDV is circulating.

IEC TC57 / WG17 will meet in Frankfurt, Germany in June 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 has been circulated as a first DC. DTR is in preparation
 - IEC 61850-90-10 – modelling of schedules, has been circulated as DC; comments received will be treated during the meeting next week.
 - 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 DTR has recently been circulated.

WG19 is as well working on a harmonized model of IEC 61850 and CIM. A CD of a technical specification IEC 62361-102 has been circulated in January 2015.

I. RELAYING PRACTICES SUBCOMMITTEE

Chair: J. Pond

Vice-Chair: B. Mugalian

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

The I Subcommittee met on May 13, 2015 with 29 members in attendance – a quorum was achieved.

- Minutes of the I Subcommittee meeting held in Garden Grove CA in January 2015 were approved (motion Meisinger, Makki (second))
- Coordination & Advisory Committee Meeting Items of Interest:
 - Working Group Chairs should provide their pertinent information to Jeff Pond and Brian Mugalian. Russ Patterson and Rick Gamble will post information for your working group. Email your content to: webmaintenance@pes-psrc.org
 - Future PSRC Meetings
 - September 2015 – La Jolla CA
 - January 2016 - TBD
 - May 2016 – Denver CO
 - September 2016 – Cincinnati OH
 - PSRC is looking for presentations for the September 2015 meeting

- Administrative items:
 - Working Group roster updates will be needed for the September 2015 PSRC Directory
 - For working group agendas and minutes, please use the format attached to the meeting agenda
 - IEEE Patent Slides are available on the PSRC web site for presentation at the beginning of each meeting – new version issued March 15, 2015 and located at: <https://development.standards.ieee.org/myproject/Public/mytools/mob/slideset.pdf>
 - Review scope with Working Group members and achieve approval before submitting a PAR to the IEEE-SA
 - Review Policy & Procedures Manual at <http://www.pes-psrc.org/Manuals.html>
 - Working Group Chairs developing or revising IEEE guides need to attend the Standards Coordinator meeting on Tuesday morning
 - Email items to post on the I web pages to Jeff Pond and Brian Mugalian which will be reviewed and forwarded to: webmaintenance@pes-psrc.org

Reports from the WG Chairs

I2: Terminology Review Working Group

Chair: M. Swanson

Vice Chair: F. Friend

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

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

The I2 working group, chaired by Mal Swanson, met on Wednesday, May 13, 2015 with 9 members and no guests.

Minutes from the January meeting in Garden Grove, 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).

Output from a working group in the form of a report does not need review of terms; however, any Standards work with a PAR must be submitted for review and approval from I2.

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) Standards projects and drafts. Report to PSRC on IEC Standards development.

The WG met on May 12, 2015 in a lively session with 7 members & 5 guests to review TC 95 standards activities. There are no standards projects requiring review or comments at this time, but there are work coordination opportunities described below.

The Chair updated the status of minutes and presentations from the TC 95 hosted by the US National Committee in Clearwater Beach, FL on December 5, 2014. Dr. Murty Yalla is now the new Chair of TC 95 (internationally). Official meeting minutes and copies of presentations were circulated by e-mail and are available on request from the Chair.

Murty Yalla gave an update from the maintenance team MT4 meeting held in Chengdu, China on April 20-23:

- IEC 60255-121 – Functional Standard for Distance Relays - A corrigendum is being prepared due to some errors that were detected during Chinese translation.
- IEC 60255-187-1 - Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers – Validating that dynamic models give appropriate normalized test cases to be issued with standard, before a CD is sent out by October.
- IEC 60255-187-3 - Functional requirements for biased (percentage) differential relays for transmission lines - a draft outline has been circulated for comments.
- IEC 60255-181 Functional requirements for frequency protection - first draft discussed.
- IEEE PSRC COMSET standard development - a request from IEEE PSRC H27 Standard for Protection and Control Configuration Data Format for joint development has been enthusiastically received by TC 95 leaders.
- Next meeting is in Biarritz, France from October 27th-30th, 2015.

The Chair presented TC 95 new project announcements for which the USNC seeks participants (contact Eric Udren for details):

- 95/330/DC – Update to IEC 60255-1 Ed. 1: *Measuring relays and protection equipment – Part 1: Common requirements*. Stated concern – do we state requirements for Smart Grid devices and controls associated with electronic power converters/inverters/conditioners/ controls? Apply this standard to any device which is not a protection relay in these applications.
- 95/331/DC – Update to IEC 60255-26 Ed. 3: *Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements*. Stated concern – do we test adequately for influences from Smart Grid devices (electronic power converters/inverters/conditioners/controls)?
- 95/332/DC – Update to IEC 60255-27 Ed. 2: *Measuring relays and protection equipment – Part 27: Product safety requirements*. Stated concern – adapt the standard to meet the new requirements of the European Low Voltage Directive covering protection of people and animals from all risks including mechanical, vibration, etc.; and internal production conformity control. Technical file shall include the analysis and assessment of the risks associated with the product. In addition, revised base standard IEC 61010 now includes risk assessments and considers other aspects of safety not covered by IEC 60255-27 Ed.
- 95/333/DC - New functional standard project - IEC 60255-181: Measuring relays and protection equipment – Part 181: Functional requirements for frequency protection (see MT4 report above).
- 95/329/DC - Review of IEC 60050-447 Ed. 1: International Electrotechnical Vocabulary – Part 447: Measuring relays – MT1 to fix or add terms: normal use, binary inputs, analogue inputs, start time, overshoot time, dynamic performance, transient response, transient overreach, assigned error, mean value of measurements, intrinsic error, operating accuracy, overall system accuracy, differential current, restraint percentage.

The WG discussed the opportunity to improve coordination between IEEE application practices as documented in PSRC guides and standards, and IEC functional requirements standards for relays as documented in the work products of MT4. We already achieved good collaboration with PSRC WG D21 contributions by extensive commenting on drafts of 60255-121, Functional Standard for Distance Relays, now published. The Chair and Vice Chair are initiating PSRC WG coordination with the support of PSRC Committee and Subcommittee leadership, and WGs that are established or that may be established specifically for this purpose. The IEC maintenance team (standard drafting team) can exchange early work products directly with the coordinated PSRC WG, and can receive drafts in return. The PSRC WG can also comment on IEC official standard drafts via comments through the USNC via the TC 95 Technical Advisor (the Chair of I4). This will lead to good alignment of relay functional capabilities for which manufacturers will type-test with the demands of applications cataloged in guides and standards.

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

17: Revision of C37.103 Guide for Differential and Polarizing Circuit Testing

Chair: Gary Kobet
Vice Chair: Alex Lee
Output: IEEE Guide
Established: May 2012
Expected completion date: December 2016

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

Working Group I7 held its meeting in a single session on Tuesday, May 12, 2015. This was the tenth meeting for this working group.

There were 6 members present and a quorum was reached. Five guests attended the meeting. Membership stands at 10 members and 5 corresponding members.

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

January 2015 meeting minutes were reviewed, as well as minutes from teleconference meetings held in February 2015 and March 2015. Jason motioned to accept these minutes. and seconded by Mark Schroeder. The minutes were approved.

Draft 7.0 was presented and reviewed by working group members.

Gary will request Rene to update Figure 9, 10 and 34 as per Working group comments. 6 working members accepted this guide and proposed to resubmit to sub-committee for approval.

Working group will resubmit this guide to Sub-Committee for approval when Figure 9, 10 and 34 were updated..

I8: Revision of C57.13.3 – Guide for Grounding of Instrument Transformer Secondary Circuits and Cases

Chair: Brian Mugalian
Vice-Chair: Bruce Magruder
Established: 2009
Output: Revision of IEEE C57.13.3-2005
Expected Completion Date: 2013

Assignment: Revision to IEEE C57.13.3 to include other types of transformers and other than North American grounding practices

Working Group I8, Revision of C57.13.3 - Guide for Grounding of Instrument Transformer Secondary Circuits and Cases has completed its assignment and did not meet. The Guide was published on January 23, 2015. The Chair requested the Subcommittee to disband the I8 working group. Motion entered by M. Meisinger, seconded by M. Swanson, motion approved. Thanks to the working group members for their hard work on this revision.

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

Chair: Farnoosh Rahmatian
Vice-Chair: Bruce Pickett
Established: 2010
Output: Guide PAR PC37.241
Expected Completion Date: 2014

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

The Working Group met on May 13, 2015 in a single session. The session was chaired by Farnoosh Rahmatian. There were participation from 7 members and 4 guests. We had quorum.

All participants introduced themselves.

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

The minutes of the January 2015 meeting were approved.

Chair updated the attendees on the status of PAR. The PAR for PC37.241 will expire on December 31st, 2016.

Chair led review of activities and actions from the previous meeting:

1. Latest draft (4.2) of the Guide was briefly reviewed including edits incorporating
 - a. Christoph Brunner's additions to section 7.3 (with change tracking) – Thanks Christoph
 - b. Charlie's edits from his January 2015 review – Thanks Charlie.
 - c. Some minor additional edits (non-technical).

The WG feels that document is ready for internal WG vote.

Actions:

1. Farnoosh to remove sections leaders' names from the document.
2. Rich Hunt to provide a redraw of Figure 15 (Visio).
3. Farnoosh to move the reference article in section 7.3.3 to the Bibliography Annex.
4. Once the above 3 actions are complete (next two weeks), Chair to initiate WG vote (with 30 days or 6 weeks for review and voting).
5. IEEE MEC to be initiated after the conclusion of WG votes.

I12: Quality Assurance for Protection and Control (P&C)

Chair: Andre Uribe

Vice Chair: Mal Swanson

Established: 2011

Expected Completion Date: 2014

Assignment: "To develop a special report outlining the best practices of quality control for protection and control design drawing packages from conception to final "as-built".

The Working Group I-12 did not meet. The working group will meet in September to address comments and finalize the report..

A request to disband I12 will be made at the September 2015 Relaying Practices Subcommittee meeting.

I21: Analysis of System Waveforms and Event Data

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.

Working Group I21 met on Tuesday May 12, 2015 with 8 members and 8 guests.

The final draft for the report will be sent out for a grammatical review and is due back on June 12, 2015.

Five members and guests have volunteered to perform this review.

Working group I21 will be submitting the report to I Subcommittee in July 2015.

I22: End of Useful Life Assessment for P&C Devices

Chair: Bob Beresh

Vice Chair: Bruce Mackie

Output: Report

Established: 2012

Expected Completion Date: 2014

Assignment: Prepare a PSRC report on the criteria for determining the end of life for protection, control, and monitoring devices including electromechanical, solid-state and microprocessor-based devices.

WG I22 met on Tuesday, May 12, 2015 at 4:30pm CDT in a single session with 7 members and 14 guests.

After introductions, the past minutes and current status of the document was reviewed. The document is complete.

The outline of the paper was reviewed mainly for those new to the meeting. The remainder of the meeting discussed the publicizing of the document. The following volunteered to make presentations at the specified conferences. However if a conference requires a rewrite or shorter paper, then no presentation will be made at that conference.

| I22 Presentation List | | | | | |
|-----------------------|--------------|------------------------------|-------------------------------------------------------------|--------------------------------------------|--------------|
| Last Name | First Name | Affiliation | Conferences | Conferences | Conferences |
| Mackie | Bruce | Nashville Electric Service | Main Committee | | |
| Moxley | Roy | Siemens | MIPSYCON | | |
| Gagnon | Jean Philipp | GenTec | Western | Georgia Tech | Cigre Canada |
| Kazimier | Ben | Basler | Texas A&M | | |
| Knapek | Will | Omicron | Pac World | International Protection Testing Symposium | |
| Pavavicharn | Suparat | Basler | Iowa / Nebraska System Protection and Substation Conference | | |
| Weyer | Guillermo | Bluefin Energy Solutions Inc | Doble Conference | Northeast conferences | |
| Xavier | Joe | ABB | NWPPA | | |
| Zamani | Amin | Kinectrics | IEEE T&D | | |

Due to completion of the report, the working group requests approval to disband. Amir Makki requested a copy of the revised report after the latest received comments. Motion to disband entered by M. Meisinger, seconded by A. Uribe, motion approved.

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: Review of IEEE C57.13.1 to determine whether a revision is needed

Working Group I23, Revision of C57.13.1 - Guide for Field Testing of Relaying Current Transformers, was held in La Vista Room C, Hilton Palacio de Rio, San Antonio, TX, May 13, 2015 at 8:00 am. Seven members and one guest were present and a quorum was met.

Patent Conflict slides were shown.

1. Minutes from January 2014 meeting were reviewed and accepted. Motion to accept by Heather Malson, seconded by Jason Buneo.
2. Reviewed drawings submitted by Jeff Burnworth.
 - a. 16.1 comment on why to short unused bushing when testing is under investigation.
 - b. Revise size of terminal symbols on drawing.
 - c. Change delta orientation on the figure to match the phasor
3. Reviewed Frequency method of excitation testing submitted by Will Knappek. Need more information Saturation Test diagram.
4. Added Annex A.3.4 benefits of modern CT test sets submitted by Don Sevcik.
5. Web meeting scheduled at 11:00 am on June 17th. Will Knappek will set up.

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

Chair: Jim Niemira

Vice-Chair: Jeff Long

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

Established: January 2013

Expected Completion Date: September 2014

The Working Group I-24 met on Tuesday, May 12th, 2015, at San Antonio in single session chaired by Jim Niemira with a total of **17 attendees** (7 members (including 1 new member) and 10 guests). Quorum was not initially met therefore the minutes from the last meeting will be emailed to members in order to vote to accept the minutes.

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

It was noted that several writing assignments are still missing from Joe Perez, Jeff Long, George Semati and Veselin Skendzic.

Jim Niemira will contact the individuals to provide their contributions for the report.

Open Action Items are:

- 1) Amir Makki to make the presentation from the January 2015 meeting available to the working group.
- 2) John Buffington will work with Jim Niemira to tailor the presentation given by Vincent Mosser into practical applications for the protection and control audience.
- 3) Jeff Long to incorporate additional theory information into the report using the presentation from Vincent Mosser as a reference document.
- 4) John Buffington will create a table of advantages and disadvantages of Hall Effect sensors vs. other current sensing technologies.
- 5) Mark Taylor will add DFR applications to the report.

Ratan Das joined the membership of the working group.

New Action Items:

- 1) Jim Niemira to contact John Wang to see if he's still wishing to be a member of the group.
- 2) Jim Niemira to email minutes from the last meeting to WG members to vote to accept the minutes.
- 3) Jeff Long to include a refresher on Lenz's Law and Ampere's Law when expanding the Theory section of the report.
- 4) Jeff Long to reformat the report in IEEE style with regards to list figure numbers according to the section they are in. For example Figure 2.3, Figure 4.1, etc.
- 5) Amir Makki to amend his contribution to reword a few transducer sensitivity ranges.
- 6) Amir Makki to confirm the source of the strength of the induced magnetic field with respect to distance of the sensor to the cable.

- 7) Farnoosh Rahmatian to contact Veselin Skendzic to see if he still plans to attend the WG meetings and contribute to the Electronics section of the report.
- 8) Krish Narendra from ERL Phase agreed to peer review Amir Makki's technical contribution.
- 9) Jim Niemira agreed to peer review John Buffington's technical contribution.
- 10) When reviewing the document, we (as a group) need to agree on common terms throughout the report. Suggestion to check IEEE and IEC for commonly used terms/definitions.

The following members were in attendance.

| Member | Company |
|------------------------|----------------------------------|
| Jim Niemira (Chair) | S&C Electric Co. |
| Jeff Long (Vice Chair) | Kiewit Engineering & Design, Co. |
| Mark Taylor | Softstuf |
| John Buffington | Itron, Inc. |
| Jeff Burnworth | Basler Electric |
| Amir Makki | Softstuf |
| Ratan Das (new member) | ABB Inc. |

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 today, May 13, 2015, in San Antonio, TX with 11 members and 18 guests.

After reviewing the minutes of the January meeting and the work that went on between meetings the group went over the outline of the writing contribution from Eric Schock of First Energy on common practices in all protection system commissioning programs. The next step is to see what sections of the document we can incorporate in our document. There were several good discussions on other sections of the document and some additional writing assignments were made to help stream line the common section of the document. The intent of the group is to try to meet at least twice before the September meeting, via teleconferences.

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: Recommendation to update or expand Mathematical models of instrument transformers [1] and transducers, including interface electronics such as merging units, for use in both off-line and real time EMTP studies. In addition to improved models for conventional CT's, PT's and CVT's there are now new transducer types such as optical, Hall effect, Rogowski coils.

1. "Mathematical Models for Current, Voltage, and Coupling Capacitor Voltage Transformers." , Working Group C5 of the IEEE PSRC, Chairman D. Tziouvaras, Vice-chairman **P.G. McLaren**, et al., IEEE Transactions on Power Delivery, January 2000, Vol. 15, No. 1, p62.

Working Group I26 held its meeting in a single session on Tuesday, May 12, 2015. This was the fifth meeting for this working group.

There were 5 members present and a quorum was reached. 10 guests attended the meeting.

Reviewed 2 submission from Yuan and Jackie.
Working group discussed CT design parameters available from manufacturers to be used with the Jiles-Atherton CT Modeling.
The WG suggested focusing on CT modeling and practical applications.

I27: Investigation of Protective Relay Self-Monitoring Capabilities

Chair: Bob Beresh

Vice Chair: Yuchen Lu

Established: 2014

Output: Report

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.

Expected Completion Date: 2015

We request approval of Cathy Dalton of EPRI as Vice Chair and Ben Kazimier of Basler as Secretary.

We discussed relay structure drawing provided by Nilesh Bilamorah (Dominion)

Asked manufacturers for general relay structure diagrams and if there is any way for users to validate self monitoring. Requests were made for general relay test practices from users and for problems seen as examples of gaps and consequences of failures.

It was suggested the report include sections on problems (especially with monitoring) and on things users would like to see in a monitoring system.

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

Chair: Joseph Valenzuela

Vice Chair: Jeff Long

Output: Revision of the Guide

Established: September 2014

Expected Completion Date: January 2018

The Working Group I-29 met on Tuesday, May 12th, 2015, at San Antonio, TX in single session chaired by Joseph Valenzuela with a total of **14 attendees** (6 members, 1 corresponding member, 1 new member and 6 guests). Quorum was met.

Meeting was brought to order at 1:35 pm.

The minutes from the last meeting were approved.

It was discussed by the chair, Joseph Valenzuela that the PAR submitted in April 2015 will be reviewed for approval by NESCOM at the June meeting. All working group comments to the PAR from the January 2015 meeting were incorporated.

It was noted that comments were received from Gordie Halt, Alla Deronja, Jack Wilson, Mike Higginson, Ilia Voloh and Chip White.

The group reviewed Mike Higginson's comments to Section 5 of the guide and provided feedback to technical comments.

The group reviewed Jack Wilson's comments to Section 6 of the guide and provided feedback to technical comments. The WG agreed to expand the section to include a subsection dedicated to Saturation effects on microprocessor relays.

The group reviewed Alla Deronja's comments to Sections 6 & 7 of the guide and provided feedback to technical comments.

The group reviewed Gordie Halt's comments to Sections 1, 4, Annex B and Annex E of the guide and provided feedback to technical comments.

Open Action Items:

- 1) Need to receive comments from the following:
 Section 4: Lee Bigham, Kevin Donahoe, and Illia Voloh
 Section 5: Alex Lee
 Section 6: Phil Zinck
 Section 7: Eric Monson
 Annex A: Tapan Manna
- 2) Jeff Long and Joseph Valenzuela will develop/compile an excel spreadsheet used to track the comments and proposed changes to the guide.

New Action Items:

- 1) Illia Voloh indicated there was an error between time to saturate calculation in the guide (equation #20) vs the IEEE excel spreadsheet that is posted on the PSRC website. Alex Lee agreed to review the IEEE excel spreadsheet calculation and compare this with equation #20 in the guide. Illia Voloh and Joseph Valenzuela to reach out to previous guide contributors for insight to equation basis.
- 2) The WG agreed to add an Annex to the guide to include several CT sizing examples/applications.
- 3) Jack Wilson to check C37.109 guide on shunt reactors and compare the information to Section 7.1.3 of the C37.110 guide to confirm the information agrees with each other.
- 4) Will Knappek to provide paper to the WG that supported the table shown in Annex C.

Members in attendance at the meeting were:

| Member | Company |
|-----------------------------|----------------------------------|
| Joseph Valenzuela (Chair) | Kiewit Engineering & Design, Co. |
| Jeff Long (Vice Chair) | Kiewit Engineering & Design, Co. |
| Alex Lee | AEP |
| Michael Higginson | S&C Electric |
| Will Knappek | Omicron |
| Jack Wilson | Ameren |
| Meyer Kao (new member) | Patterson Power Engineers |
| Corresponding Member | Company |
| Alla Deronja | American Transmission Company |

During the I Subcommittee meeting, Mike Meisinger inquired about those working group members that worked on the earlier revisions of documents to attend the revision meetings to pass on the knowledge and lessons learned from previous writing efforts. It would help the new writers understand the whys of some of the decisions made.

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

Chair: Ljubomir Kojovic

Vice Chair: Tapan Manna

Output: Revision of the Guide

Established: September 2014

Expected Completion Date: December 2018

Working Group I30 held its meeting in a single session on Tuesday, May 12, 2015. This was the third meeting for this working group.

There were 5 members and 17 guests attended the meeting.

Before the San Antonio PSRC meeting, comments received on the submitted PAR for I30 working group were reviewed and implemented in the updated PAR with the help of the IEEE NesCom administrator.

During the meeting, this updated PAR for I30 working group was discussed. Main aspect of the Guide revision is harmonization with the IEC 61869 standards.

All participants presented their applications and interest in the Rogowski coil-based solutions. It was a unanimous conclusion that this is an evolving technology with promising opportunities to provide improved power relaying solutions.

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

Chair: John Tengdin

Vice Chair: Brian Mugalian

Output: Revision

Established: September 2014

Expected Completion Date: TBD

I31 met on May 13, 2015 with two members and three guests. Ken Fodero will become a new member. It was determined after conference calls held after the January 2015 JTCM meeting that the PAR revision for IEEE 1613.1 be withdrawn, and that a new PAR be submitted for revision of IEEE 1613. This working group would be disbanded and new working group formed with Substation C2. Further discussions will occur at the September 2015 meeting.

Task Force reports

ITF32: Review Survey of Relaying Test Practices (2001 report)

Chair: Andre Uribe

Vice Chair: Joe Uchiyama

Output: Review

Established: January 2015

Expected Completion Date:

Andre Uribe reported that the survey from 2001 is obsolete. The Task Force concluded that the survey should be updated to reflect new data on micro-processor based relays and input from NERC. The Task Force will meet again in September 2015.

Liaison Reports

Instrument Transformer Subcommittee:

The fall meeting of the Instrument Transformer Sub Committee will be in Memphis, TN, 1 – 5, November 2015 at the Peabody Memphis.

There are three active working groups.

PC57.13 Standard Requirements for Instrument Transformers is being revised – Draft 5.

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

Recommended a Task Force to determine if a working group is needed to define relay testing terms. See recommendation from Amir Makki.

Dear Jeff and Brian,

As promised I have prepared the following description for discussion during the I Subcommittee meeting in Milwaukee:

We would like to discuss the forming of a new Task Force to determine whether a Working Group should be formed to define the terms used to describe the various types of relay testing techniques applied in our industry. Examples of testing terms include but are not limited to: **element, scheme, system, state, dynamic, transient, and end to end**. The output of the Task force would be a recommendation to the subcommittee.

The work is needed because there is a whole family of relay testing terms that are not defined in the IEEE dictionary. The terms are not uniformly used and mean different things to different producers and users. Providing standard definitions for these terms will help eliminate any confusion. The resulting standard definitions should also be submitted to the I2 Working Group for inclusion in the IEEE dictionary.

Thanks,
Amir Makki

It was determined by the Subcommittee that a Task Force be formed. Amir Makki entered the motion and seconded by Alex Apostolov. ITF 33 will meet in September 2015 – named Definition of Relaying Testing Terms.

New Business

None

J: ROTATING MACHINERY PROTECTION SUBCOMMITTEE

Chair: M. Yalla

Vice Chair: M. Reichard

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 Jan 14, 2015 with 15 members (achieving quorum 15/26) and 15 guests. There was a call for the approval of the minutes of the Sep 2014 meeting in Milwaukee, WI. These minutes were approved unanimously 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

Established: 2011

Output: Report to Subcommittee

Status: 10th Meeting

Expected Completion Date: 2016

Assignment: 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 group met on 1/14/2015 in Garden Grove, CA for a double session with 12 members and 15 guests in attendance.

The Chair announced that due to personal reasons, Vice Chair Mukesh Nagpal will no longer be able to attend these meetings. Manish Das was nominated and accepted as the new Vice Chair.

The meeting started with Jun Verzosa making a presentation on Testing of Out-of-Step Protection. There were several questions and good discussions following the presentation.

Dr. Rama Gokaraju presented an example of Equal Area Criterion Scheme. A detailed discussion was held on the applicability of x_d'' vs. x_d in the simulation. It was recommended that the equal area curve be re-evaluated by the usage of x_d'' .

Gene Henneberg presented Triple Lens Scheme.

Sudhir Thakur presented the draft D4 version of the paper as it stands today. He discussed the NERC TRD recommendation to not set the out of step protection unless stability studies have been performed and a section was added in the paper to document J subcommittee position.

There were no formal assignments made. The team agreed that the paper as it stands today has good content and would now be formatted and reviewed in entirety by three reviewers and the individual contributors would be reviewing their sections.

The minutes from the Sep 2014 meeting was approved.

The working group will have its 11th meeting in May 2015, with the need for a single session, computer projector and seating for 35 people.

J6: Protection Issues Related To Pumped Storage Generation

Chair: Joe Uchiyama

Vice Chair: Dale Finney

Established: January 2011

Output: IEEE Transaction Paper

Assignment: Based on the industrial survey, evaluate and report on protective relaying concepts and practices applicable to a combination of generator and motor, and performance of plant protective systems. To summarize a report of the trend of the last thirty-five (35) years of Pump Storage unit protection since PSRC presented the summary report in May/June 1975.

Scope: Summarize the trend of Pump-Storage motor and generator protection for last thirty-five (35) years of industry practices.

Draft: 5.0

The J6 WG met on Tuesday, Jan 13, 2015 at 4:30 p.m., in Garden Grove, CA in a single session with seven (7) members and eight (8) guests. A quorum was met so the September minute was approved.

After introductions, Chairman reported the results of J-subcommittee ballot and distributed the agenda, list of comments, draft 4.0 which was used for J-subcommittee ballot.

The comments on the draft-3.2 were reviewed and the following topics were discussed:

- Topic-1 (Device 27TH) Third Harmonic Undervoltage Relay/Element

In general, most units will generate 1% or more 3rd harmonic voltage. If the reduced or no 3rd harmonic voltage at the neutral is detected, it determines as a short circuit between a stator winding(s) and ground. 27TH 3rdharmonic under-voltage relay/element detects this condition. 100% ground fault detection is achieved by the combination of a fundamental frequency overvoltage

relay/element (59G covering 85~95% of the stator windings from unit terminal) and a 3rd harmonic undervoltage relay/element (27TH covering 90~100% of stator windings).”

- Topic 2 (Device 78) Out of step Relay /Element
During a loss-of-synchronism (aka out-of-step) between a unit and a system, the apparent impedance at the unit terminal will vary as function of the unit and system. This variation in impedance may be readily detected by out-of-step relay. See C37.102 for the details.
- Topic-3 (Title of Paper)
“Protection Practices for Pumped Storage Generation”
- Topic-4 (various typos & Clarifications)
The document was cleaned up with the basis of J-subcommittee ballot comments. Dale Finney (Vice Chair) will review the document and make any editorial corrections.
- Next step :
 - ✓ As soon as Dale returns the reviewed document to the chairman, he will update the document and send to WG members for the final review.
 - ✓ If there will not indicate the substantial comments from the WG, chairman will submit to PSRC officer for their approval.
 - ✓ Upon of the PSRC officers’ approval, the chairman will submit to IEEE for their editorial review and followed by final submission after addressing the comments.

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 2015

Status Draft 1.0

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

WG Chairman Mike Reichard is presently deployed; Vice Chair Steve Conrad conducted the meeting and thanked Mike for his military service.

The working group met with 3 members and 14 Guests (not achieving quorum) on January 13, 2015 in the Regency-Hyatt.

The meeting minutes from the September meeting were not approved as the quorum was not met, vice chair will call for email approval. The chair discussed the assignment of the WG and summarized draft 1 of the report.

Zeeky Bukhala agreed to write both the Abstract and Conclusion and submit each prior to February 15, 2015. The VC will incorporate these and request the WG review the draft 2 for comments prior to the May meeting. The intent of the WG is to submit the report to the SC after 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: 5th Meeting

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

The group met on 1/14/2015 in Garden Grove, CA with 6 members and 9 guests in attendance.

The minutes from Sept 2014 meeting were approved.

The meeting began with a review of two working group assignments.

Fundamental Generator Protection Relay Deficiencies on Large Generators (Maughan Paper).

The key aspects of the paper were identified. It was agreed that a discussion on faults originating from stator conductor fractures should be captured for ultimate inclusion into the next revisions of C37.101 and C37.102.

A Practical Improvement to Stator Ground Fault Protection Using Negative Sequence Current (Patterson Paper)

Key aspects of the paper were identified. Several attendees commented on coordination issues related to the VT fuses. There was a discussion on the need to secure the subharmonic injection scheme for VT secondary faults.

Russ Patterson raised the question of whether the report would include a section on resonant grounding of generators.

Nate Klingerman discussed a recent experience of an intermittent ground on a large thermal unit. Nate will collect some data for this event to share with the working group.

The chair shared a proposed outline of the paper. No formal assignments were made. However the working group members were urged to review the outline and consider writing assignments for the next meeting.

The working group will have its 6th meeting in May 2015, with the need for a single session, computer projector and seating for 25 people.

Avoid conflict with K11 WG meeting.

J13 : Modeling of Generator Controls for Coordinating Generator Relays

Chair: Juan Gers

Vice Chair: Phil Tatro

Established: September 2012

Output: Report to Subcommittee

Expected Completion: 2016

Status: 7th Meeting

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

WG Report

The working group met with 16 members and 8 guests present. A quorum was achieved.

The working group approved minutes of the September 9, 2014 meeting as presented. Phil Tatro reported that minutes of the May 13, 2014 meeting were approved by email ballot subsequent to the September meeting.

Sandro Aquiles-Perez presented a summary of methods available for modeling protective relays in transient stability programs and the advantages and disadvantages of each method. The methods presented include manually modeling the expected operation of the relays and use of generic models or detailed models that respond to voltage and current phasor data calculated by the program. He also discussed transient stability program limitations such as only having positive sequence data available. Sandro presented information on a third approach to provide a link between the transient stability program and protective relay software. In this approach the positive sequence solution is exported to the protective relay software which then solves the negative and zero sequence networks and assess the relay operation using a detailed relay model. The protective relay software then exports the relay state back to the transient stability program to determine any switching to be modeled in the next time step solution. An example was provided for a generator loss-of-field event. Working group members discussed limitations of converting the generator capability curve from the P-Q plane to the R-X plane which requires an assumed voltage.

Dale Finney illustrated the formulation to calculate the critical angle and critical clearing time for a balanced three-phase fault. For this he used an example from the book by Grainger and Stevenson that considers a three-phase fault in a system with a generator swinging against an infinite bus. This method can provide a first order approximation to verify whether transient stability results are in the right range. He validated the results by using a Matlab Simulink software that replicated the example. Working group members discussed interest in repeating with a local networked system modeled for which the critical angle is based on a fault and tripping one of the local networked lines.

Robert Thornton-Jones provided a liaison report for ESCS. He reported present activity is focused on bringing standards up-to-date to support validation and testing under NERC requirements. The next meeting is at the July 2015 Power & Energy Society meeting in Denver. Charlie Henville indicated he will attend the meeting. Juan Gers requested that others consider attending as it would be good to have two or three working group members attend. Robert will provide a presentation to the working group at the next meeting in May 2015, subject to ability to attend.

Juan Gers reviewed the draft outline for the working group report and requested volunteers to work on drafting sections of the report. Juan and Phil will work on compiling the draft sections into a first draft. Volunteers so far include:

- Introduction to the paper and discussion on disturbances and stressed system conditions – Dale Finney and Juan Gers
- Characteristics of PSS control systems and relationship with generator protective systems – Mike Basler
- Operating characteristics, settings, and coordination of overexcitation and underexcitation limiters – Normann Fischer
- Modeling of protective relays in power dynamic stability modeling software. Sandro Aquiles-Perez, Deepak Maragal
- Coordination checks of the timing and sensitivity of protective elements with generator control characteristics. – Normann Fischer
- Modeling tripping of the generator and delaying tripping of the excitation system – Charlie Henville

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: 3rd Meeting

The working group held its third meeting on Tuesday, January 13th, 2015 with 9 members and 9 guests in attendance

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

- I. Chair kicked off the meeting with introductions and a brief review of the assignment and background of the working group.
- II. Minutes from the September 2014 meeting were approved.
- III. Assignments from the September meeting were reviewed
 - a. Chris Ruckman continues to have discussions with ISO-New England to find any information that they have regarding the restoration process following the 2003 Northeast blackout.
 - b. Chris Ruckman shared an updated combustion turbine oneline that included the addition of a diesel generator (DG) to the low voltage (LV) distribution system. Working group agreed there was no need to show other LV loads other than noting their existence in the text. Chris will also include protection associated with the DG to the oneline
 - c. Dale Finney shared an updated hydro oneline that included inputs from Sungsoo Kim and Russ Patterson. Working group recommended removing the redundant protection packages to maintain consistency with the other onelines. Nathan Klingerman will send his inputs to Dale.
 - d. Chris Ruckman's literature search on emergency power (DC and UPS) during black start identified two papers published in 1995 and 2005 that only had cursory observations on the subject. Working group agreed there is a need to include a discussion on the importance of emergency power during unit trips and/or shutdowns and some guidance around battery sizing.
 - e. Matt Basler reported that he is continuing to research the identification of potential issues with excitation during black start. During discussion the following items were suggested.
 - i. Manual versus automatic regulation during black start. Deepak Maragal shared his experience that led to the use of manual regulation during black start operations.
 - ii. Limiter and protections during manual regulation
 - iii. Careful review of unit online or offline status as indicated to the exciter during black start and its impact on exciter control (this also applies to turbine control).
 - f. Additional discussion generated during the assignment review included:
 - i. It was agreed that there was no need to address protective elements by application, i.e., diesel, combustion turbine, etc. The paper will outline protections across all plant types and highlight any differences in application.
 - ii. There should be a short discussion on steam turbine black start plants focusing on the start sequence and highlighting any protection differences.
 - iii. The onelines will highlight any elements requiring special attention.
 - iv. Members shared experience with transformer in-rush and its impact on differential protection. Dale Finney indicated he has some oscillography illustrating this phenomenon.
 - v. Reduced fault contribution has an adverse impact on some protective elements, particularly current elements.
- IV. Next Steps.
 - a. The following tasks were assigned
 - i. Combustion turbine black start write up – Chris Ruckman

- ii. Hydro turbine black start write up – OPEN
 - iii. Other plant startups (steam turbine, VSC HVDC, distributed power, etc.) – OPEN
 - iv. Protection element write ups. Chair pointed out that there are existing write-ups on most functions in the existing literature:
 - 27, 59 – Dale Fredrickson
 - 46 – Derrick Haas
 - 50, 51 (station service), 87SP – Sungsoo Kim
 - 87 – Dale Finney
 - Inadvertent energization – Nick Hoch
 - Chair and Vice-Chair will draft the remaining elements.
- b. Chair appealed to members to look for cases of when system restoration has been applied, Dale Fredrickson also appealed to members to find actual System Restoration Plans for consideration.

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

Chair: Wayne Hartmann

Vice Chair: Joseph Valenzuela

Established: 2015 (1/15)

Output: Report

Status: 1st Meeting

Assignment:

1. Review, compare and contrast NEMA MG-1 with ANSI C50.41-2012 regarding transfer criteria.
2. Investigate existing open-transition motor bus transfer (MBT) actual data from multiple events at the medium voltage level. Examine for current versus Volts/Hz at transfer periods to see if there is a correlation.
3. Examine published reports and papers on motor bus transfer criteria to reconcile the conclusions with field results and C50.41 and NEMA MG-1.
4. Study motor protection oscillography voltage and current to identify which motors are generating and which are motoring. Examine v/Hz and reacceleration current of composite bus and individual motors.

Activity:

1. The WG met January 13, 2015, with 15 members and 5 guests. Chris Ruckman served as Vice Chair. This was the 1st meeting of the WG after 2 TF meetings.
2. Chair reviewed history of TF and reviewed assignment for members and guests.
3. Chair stated now the TF has turned into a WG, the intent is to produce a written Report to Subcommittee.
4. Tom Beckwith presented [1] Test Results and observations from testing of MBT relays under IEEE defined inertia (bus decay) values for frequency and voltage and [2] Field Results of actual unplanned Fast and In-Phase transfers from multiple power and industrial plants.

Discussion:

1. It was noted on the last C37.96 update that the WG had difficulty determining origin/rationale of the 1.33 V/Hz transfer limit in C50.41. It was noted that the 10 cycle synchronous transfer time limit in C50.41 also needs origin/rationale investigation.
2. The Test Results and Field Results called the 1.33 V/Hz and 10 cycle maximum synchronous transfer limits into question. The Field Results demonstrated there is no corollary of V/Hz to current pickup at transfer (I_{MAX}/I_{FLA}).

3. Comment to Test Results was voltage and frequency may not decay as per the 2012 IEEE Report defined rates. It was noted that the IEEE designated decay rates (inertias) provide a standard per IEEE designated decay rates as a baseline for characterization of MBT equipment performance.
4. Suggestion made that WG attempt to examine aggregate motor bus observed characteristics at transfer and see if torque approximation for aggregate motor bus determined.

Assignments:

1. Chair to investigate use of web for document management for WG.
2. Russ Patterson to report on development of motor manufacturers list to be used to contact these manufacturers about their input on motor torque capabilities versus the C50.41 standard.
3. Wayne Hartmann, Norman Fischer and Derrick Haas to create suggestions for plant monitoring (individual motor relay triggering) so oscillographic information can be captured from individual MV motors when a bus transfer is made.
4. Dale Finney and Prem Kumar to forward information of 1.33 V/Hz origins made during the latest C37.96 revision to the Chair.
5. Murty Yalla and Dale Finney to investigate to examine Field Results data and see if air gap torque could be calculated or approximated.
6. Chris Ruckman volunteered to write up a discussion of changes in the C50.41 2002/2012 documents.
7. Norman Fischer and Derrick Haas to review Test Results and Field Results to further comment on observations given at Meeting.
8. Chair to draft outline of Report.
9. Chair to send link for pertinent paper and report download by WG so volunteer for review of papers and reports made with the lens of comparing and contrasting of transfer recommendations in C50.41 and NEMA MG-1. Chair will call for volunteers WG members have had a chance to review paper and report collection.
 - Assignments 1-7 are to be reported to the Chair by April 15, 2015, for exploration at the May 2015 Meeting.
 - Norman Fischer, Derrick Haas and Nate Klingerman were welcomed as new WG members

Next Meeting:

- Single session; projector, 30 people

Other Reports:

C17: Fault current contribution from wind farm plants

G. Henneberg did not attend the J SC meeting

Liaison Reports

None

Electric Machinery Committee (EMC)

C. Mozina will not be attending PSRC meetings in the future, Zeeky Bukhala will act as a Liason

IAS I&CPS Committee

C. Mozina will not be attending PSRC meetings in the future

Need to find a Liason

Nuclear 1E WG

Standard 741 will be split into two parts. Prem will provide details in the next meeting.

P. Kumar

NERC (related to rotating machinery)

J. Uchiyama

PRC025-1 was approved in July
When will it be effective – October 2014. It covers 21 and 51V, etc.

PRC026 is finally approved after many ballots

Chair instructed Juan and Sudhir to check this document and report it at the next subcommittee meeting on its impact on J subcommittee documents.

PRC027

It is expected that 027 will replace PRC 001

Any system change that increases fault current by 10% requires a new coordination study

Coordination Reports

None

Old Business

J SC to investigate with D SC Device 78 definition C37.2 – 2008 to change it to Loss-of-Synchronism protection. Gary Kobet will be the point of contact.

The proposal from Gary Kobet was discussed and it was decided by the subcommittee to modify the present write up in C37.2 as follows:

Device number 68—blocking or “out-of-step” **blocking** relay

A device that initiates a pilot signal for blocking of tripping on external faults in a transmission line or in other apparatus under predetermined conditions, or cooperates with other devices to block tripping or reclosing on an out-of-step condition or on power swings.

Device number 78 — phase-angle measuring **or out-of-step tripping relay**

A device that functions at a predetermined phase angle between two voltages, between two currents, or between a voltage and a current **or a device which initiates tripping on an out-of-step condition.**

New Business

New J Subcommittee Members

Chair announced that the following are appointed as J subcommittee members

1. Chris Ruckman
2. Hugo Monterrubio
3. Manish Das

New Chair and Vice Chair of J Subcommittee

Chair Murty Yalla thanked all the subcommittee members for their contributions during his term for the past 6 years and announced that this is his last meeting as a J subcommittee chair and Michael Reichard will take over the responsibility as a Chair of the J subcommittee from May 2015 meeting.

Chair also announced that the new Vice Chair of the J subcommittee is Dale Finney.

The meeting was adjourned

K: SUBSTATION PROTECTION SUBCOMMITTEE

Chair: M. J. Thompson
Vice Chair: D. G Lukach

The K-Subcommittee met on Wednesday, May 13, 2015 in San Antonio, TX, with 23 of 32 members and 43 guests in attendance. A quorum was achieved. Steve Conrad motioned to approve the January, 2015 subcommittee meeting minutes. Gene Henneberg seconded. Vote was unanimous to approve.

Jeff Barsch has accepted an invitation to join the K subcommittee.

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 5.2a
Expected Completion Date: Dec.2016

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.

San Antonio, TX 12th May, 2015

The K1 working group met in a double session. 12 members and 5 guests were present. A call for quorum was achieved towards the end of the first session. A motion to approve the minutes from the meeting in January 2015 Garden Grove, CA was called. Mike Thompson moved to approve the minutes, Charlie Henville seconded the motion, and the meeting minutes were approved.

The IEEE Patent disclosure slides were presented.

The WG worked on the current draft 5.1b. The next draft will be 5.2a

The following items were discussed:

- Charlie Henville presented the results of his review of the short circuit analysis prepared by Eli Pajuelo section 10.
- Charlie proposed removing the section comparing the results of commercially available fault simulation programs. Eli Pajelo responded to Charlie via email that he felt that there was benefit to leave this section in the guide. The group discussed this and agreed that it is not appropriate to discuss specific fault programs in the guide. The group also decided to provide in the appendix a case study with a specific example calculation based on defined inputs and allow the user to compare the case study results to the results produced by specific fault analysis program.
- The level of detail provided for time domain simulation and modeling of core saturation and core proximity CT saturation was discussed. Eli's more detailed text regarding modeling will be inserted as an annex and referenced in the main body of the guide.
- Charlie Henville presented a high level overview of the Fault Current Distribution Across PSTs provided by Zoran Gajic section 10. It was decided to place some of the generic equations and diagrams in the beginning of the Short Circuit study.
- Mike Thompson reviewed the results of his meeting with the Transformers Committee discussing the suggested updates and additions to their new dual logo IEC/IEEE standard 60076-57-2012 on specifying Phase Shifting Transformers. The new standard is currently in ballot resolution and will not be updated with the K1 group's recommendations. The connections for zero sequence impedance testing of a two core PST as part of the findings were discussed.
- Demetrios Tziouvaras presented his contribution to section 11 on Distance Protection of PSTs.

- Lubo reviewed Zoran Gajic's contribution regarding the calculations of PST parameters used by protective relays.
- Location to the LTC advance-retard reversal switch was discussed. Zoran Gajic's contribution on differential protection identified a PST configuration where the reversal switch was provided in the series secondary delta winding rather than the exciter secondary winding. This configuration would require special consideration for the 87S differential protection. The group discussed that this is not a typical design and that it would be appropriate to include this issue as a brief discussion without a figure.
- Mike Thompson reviewed his contribution to section 11 on circulating current protection.
- Mahfooz Hilaly reviewed his contribution to sections 11.2 and 11.3 on Phase, Ground and Neutral Overcurrent protection.

Assignments

- Charlie to discuss with Zoran Gajic shortening the Fault Current Distribution Across PSTs addition to section 10 and provide the detailed analysis as an appendix.
- Mike Thompson to add a figure to show a two core asymmetrical design with a buried delta winding.
- Demetrios Tziouvaras to elaborate on his contribution to section 11 on Distance Protection of PSTs to include more discussion of apparent impedance seen by relays for varied tap positions. R-X diagrams will be included.
- Lubo Sevov to work with Zoran Gajic and come up with write-up on the generic calculations for PST data used by the relay, and add paragraph about the application of a Reverse Switch across delta series secondary winding and the impact on the 87S protection
- Mahfooz Hilaly to elaborate on his contribution to section 11 overcurrent protection based on group discussions and comments.

Authors are requested to provide contributions by 30th July.

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

Chairman: Roger Whittaker

Vice Chair: Adi Mulawarman

Established: 2011

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

Draft : 2.2

Expected Completion Date: Dec. 2016

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

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

18 out of 26 of members attended WG. There was a total of 47 attendees. A quorum was achieved.

2. Approve Garden Grove meeting minutes

Phil Tatro motioned

Ray Young seconded

The minutes were approved by unanimous vote.

3. Request-go-to-ballot results: 26 members, 26 voted, 25 approving

Don Lukach indicated that we need to go through SA Editorial. 30 day review at the same time get the ballot pool setup/invitation.

Roger will request to main committee to go to Ballot.

4. Discuss comments, review final draft

Update figure B.1 to say 50BF "current detector" instead of Fault Detector. Roger is making editorial changes to special words such as "must", "shall", and "should". These words are being replaced in ways that do not affect the meaning or semantics of the content presented.

5. Breaker failure events?Adjourn

Several were mentioned.

K10: SCC21 DISTRIBUTED RESOURCES STANDARD COORDINATION

Chair: Gerald Johnson

Vice Chair: TBA

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 May 12, 2015 in San Antonio, TX with 11 members and 5 guests in attendance. Just to repeat from the last meeting, 1547a - 2014 which is the amendment to 1547-2003 that includes changes to voltage and frequency ride through and voltage regulation was approved. The document is available for purchase and cost \$42 for IEEE members. P1547.1a is an amendment to the conformance testing standard to match up with the changes in 1547a-2014. This standard was approved in April 2015 and will soon be available for purchase. P1547.8, "Recommended Practice for Establishing Methods and Procedures that Provide Supplemental Support for Implementation Strategies for Expanded Use of IEEE Standard 1547" completed its first ballot and is still in the process of resolving comments. P1547 working group met at the NRECA headquarters in Washington DC Feb 10 through 12 to continue work on P1547. Many utility representatives were present for this meeting as well as consultants and Inverter manufacturers.

All minutes for working group meetings are posted on the SCC21 web site under "logistics" for the particular document. All revisions to P1547 must be completed by 2018. If you are interested in participating in the revision of P1547, please check the SCC21 web site for meeting information. The next meeting will be at the in Boston at National Grid headquarters June 1 through 3, 2015 and will focus on P1547.

Mark Sirra attended our Tue meeting and provided input on the many web X meetings held since the Feb meeting in Washington. There are 4 groups working on topics that we hope will be ready to roll into P1547 at our June meeting, and will ultimately become the first draft of the revised document.

After discussing the standards, we had an open discussion of what was happening around the country related mostly to solar, inverter based installations and some wind projects. Still lots of incentives and mandates for installing solar power.

K11: Open Phase Detection for Nuclear Generating Stations

Chair: Charlie Sufana

Vice Chair: M. Urbina

Output: Report

Draft 2.0

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

Introductions were done after a welcome by Chairman Charlie Sufana. There were 12 members and 12 guests in attendance for the May 13, 2015 meeting.

The minutes from the January 14, 2015 K11 meeting were read and approved.

Mike Urbina had nothing new to report from the NEI.

Charlie then quickly reviewed updates to the report that have been added since the last meeting. Sections for optical CTs (4.8.1) and the active injection scheme (4.9) were added.

The working group then had a presentation by Greg Franklin, PSSTech. He provided the information that is now part of 4.9. Greg explained the active injection scheme that EPRI has been developing and pointed out the following:

1. Designed for transformers with physical or phantom tertiaries
2. Trips based on active injection or passive overcurrent (50N)
3. Active injection only works up to some ground fault impedance
4. Detects a change in zero sequence impedance
5. For security, 5th harmonic of neutral current is used
6. Active element and passive elements have separate timers

There was a discussion about open phase on delta primary transformers, Normann Fischer (SEL) indicated that the open phase on a delta primary transformer will show no voltage difference. There was an extended discussion about high side PTs vs low side PTs.

Wayne Johnson (EPRI) suggested removing sentence on page 5, regarding presenting findings that could impact proper operation of equipment important to safety. There was no disagreement.

Charlie next went over the Alstom optical CT section that was added. He indicated that it was part of much larger paper that Alstom had provided to him.

Wayne Johnson (EPRI) and Bob Arritt (EPRI) indicated that the harmonic signature of an open phase was patented by EPRI. Charlie proposed removing part of the figures that were included with the optical CT material.

It was requested to distribute the Alstom material, but it is not clear if it is proprietary. Charlie indicated he would check with Alstom to see if the paper could be sent to the working group.

There was a discussion about the use of metering class CTs to get enough accuracy to measure magnetizing current. With some relays, metering class CTs might be just as good as using optical CTs. Charlie asked if anyone would be interested in adding something regarding the use of metering class CTs. Wayne Johnson and Bob Arritt suggested moving the Alstom material after page 36 into an appendix. Charlie will edit the draft to see how it would fit.

Charlie suggested finishing this at the September meeting and publishing the initial version on web.

K12: P1032 Guide for Protecting Transmission Static Var Compensators.

Chair: John Wang

Vice Chair: Martin Best

Established: May 2013

Output: Guide for Protecting Transmission Static Var Compensators

Expected Completion Date: December 2016

Draft 9

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

PSRC K12 had a meeting on Monday, May 11, 2015. Satish Samineni led the meeting as the Chair and Vice-Chair couldn't make it to the meeting. K12 had 3 members and 12 guests present. Quorum was not met. One guest volunteered to be a member.

The K12 meeting minutes from January meeting were reviewed and approved after the meeting through email.

In the May 11 meeting, the working group reviewed consolidated K12 comments and completed revisions to Sections 6.1.1.2 to 7.1 of the draft provided by K12.

WG K12 plans to have another web meeting possibly in August.

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

Chair: Ilia Voloh

Vice Chair: Joshua Park

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

Draft 1.4

1. WG met on Tuesday, May 12th, 2015 with 5 members and 6 guests.
2. WG Vice-Chair Joshua Park was not able to attend this meeting.
3. IEEE Patent slides were introduced.
4. There was no quorum to approve January 2015 Meeting Minutes. Therefore, Meeting Minutes approval will be done by chair via emails.
5. Review of Prior Assignments:
 - o New section 5.8 Sample protection system was added, result of contribution from Paul Marken. Group agreed that this section needs to be expanded as providing indication of protective and control functions protecting segments of the bank.

- It was agreed to move Appendix H table listing protection and control actions to move into new section 5.8.
 - Correction in Section 4.2.3 “Line Harmonics” provided by Tapan Manna were incorporated in the draft.
 - Additional assignments were not provided, members were reminded to contribute
6. New Assignments
- Satish Samineni agreed to review section 5.3 Capacitor Protection.
 - Galina Antonova agreed to review section 5.1 Protection and Control Philosophy.
 - Add new section on capacitor bank modeling and lab testing. Joshua Park will write this based on his experiences with RTDS testing on series compensated line protection.
 - SSR section 4.2.6 and Annex A Low-frequency transients and other sections still need to be reviewed with the latest information in this area.

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

Draft 4.0

The working group met on May 13, 2015 with 38 participants (13 members and 25 guests).

Minutes of the January meeting approved by email stands final without any correction.

Extended abstract submitted for the IEEE PWRD Special publication has been accepted for full paper submission which is due by July 1, 2015.

At this point we have two pending assignments. One of them is new (section 4.2.4) and the other section 6.3 is due for a while – hard deadline for submitting all assignments is May 22, 2015. We are also waiting for bibliography and source figures for sections 4.7.1 and 6.2.

We had discussions on sections 4.4 and 6.2. It was discussed to add a paragraph on other communication possibilities besides HSR/PRP - Rich Hunt agreed to contribute on this topic by May 22, 2015.

Final draft report will be send to members for comments by July 10 - comments from members are due by August 14, 2015.

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: 2

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 19 members and 21 Guests on 13 May 2015, at the Hilton Palacio del Rio-San Antonio, TX. The working group consists of 38 members. Quorum was achieved at this meeting. The minutes from the January – Garden Grove, CA meeting were motioned for approval by Brian Boysen and second Suparat Pavavicharn, motion/minutes were approved.

The chair reviewed and displayed 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 discussed. As a requirement of standards development work all participants are required to indicate both

their Company and Affiliation. 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 1.

Clause 9.0 – Don Ware will review clause and discuss the use of 63P in LTC cabinets of transformer, also look at fig 28/29 to ensure clarity with text discussion of bellows contacts.

Clause 11.0 Discussed the removal of 86T lockout tripping and modify paragraph to include trip output. Also the WG removed the sentence on excessive damage.

Clause 12.0 Quite a bit of debate concerning whether include/remove the clause on re-energizing (vote in favor 12 to 2). Agreed to change the title to Post Trip Analysis Prior to Re-energizing.

Clause 13.0 Pat Carrol will review the clause.

New Assignments were made as follows:

| | | |
|----------------------|---|--------------------------------|
| Clauses 1,2,4 | - | Jeff Long |
| Clause 3 | | Mark Schroeder (terms co-ord.) |
| Clause 10 | | Rich Young |
| Clause 15 | | Alla Deronja |
| Annex F Bibliography | | TBD |

Annex A was discussed and Mike Thompson commented on the Transformers Committee (TC) activities which includes the updating of C57.109 Through Fault. Russ Patterson will be contacting the TC to revisit the changes. Brian Boysen and Adi Mulawarman will review the Annex A and Meyer Kao will review Annex C

New member to the WG Nef Torres.

The chair will upload Draft 2 to K16 Central Point.

K17 Geomagnetic Disturbances (GMD)

Chair: Qun Qiu

Vice-Chair: Luis Polanco

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

Draft: 0

1. K17 met on Tuesday May 12th with 36 participants (23 guests and 13 signed members).
2. Chair presented agenda for the meeting of the K17 WG to all participants.
3. Meeting minutes of the K17 last meeting from January 2015 in Anaheim, CA, was previously approved via email.
4. K17 had a short presentation by Gary Hoffman on the introduction to PC57.163, IEEE Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances.
5. Presentation excited some interested discussions about obtaining available GIC measurements, and having what it can be called a "GIC signature" agreeable that can be used on providing guidance on evaluating possible impact on various equipment and an interconnected system.
6. Another input is that this report includes practical aspects on how to design protection schemes and set the relays so they are not susceptible to trip during these events, including impacts on Generators, Transformer, Capacitor Banks, system reactive power issues, voltage stability, and communications issues during DC flowing conditions.
7. Chair will be providing a briefly presentation on next WG meeting about the IEEE PSRC (1996) transaction paper on GMD. This transaction paper will be sent to interested members, so that group can have meaningful discussions about the document and see what can be used as a go-by to develop K17 WC report.
8. Chair will continue to promote open discussions to define a report outline with more inputs and involvement from members/future members and guests.

Chair: Adi Mulawarman

Vice Chair: Surarat Pavavicharn

Established: May 2014

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

Draft: 0

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

14 attendances

9 out of 11 members attended

Two new members added.

2. Approve Garden Grove meeting minutes

Mike T. - motioned

Charlie S - seconded

3. Presentations if any. (Ed Bertolini).

4. Brief on PAR process/submittal/schedule.

5. Work on Scope and Purpose wording (reference PAR preparation blank form; probably go over the complete form of this in September meeting, plan to just discuss scope and purpose on this).

The standard we will be working from was approved March 21st 2002, went through reaffirmation December 5th 2007 and was approved. We received some reaffirmation comment at the time.

Existing scope/purpose.

Unlike newer standards/guides the existing overview section does not have a subsection called out separately as scope and purpose. The scope/purpose seems to be the 4th paragraph in the Overview section as shown below.

This guide is intended to aid those engineers who have reevaluated problems associated with faults within network vaults, particularly for those network vaults located within or near high-rise buildings. It will also identify currently available devices that are being used in network transformer protection schemes. These devices should act to sense the fault and initiate fault interruption locally or remotely, thereby minimizing damage and restoration time. These devices will be described as to their fault detecting capabilities.

Proposed scope

This guide covers currently available 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.

Proposed purpose (per IEEE SA, this is encourage but not mandatory)

This guide is intended to aid those engineers who design protection of secondary network systems.

6. Adjourn

We had discussion with Ed from Richard Manufacturing on Tuesday afternoon.

on the following topics :

- background of ConEd network
- remote monitoring in network protector
- Ed has concerns with the title; misleading; suggestion ...

Protection of the network vs protection of the network transformer. (see PAR form, we ended up changing the title)

We are requesting Ed to look at PSRC C37.108 guide and point out things that are not right and help point to the right document.

Steve Conrad

Suggested a new material how to handle ARM/high speed clearing device on network transformer.

New topic to cover remote monitoring. (but is this protection related? Perhaps?)

We will add and discuss these additional topics at the next meeting.

Adi to follow up with Bruce Mackie on his company design for network protector (something about current limiting fuse on the feeder exit at the substation).

In regards to scope of the guide there are 3 standards that are somehow interrelated.

- 1547.6 distribution distributed resources on network transformers.
- C57.44
- C37.108

Do we eliminate clause 9 on distributed resource from C37.108 and let 1547.6 cover the protection there in relation to distributed resources on network feeders?

Why not let C57.44 group discuss with the 1547.6 group to make sure they don't contradict each other?

Consider moving clause 9 to the Annex so it does not have to be included in the scope.

Lubo and Prem requested to be member. Adi will ask them to review 1547.6 and C57.44 to identify if there are sections that correlate with C37.108 section on distributed resources on secondary network.

Old Business:

No Old Business was discussed.

New Business:

Mike Thompson gave a presentation cross referencing the Transformer Committee standards and guides to that of the PSRC.

The Transformer PCS (Performance Characteristics Subcommittee), requested the PSRC to review and provide comments to C57.21, IEEE Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA. This topic will be tabled until the September PSRC meeting.

The Transformer PWR (Power Transformers Subcommittee), requested the PSRC to review and provide comments to C57.109, IEEE Guide for Transformer Through-Fault-Current Duration. Russ Patterson will be in communication with this committee and as such this topic will be tabled until the September PSRC meeting.

The Transformer UTNP, (Underground Transformers and Network Protectors Subcommittee) requested the PSRC to review and provide comments to C57.12.44, IEEE Standard Requirements for Secondary Network Protectors. C57.12.44 was added to the K18 assignment.

Dr. Murty Yalla presented on IEC functional specifications that may be applicable to this subcommittee. After some discussion, a motion was made by Charlie Henville to form a new working group. Randy Crellin seconded the motion and the vote was unanimous for the new working group. Gustavo Brunello will be the chair of this working group and Abu Bapary will be the vice chair. The specifics are as follows:

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

Chair: Gustavo Brunello

Vice Chair: Abu Bapary

Established: May 2015

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

General Discussion:

No general discussion.

Motion to adjourn made by Steve Conrad and seconded by Adi Mulawarman. Motion passed unanimously.

VIII. Presentations: There were two presentations.

WG D3 - Considerations in Choosing Directional Polarizing Methods for Ground Overcurrent Elements in Line Protection Applications – Meyer Kao

WG K6 – Sudden Pressure Protection for Transformers – Randy Crellin

IX. Adjourn: Meeting was adjourned by the chair at 11:30 AM.