



**POWER SYSTEM RELAYING AND CONTROL COMMITTEE
OF THE IEEE POWER AND ENERGY SOCIETY
MINUTES OF THE MEETING
May 6-9, 2019, Cincinnati, OH**

I. Call to order / Introductions: Russ Patterson

Vice Chairman Murty Yalla, serving the role of Chairman for the absent Chair, Russ Patterson, called the meeting to order at 8:00 am on Thursday, May 9, 2019.

All attendees introduced themselves. First time attendees were asked to stand and reintroduce themselves. A quorum check was conducted, and it was verified that quorum was met with 81 voting members in attendance out of a total membership of 129 voting members. An attendance sheet was routed.

At the conclusion of the meeting, Fred Friend made a motion to adjourn, The motion was seconded by Keith Houser. The motion carried.

II. Sponsors

The committee thanked the following companies that supported our meeting by sponsoring coffee breaks and Thursday morning breakfast.

- Duke Energy
- Power Grid Engineering
- American Electric Power

III. Approval of Minutes / Financial Report: Michael Thompson

A motion to approve the minutes of the January meeting of the PSRC Committee in Garden Grove, CA was made by Ratan Das The motion was seconded by Bill Dickerson There was no further discussion. The motion was approved.

The PSRC committee financial status fine.

IV. Chairman's Report: Russ Patterson

We had 242 attendees for our May 2019 meeting in Cincinnati, OH including approximately 10 newcomers. Unfortunately, I had to leave the meeting early due to a death in the family. I would like to thank Murty, Mike, and Pratap for stepping up to cover my obligations in my absence. It is a pleasure working with friends who are eager to take care of business and help one another.

This was our first meeting using 123Signup for registration. Thank you for your patience as we transition to the new system and a special thank you to Mike Thompson for the effort he put into handling the transition for us. It was an enormous task and he handled it well.

Thank you to all PSRC attendees for making our May 2019 meeting a successful meeting. I wish you a great summer and look forward to seeing you all in Denver, CO for our September meeting.

Sincerely

V. Reports of Interest

A. Technical Paper Coordinator's Report: Murty Yalla

40 papers were submitted for the 2019 PES general meeting (August 4-8, 2019 in Atlanta, GA). 23 papers were accepted.

50 PSRC participants contributed their time and expertise to the advancement of the industry by reviewing papers.

B. Future Meetings: Murty Yalla

September 2019 Meeting; the Hilton, Denver City Center, Denver, CO; September 16-19, 2019.

January 2020 Joint Technical Committee Meeting (JTCM) Hyatt Regency Jacksonville, FL; January 12-16, 2020.

May 2020 Meeting; Sheraton Music City, Nashville, TN; May 4-7, 2020.

Details are posted on the PSRC website.

C. IEC Report: Eric Udren

TC 95, Measuring Relays and Protection Systems

IEC TC 95 creates IEC 60255 series protection system standards – electrical and physical environment type testing, design, safety, and functional behavior. Technical work is carried out by Maintenance Teams (MTs) and by Working Groups led by Convenors. Dr. Murty Yalla of PSRC is Chair of TC 95 internationally.

The Technical Advisory Group (TAG) to the US National Committee (USNC) of IEC for TC 95 meets as a part of PSRC WG I4, International Standards Development, creating US comments and votes on TC 95 standards drafts and process documents at each stage of international development. Eric Udren is the Technical Advisor (TA) to the USNC for TC 95. Deputy Technical Advisor (DTA) is Normann Fischer. The TC 95 TAG Administrator is Pacific Northwest National Laboratory (PNNL), under the US Department of Energy. The TAG Secretary is Jeff Dagle of PNNL. Eric reported on the trend of growing collaboration between PSRC and IEC TC 95 over the last 5-7 years, in a 2017 PSRC in a presentation.

TC 95 MTs last met in Paris in March. The US Technical Advisory Group is currently working with the following standards topics and projects carried out there:

- The study work of TC 95 AHWG 3 on use cases of digital sampled values (e.g. from MU) to relays instead of analog inputs has been approved as basis of a new development WG 2 under Volker Leitloff. A project for a technical report (TR) is starting. PSRC HTF47 has virtually identical scope and is looking at receiving and sharing technical developments. Collaboration is being arranged among WG and Committee leaders to drive towards unified industry guidance.
- There is a new WG on frequency measurement for DER including inverter-based resources (IBR) under TC 8. Our TC 95 TAG had submitted to IEC the NERC report on Blue Cut Fire trips, which was circulated by IEC to all NCs. We will contribute to ongoing standardization work with Normann Fischer of USNC TC 95 and Ryan Quint of NERC helping us interface. We proposed focus on both frequency measurement and response, and logic for response in real-world power system event scenarios.
- TC 95 leadership learned of a new work item proposal (NP) for standardized technical specifications for all product aspects of travelling wave fault locators used on high voltage transmission lines, from TC 85 Measuring Equipment for Electrical and Electromagnetic Quantities. A Chinese fault locator maker initiated this work outside the P&C mainstream. TC 95 thinks this is actually a relay function and should comply with TC 95 standards. We are working through multiple channels to steer this

standardization to a joint working group (JWG). Also, existing 60255 product standards (60255-1, -26, -27) define the product design, environmental withstand, safety, and type-testing requirements for protection systems and included functions like this. For reporting of fault information, 60255-24 (IEC/IEEE COMTRADE) is the widely-used existing solution that already fits here. The appropriate model for new functional standardization of traveling-wave measurement functions is 60255-121, a performance standard for distance relays which incorporates testing requirements and methods.

Other previously-reported standards development projects continue:

- 60255-1 Ed.2, Common requirements – still under revision.
- 60255-187-1: Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers – substantially complete and going to final draft international standard (FDIS) for international vote of acceptance.
- IEC 60255-187-2: Functional requirements for busbar differential protection - Still in table-of-contents and early text stage.
- IEC 60255-187-3: Functional requirements for biased (percentage) differential relays for transmission lines – still being drafted with help of Normann Fischer from USNC and PSRC. In September PSRC D34 under Normann should have a draft to review.
- 60255-132 & -167 – Directional relays – a new functional standard project for which the scope is now established, and the TOC is being developed. 132 is first.

The next meeting of MT4 and other MTs takes place during the week of October 7-11 in Glasgow, Scotland. The following meeting will take place in May 2020 in Dubrovnik, Croatia, jointly with TC 38, Instrument Transformers Committee of IEC.

D. P2800 Report: Bob Cummings

Kickoff at 2019 JTCM –

- The Sub-team scopes have been prepared, and group assignments have been made.
- The P2800 WG is meeting on May 22-23, 2019 in Atlanta at the NERC office. Meetings will also be held in September in Salt Lake City and in December in the Phoenix area. In conjunction with the NERC IRPTF.
- A strawman draft standard had been prepared using 1547-2018 as a base, with the distribution-centric issues removed and the NERC IBR Guidelines added. That draft will be started to be worked on at the May Atlanta meeting.

E. NERC Report: Bob Cummings

Fault-Induced PV Inverter Disturbances

Multi-Pronged Approach:

- Four disturbance analyses and reports
 - Blue Cut Fire, Canyon 2 Fire, Angeles Forest/Palmdale Disturbances
- Level 2 NERC Alerts
 - Identifying extent of condition, and recommending mitigating actions
- Modeling and simulations – Impacts of BPS-connected IBRs
- Outreach to BPS-connected non-BES resources (e.g., < 75 MVA)
- IRPTF Reliability Guideline – for BPS Connected IBRs
- NERC System Planning Impacts of Distributed Energy Resources (DER) Working Group (SPIDERWG)

- Clarifications to NERC Standard PRC-024 – Generator Frequency and Voltage Protective Relay Settings – Drafting Team under way
- Industry education – webinars and workshops
- Held meeting with Protection System manufacturers and inverter manufacturers (April 16-17, 2019) – beginning the dialogue between these important payers
- New Interconnection Agreement White Paper being prepared
- Potential modifications needed to NERC Standard PRC-002 – Disturbance Monitoring and Reporting Requirements

Working with IEEE

- IEEE 1547-2018 Standard applies to inverters connected to distribution systems
- IEEE P2800 Inverter Based Resource Performance Standard – for inverters connected above distribution voltage (including transmission voltages)
- IEEE DER Managements System Guideline (P2030.11)
- Regulator education workshops – IEEE Standards are not enforceable unless:
 - Adopted by regulators
 - Included in interconnection agreements (SGIA and LGIA)

Relevant Links:

Blue Cut Fire Disturbance Report:

<http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-Solar-Photovoltaic-Resource-Interruption-Disturbance-Report.aspx>

Canyon 2 Fire Disturbance Report:

<http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-Solar-Photovoltaic-Resource-Interruption-Disturbance-Report.aspx>

Webinar on Both Disturbances:

<http://www.nerc.com/pa/rrm/ea/Pages/1200-MW-Fault-Induced-Solar-Photovoltaic-Resource-Interruption-Disturbance-Report.aspx>

NERC Events Analysis:

<http://www.nerc.com/pa/rrm/ea/Pages/default.aspx>

NERC Alerts:

<http://www.nerc.com/pa/rrm/bpsa/Pages/Alerts.aspx>

NERC IRPTF Page:

<http://www.nerc.com/comm/PC/Pages/Inverter-Based-Resource-Performance-Task-Force.aspx>

NERC Standards Activities

1. System Protection Coordination (Project 2007-06)
 - PRC-001-1.1(ii) replaced by two new standards
 - PRC-027-1 – Coordination of Protection Systems for Performance During Faults
 - PER-006-1 – Specific Training for Personnel
 - FERC approved both on 8/13/2018

- Both become mandatory and enforceable on 10/1/2020
- PRC-027-1
 - Requires an initial baseline Protection System Coordination Study
 - Requires new coordination study when fault current levels change by ≥15%
- PER-006-1
 - Requires the Generator Operator to conduct protection system training
 - Training on “operational functionality” of protection systems
- 2. Remedial Action Schemes (Project 2010-05.3)
 - PRC-012-2 – Remedial Action Schemes
 - Intended to ensure that Remedial Action Schemes (RAS) do not introduce unintentional or unacceptable reliability risks to the Bulk Electric System (BES)
 - Effective 1/1/2021
- 3. Response to Stable Power Swings (Project 2010-13.3)
 - PRC-026-1 – Relay Performance during Stable Power Swings
 - Ensure that load-responsive protective relays are expected to not trip in response to stable power swings during non-Fault conditions
 - Becomes enforceable on 1/1/2020
 - Specific to certain locations:
 - Angular stability constraint at generators
 - Element that is a monitored system operating limit based on an angular constraint
 - Element that forms the boundary of an island only if the island is formed by tripping the element due to angular instability
 - Where relay tripping occurs due to a stable or unstable power swing during a simulated disturbance
 - Any location that trips in response to a stable or unstable swing
- 4. Generator Relay Loadability (Project 2016-04)
 - PRC-025-2 – Generator Relay Loadability (Eff: 7/1/2018)
 - Certain additions have a specific implementation period
 - Revised to address:
 - Physical limitations of inverter-based resource (IBR) protection
 - e.g., allow calculations could have required an increase in frame size
 - Revisions the load curve to “not infringe” on the pick-up setting
 - Inclusion of the IEEE 50 instantaneous element
 - Generation (i.e., weak) remote to transmission (e.g., >40 miles)
 - Relationship to PRC-023 (Transmission Relay Loadability)
 - Entities must continue to comply with Requirement R1, Criterion 6 through implementation of PRC-025

- IBR considerations for arc flash
 - Directional relaying must be used for lower setting(s) looking into plant

F. CIGRE B5 Activities Report: Rich Hunt

The new B5 Working Groups announced at the last meeting are still actively soliciting members. These Working Group are:

- B5.68 Optimization of the IEC 61850 Protection, Automation and Control Systems (PACS) engineering process and tools
- B5.69 Experience gained and Recommendations for Implementation of Process Bus in Protection, Automation and Control Systems (PACS). The convener is our own Alex Apostolov
- B5.70 Reliability of Protection Automation and Control System (PACS) of power systems – Evaluation Methods and Comparison of Architectures

To participate in one of these Working Groups, you must be nominated through your National Committee. If interested, contact your B5 national representative. (Rich Hunt for the U.S., Richard.hunt@ge.com, Bogdan Kasztenny for Canada, Bogdan_kasztenny@selinc.com. For other countries, contact Rich and he'll provide the name and contact information.)

CIGRE 2019 B5 Colloquium, Tromso, Norway

The B5 Colloquium will be held June 23 through June 29, 2019 in Tromso Norway. Inside the Arctic Circle, and the best place in the world to watch the Northern Lights. (The meeting is in June, during the period of the midnight sun).

Papers are already accepted and completed, and the Special Reporters for the preferential subjects are preparing their reports. The preferential subjects are:

PS 1: Leveraging PMU data for better Protection, Automation and Control Systems

PS 2: Time in Protection Applications – Time sources and distribution Methods

PS 3: Future technologies for inter-substation communication, Migrating Digital Teleprotection Channels to Packet-Based Networks

Head for the land of the midnight sun in June. Details on the Colloquium can be found on the website:

<https://www.cigrebtromsoe2019.com/>

2019 CIGRE Grid of the Future Conference, Atlanta, GA.

The 2019 CIGRE Grid of the Future Conference will be held in Atlanta, GA, November 3-6. The Call for Papers is out. Complete manuscripts (not just a synopsis) must be submitted by July 26, 2019. The paper should be formatted in accordance with the CIGRE Publications Guide.

The Conference also includes a NGN (next generation engineer) paper contest.

For complete details on the CIGRE Grid of the Future, visit the website at <https://cigre-usnc.org/grid-of-the-future/>.

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

G. PSCC Committee Report: James Formea

On behalf of the members and guests of the PSCCC, I want to extend a hearty thank you to the PSRCC members and officers, and especially Mike Thompson, your Secretary, for your continued assistance managing the logistics for our joint meetings. We held roughly 25 meetings of working groups, task forces, and study groups under the P and S subcommittees. The C subcommittee will meet this afternoon.

Some highlights of the week:

- SG P15 met this week and voted to request the formation of a working group to draft a new standard profile for communications with distributed energy resources using IEEE Std 1815, DNP3
- SG P13, working on a protocol-centric beginner's guide to IEC 61850, met for the first time and was very well attended. P13 will progress as a task force.
- SG S12 met to discuss cybersecurity requirements for virtual IEDs and concluded that these requirements will be addressed by the existing WG S1, which is currently active with a PAR to revise IEEE Std 1686.
- The S2 and S4 working groups are both nearing completion and preparing to ballot the P1711.1 SSPP Serial SCADA Protection Protocol and 1711.2 SSCP Secure SCADA Communications Protocol standards, hopefully later this year. These will fall under a new umbrella standard, P1711.
- The S subcommittee was again pleased to host a small number of utility IT representatives as guest attendees to Task Force S9 on Utility IT-OT Cybersecurity Challenges in Roles & Terminology. The input of these individuals is vitally important to the success of the group, and the PSCCC is hoping to see continued involvement from utility IT representatives as this work progresses.

Thank you again for the opportunity to meet with you this week, and we look forward to seeing you all in Denver.

H. 123Signup Update: Michael Thompson

The 123signup system is an integrated system that handles all membership management tasks. Within the system, all members manage their own personal information. The system provides GDPR compliance. The system handles all registration and credit card payments.

Status report:

- Initial load of names complete
 - 615 records
 - 363 have completed profiles
- Incomplete profiles will eventually be purged
- All active SC/WG/TF have been set up
 - 1 Main Committee
 - 7 SC
 - 85 WG/TF
 - 93 Rosters total
- 68% of WG/TF rosters have been loaded
- Officers now must check rosters and adjust as needed
- Initial training of SC/WG/TF officers completed this week
- Instructions and links for WG administrators has been added to the 123signup page on the website.
- Remaining tasks
 - Each SC and WG officer must check their roster for accuracy
 - Once done, Secretary will promote interested individuals to active participants
 - Must be listed as member on at least one roster

I. Standards Coordinators Report: Don Lukach

This report summarizes the status of PAR related projects as of the May 2019 meeting.

Note that the IEEE SA RevCom applies to the revision of existing PAR related projects and NesCom refers to new projects.

IEEE SA commented the following topics of interest:

- myProject changes are expected in the third or fourth quarter, 2019. Expect training to be provided by SA.
- SA Editorial staff plans to be present at the PSRC September meeting. This worked well in 2018, and will assist PSRC greatly.
- iMeet training is planned for an upcoming meeting.
- Policies and Procedures training is planned in the near future..

Main Committee PAR Submissions approved at the May meeting*:

PC37.99	Guide for the Protection of Shunt Capacitor Banks
PC37.109*	Guide for the Protection of Shunt Reactors

*Contingent upon WG final affirmative vote.[Received post Main meeting]

Main Committee PAR Submissions of projects to SA ballot approved at the May meeting:

PC37.91	Guide for Protecting Power Transformers
PC37.108	Guide for the Protection of Secondary Network Systems
PC37.235	Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes
PC37.250	Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

RevCom/ NesCom approval or acceptance of projects since January 2019:

PAR Number	Project Type	Title	Status
C37.247	New	Standard for Phasor Data Concentrators for Power Systems	Complete
PC37.90.2	Revision	Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	WG Draft Development
PC37.1.3	New	Recommended Practice for Human Machine Interfaces (HMIs) used with Electric Utility Automation Systems	WG Draft Development
PC37.252	New	Guide for Testing Automatic Voltage Control Systems in Regional Power Grids	WG Draft Development

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

PC37.230	Guide for Protective Relay Applications to Distribution Lines	Sponsor Ballot: Comment Resolution
PC37.92	Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers	Sponsor Ballot: Comment Resolution

PARS expiring at the end of 2019 to 2023

PAR Number	Project Type	Title	PAR Expiration
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PC37.230	Revision	Guide for Protective Relay Applications to Distribution Lines	12/31/2019
PC37.91	Revision	Guide for Protecting Power Transformers	12/31/2019
PC37.108	Revision	Guide for the Protection of Secondary Network Systems	12/31/2019
PC37.110	Revision	Guide for the Application of Current Transformers Used for Protective Relaying Purposes	12/31/2019
PC37.233	Revision	Guide for Power System Protection Testing	12/31/2019
PC37.235	Revision	Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes	12/31/2019
PC37.242	Revision	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control	12/31/2019
PC37.2	Revision	Standard Electrical Power System Device Function Numbers, Acronyms, and Contact Designations	12/31/2020
PC37.249	New	Guide for Categorizing Security Needs for Protection and Automation Related Data Files	12/31/2020
PC37.250	New	Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes	12/31/2020
PC37.251	New	Standard for Common Protection and Control Settings or Configuration Data Format (COMSET)	12/31/2020
P1646	Revision	Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation	12/31/2021
PC37.90.2	Revision	Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	12/31/2021
PC37.101	Revision	Guide for Generator Ground Protection	12/31/2021
PC37.102	Revision	Guide for AC Generator Protection	12/31/2021
PC37.120	New	Protection System Redundancy for Power System Reliability	12/31/2021
PC37.234	Revision	Guide for Protective Relay Applications to Power System Buses	12/31/2021
PC37.92	Revision	Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers	12/31/2022
P2030.12	New	Guide for the Design of Microgrid Protection Systems	12/31/2022
P2030.100.1	New	Monitoring and Diagnostics of IEC 61850 Generic Object Oriented Status Event (GOOSE) and Sampled Values Based Systems	12/31/2022
PC37.90	Revision	Standard for Relays and Relay Systems Associated with Electric Power Apparatus	12/31/2022
PC37.104	Revision	Guide for Automatic Reclosing on AC Distribution and Transmission Lines	12/31/2022
PC37.106	Revision	Guide for Abnormal Frequency Protection for Power Generating Plants	12/31/2022
PC37.300	New	Guide for Centralized Protection and Control (CPC) Systems within a Substation	12/31/2022
PC37.1.3	New	Recommended Practice for Human Machine Interfaces (HMIs) used with Electric Utility Automation Systems	12/31/2023

PC37.252	New	Guide for Testing Automatic Voltage Control Systems in Regional Power Grids	12/31/2023
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PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:

<https://standards.ieee.org/about/sasb/meetings.html>

Submittal dates are as follow.

July 26

September 17

All PSRCC Par-Related Projects:

PAR Number	Project Type	Title	Status
C37.90.3	New	Standard for Electrostatic Discharge Tests for Protective Relays	Complete
C37.108	Revision	Guide for the Protection of Network Transformers	Complete
C37.106	Revision	Guide for Abnormal Frequency Protection for Power Generating Plants	Complete
C37.90.2	Revision	Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	Complete
C37.92	New	Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers	Complete
C37.90	Revision	Standard for Relays and Relay Systems Associated with Electric Power Apparatus	Complete
C37.101	Revision	Guide for Generator Ground Protection	Complete
C37.102	Revision	Guide for AC Generator Protection	Complete
C37.109	Revision	Guide for the Protection of Shunt Reactors	Complete
C37.117	New	Guide for the Application of Protective Relays Used for Abnormal Frequency Load Shedding and Restoration	Complete
C37.231	New	Recommended Practice for Microprocessor-based Protection Equipment Firmware Control	Complete
1646	New	Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation	Complete
C37.110	Revision	Guide for the Application of Current Transformers used for Protective Relaying Purpose	Complete
C37.91	Revision	Guide for Protecting Power Transformers	Complete
C37.230	New	Guide for Protective Relay Applications to Distribution Lines	Complete
C37.233	New	Guide For Power System Protection Testing	Complete
C37.234	New	Guide for Protective Relay Applications to Power System Buses	Complete
C37.235	New	Guide for the Application of Rogowski Coils used for Protective Relaying Purposes	Complete
C37.2	Revision	Standard Electrical Power System Device Function Numbers, Acronyms and Contact Designations	Complete

C37.105	Revision	Standard for Qualifying Class 1E Protective Relays and Auxiliaries for Nuclear Power Generating Stations	Complete
C37.101-2006/Cor 1	Corrigendum	Guide for Generator Ground Protection - Corrigendum 1: Annex A.2 Phasor Analysis (Informative)	Complete
C37.90.1	Revision	Standard Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus	Complete
C37.96	Revision	Guide for AC Motor Protection	Complete
C37.99	Revision	Guide for the Protection of Shunt Capacitor Banks	Complete
C37.110-2007/Cor 1	Corrigendum	IEEE Guide for the Application of Current Transformers Used for Protective Relaying Purposes - Corrigendum 1: Corrections to Equation 18 and Equation 19	Complete
C37.239	New	Standard for Common Format for Event Data Exchange (COMFEDE) for Power Systems	Complete
C37.104	Revision	Guide for Automatic Reclosing of Circuit Breakers for AC Distribution and Transmission Lines	Complete
C37.95	Revision	Guide for Protective Relaying of Utility-Consumer Interconnections	Complete
C37.98	Revision	Standard for Seismic Qualification Testing of Protective Relays and Auxiliaries for Nuclear Facilities	Complete
C37.111	Revision	Standard for Common Format for Transient Data Exchange (COMTRADE) for Power Systems	Complete
C37.114	Revision	Guide for Determining Fault Location on AC Transmission and Distribution Lines	Complete
C37.242	New	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMU) for Power System Protection and Control	Complete
C37.113	Revision	Guide for Protective Relay Applications to Transmission Lines	Complete
C37.232	Revision	Standard for Common Format for Naming Time Sequence Data Files (COMNAME)	Complete
C57.13.3	Revision	Guide for Grounding of Instrument Transformer Secondary Circuits and Cases	Complete
C37.103	Revision	Guide for Differential and Polarizing Relay Circuit Testing	Complete
C37.119	Revision	Guide for Breaker Failure Protection of Power Circuit Breakers	Complete
C37.243	New	Guide for Application of Digital Line Current Differential Relays Using Digital Communication	Complete
C37.241	New	Guide for Application of Optical Instrument Transformers for Protective Relaying	Complete
C37.246	New	Guide for Protection Systems of Transmission to Generation Interconnections	Complete
C37.248	New	Guide for Common Format for Naming Intelligent Electronic Devices (COMDEV)	Complete
C57.13.1	Revision	Guide for Field Testing of Relaying Current Transformers	Complete

60255-118-1	Revision	Measuring Relays and Protection Equipment - Part 118-1: Synchrophasor for Power System - Measurements	Complete
C37.237	New	Standard Requirements for Time Tags Created by Intelligent Electronic Devices - COMTAG(TM)	Complete
C37.245	New	Guide for the Application of Protective Relaying for Phase Shifting Transformers	Complete
C37.116	Revision	Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks	Complete
C37.247	New	Standard for Phasor Data Concentrators for Power Systems	Complete
C37.112	Revision	Standard Inverse-Time Characteristic Equations for Overcurrent Relays	Complete
PC37.230	Revision	Guide for Protective Relay Applications to Distribution Lines	Sponsor Ballot: Comment Resolution
PC37.92	Revision	Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers	Sponsor Ballot: Comment Resolution
PC37.91	Revision	Guide for Protecting Power Transformers	WG Draft Development
PC37.108	Revision	Guide for the Protection of Secondary Network Systems	WG Draft Development
PC37.110	Revision	Guide for the Application of Current Transformers Used for Protective Relaying Purposes	WG Draft Development
PC37.233	Revision	Guide for Power System Protection Testing	WG Draft Development
PC37.235	Revision	Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes	WG Draft Development
PC37.242	Revision	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control	WG Draft Development
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PC37.249	New	Guide for Categorizing Security Needs for Protection and Automation Related Data Files	WG Draft Development
PC37.250	New	Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes	WG Draft Development
PC37.251	New	Standard for Common Protection and Control Settings or Configuration Data Format (COMSET)	WG Draft Development
P1646	Revision	Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation	WG Draft Development
PC37.90.2	Revision	Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	WG Draft Development
PC37.101	Revision	Guide for Generator Ground Protection	WG Draft Development

PC37.102	Revision	Guide for AC Generator Protection	WG Draft Development
PC37.120	New	Protection System Redundancy for Power System Reliability	WG Draft Development
PC37.234	Revision	Guide for Protective Relay Applications to Power System Buses	WG Draft Development
P2030.12	New	Guide for the Design of Microgrid Protection Systems	WG Draft Development
P2030.100.1	New	Monitoring and Diagnostics of IEC 61850 Generic Object Oriented Status Event (GOOSE) and Sampled Values Based Systems	WG Draft Development
PC37.90	Revision	Standard for Relays and Relay Systems Associated with Electric Power Apparatus	WG Draft Development
PC37.104	Revision	Guide for Automatic Reclosing on AC Distribution and Transmission Lines	WG Draft Development
PC37.106	Revision	Guide for Abnormal Frequency Protection for Power Generating Plants	WG Draft Development
PC37.300	New	Guide for Centralized Protection and Control (CPC) Systems within a Substation	WG Draft Development
PC37.1.3	New	Recommended Practice for Human Machine Interfaces (HMIs) used with Electric Utility Automation Systems	WG Draft Development
PC37.252	New	Guide for Testing Automatic Voltage Control Systems in Regional Power Grids	WG Draft Development

VI. B: Advisory Subcommittee Reports

Chair: Russ Patterson

Vice Chair: Murty Yalla

A. B1: Awards and Technical Paper Recognition Working Group

Chair: Hugo Monterrubio

Vice Chair: Mal Swanson

The B1 Working Group met on Monday May 6, 2019 in Cincinnati, OH with 8 members. The January 2019 meeting minutes were discussed and approved.

The following items were discussed during this meeting:

1. The WG welcomed one new member, Don Lukach – Outgoing K Chair.
2. The WG discussed the need to significantly improve the PSRC WG tracking matrix as well as the process to collect and maintain this information as this information is critical for the nomination and/or issuing of WG awards. This topic will be elevated to the PSRC officers to seek guidance.
3. Awards Spotlight – The WG is currently working to nominate PSRC members for the following awards (Names of candidates are kept confidential and will be announced if the nomination is successful):
 - a. IEEE Nikola Tesla Award
 - b. IEEE PES Douglas M Staszkesky Distribution Automation Award
 - c. IEEE PES Award for Excellence in Power Distribution Engineering
 - d. IEEE PES Leadership in Power Award

- e. IEEE SA Standards Medallion
 - f. IEEE Charles Proteus Steinmetz
4. The following awards were announced or issued on Thursday May 9, 2019 during the PSRC Main Committee Meeting
- a. Completed WG Recognitions
 - i. C2 - Role of Protective Relaying in the Smart Grid
 - **Alex Apostolov - Chair**
 - **Roy Moxley – Vice Chair**
 - ii. C18 - C37.246-2017 IEEE Guide for Protection Systems of Transmission-to-Generation Interconnections
 - **Alla Deronja – Chair**
 - **Keith Houser – Vice Chair**
 - iii. C20 - Impact of voltage source converter (VSC) Based HVDC Transmission on AC System Protection
 - **Joe Mooney – Chair**
 - **Ian Tualla – Vice Chair**
 - iv. J7 - Avoiding Unwanted Reclosing on Rotating Apparatus
 - **Mike Reichard – Chair**
 - **Steve Conrad – Vice Chair**
 - b. Completed SA WG Award

K21 – C37.112 IEEE Standard Inverse-Time Characteristic Equations for Overcurrent Relays

Randy Crellin (Chair) & Michael Thompson (Vice Chair)

WG Members:

Brian Boysen	John Seuss
Jeff Burnworth	Charles Sufana
Rick Gamble	Eric Udren
Hillmon Ladner	Murty Yalla
Don Lukach	

5. Request for Nomination Young Professional Award
- Recognizes the technical and PES leadership contributions of younger members of PES.
 - PES Young Professionals are PES members who will be 35 years of age or younger on July 31 of the year in which the award is given (7/31/20).
 - The Nominee must be a member of the IEEE Power & Energy Society.
 - Each Technical Committee is allowed one nomination per year, per committee.
 - Deadline to submit your name will be September 1
6. Recent recognition of leaders in our industry:
- Edmond O. Schweitzer III, president and chief technology officer of SEL inducted into the national inventors hall of fame 2019 for his inventions related to digital protective relay.
 - Eric A. Udren, executive advisor, Quanta Technologies, is elected to the National Academy of Engineers 2019. Eric’s citation is ‘for leadership in advancing protection technologies for electric power grids’.

B. B3: Membership Working Group

Chair: Mal Swanson

Attendance during the Garden Grove meeting was 242, which is near the top attendance mark for us.

10 new attendees were in our Newcomers Orientation meeting on Tuesday. Cathy Dalton sent a pre-meeting welcoming email and a follow up to each newcomer for first impressions.

No management support letters were drafted. If any attendee or potential attendee needs stronger management support for PSRC participation, we encourage them to let us know.

C. B4: O&P Manual Revision and Working Group Chair Training Working Group

Chair: Phil Winston

No report.

D. B5: Publicity Working Group

Chair: Cathy Dalton

Vice Chair: Mal Swanson

PACWorld Update: Cathy Dalton submitted information to include in PSRC update for the June 2019 issue of PACWorld, based on information discussed at our May 2019 meeting in Cincinnati, OH. The subcommittee chairs were asked to send a brief summary of their activities for inclusion in this article. Cathy received input from Galina Antonova, Gene Henneberg, Don Lukach. Also included will be some information that was presented at the Main Committee meeting. One item is a summary of Alla Deronja's presentation on the new IEEE C37.246-2017 Guide for Protection Systems of Transmission-to-Generation Interconnections covers principles of transmission-to-generation interconnection protection. The scope of the guide is to document accepted protection practices for transmission-to-generation interconnections and cover the protection system applications at these interconnections. In addition, a summary of Ken Martin's presentation on WG H11, Synchrophasor Measurements for Power Systems Standard IEC/IEEE 60255-118-1, will be included in the article.

Encouraging membership: Cathy and Amir Makki discussed how to further encourage PSRC membership through publicity at non-IEEE events, such as well-known relay conferences. Cathy will work with Amir to develop a formal set of slides (one to three) to share with the entire PSRC, so as each member makes technical presentations at some of these events, he or she can tag on some slides at the end of slide decks (if they choose to do so) to encourage PSRC membership. Amir is already doing this, and suggested that we make it a formal request and process among the committee's members. These slides will include the top ten reasons why someone should participate in PSRC.

Preparation for 2019 PES General Meeting: Cathy updated the 2018 PSRC committee flyer for use at the August 2019 General Meeting in Atlanta. Officer positions, meeting locations and other minor edits were needed. Cathy sent final revisions to officers and received additional feedback to revise other language on the flyer in the "Attending a meeting" section. IEEE contact to whom this updated flyer was sent is Shana Pepin.

E. B8: Long Range Planning Working Group

Chair: Pratap Mysore

No report.

F. B9: Web Site Working Group

Chair: Rick Gamble

No report.

VII. Items of Interest from the Main Committee Meeting: Michael Thompson

A. Motions:

The chair of the C subcommittee, Gene Henneberg, made a motion to form a balloting body to ballot "PC37.250, Guide for Engineering, Implementation and Management of System Integrity Protection

Schemes”, and transmit this information to the IEEE SA. The motion was seconded by Tony Seegers. There was no discussion. The motion was voted on by the main committee members and the motion carried.

The chair of the I subcommittee, Brian Mugalion, made a motion to form a balloting body to ballot “Revision of C37.235 Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes”, and transmit this information to the IEEE SA. The motion was seconded by Gene Henneburg. There was no discussion. The motion was voted on by the main committee members and the motion carried.

The chair of the I subcommittee, Brian Mugalion, made a motion to submit a title change for C37.90, C37.90.1, C37.90.2, C37.90.3, and P1613 to IEEE SA. As described below. The motions were seconded by Oscar Bolado. The motions carried.

C37.90 (-2005)

Chair: Oscar Bolado

Existing Title:

IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

Proposed Title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – General Requirements and Tests

C37.90.1 (-2002)

Acting Chair: Jeff Burnworth

Existing Title:

IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

Proposed Title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – Surge Withstand Capability (SWC) and Electrical Fast Transient (EFT) Requirements and Tests

C37.90.2 (-2004)

Chair: Jeff Pond

Existing Title:

IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

Proposed Title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – Radiated Electromagnetic Interference Withstand Capability Requirements and Tests

C37.90.3 (-2001)

Chair: Steve Turner

Existing Title:

IEEE Standard Electrostatic Discharge Tests for Protective Relays

Proposed Title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – Electrostatic Discharge Withstand Requirements and Tests

P1613

Chair: Brian Mugalian

Revised PAR approved title:

IEEE Standard for Environmental and Testing Requirements for Devices with Communications Functions in Electric Transmission and Distribution Facilities

Proposed Title:

IEEE Standard for Environmental and Testing Requirements for Devices with Communications Functions used with Electric Power Apparatus

The chair of the K subcommittee, Jeff Barsch, made a motion to form a balloting body to ballot PC37.91, "Guide for Protecting Power Transformers", and transmit this information to the IEEE SA. The motion was seconded by Steve Conrad. There was no discussion. The motion was voted on by the main committee members and the motion carried.

The chair of the K subcommittee, Jeff Barsch, made a motion to form a balloting body to ballot PC37.108, "Guide for the Protection of Secondary Network Systems", and transmit this information to the IEEE SA. The motion was seconded by Charlie Henville. There was no discussion. The motion was voted on by the main committee members and the motion carried.

The chair of the K subcommittee, Jeff Barsch, made a motion to submit a PAR to IEEE SA.

Proposed Title: Guide for the Protection of Shunt Capacitor Banks

Output: IEEE Guide, **Project Number:** PC37.99

WG Assignment: Revise and update C37.99-2012, IEEE Guide for the Protection of Shunt Capacitor Banks

Proposed Scope: This guide applies to the protection of shunt power capacitor banks and filter capacitor banks. Included are guidelines for reliable applications of protection methods intended for use in many shunt capacitor applications and designs. The guide does not include the protection of pole-mounted capacitor banks on distribution circuits or capacitors connected to the terminals of rotating machines.

Proposed Purpose: This guide has been prepared to assist protection engineers in the application of relays and other devices for the protection of shunt capacitor banks used in substations. It covers methods of protection for many commonly used shunt capacitor bank configurations including the latest protection techniques. Additionally, this guide covers the protection of filter capacitor banks and large extra-high-voltage (EHV) shunt capacitor banks.

Proposed Chair: Meyer Kao

The motion was seconded by Bill Dickerson. There was no discussion. The motion was voted on by the main committee members and the motion carried.

The chair of the K subcommittee, Jeff Barsch, made a motion to submit a PAR to IEEE SA.

Proposed Title: Guide for the Protection of Shunt Reactors

Output: IEEE Guide, **Project Number:** PC37.109

WG Assignment: Revise C37.109-2006, IEEE Guide for the Protection of Shunt Reactors

Proposed Scope: This guide includes description of acceptable protective relay practices applied to power system shunt reactors. The guide covers protection for dry-type (air-core) and oil-immersed type reactors connected to power system buses and lines. Also included in this guide is the protection of oil-immersed reactors equipped with auxiliary power windings.

Proposed Purpose: The purpose of this guide is to provide users of shunt reactors acceptable methods and configurations for the protection of power system shunt reactors.

Proposed Chair: Kamal Garg

** Note that this request is contingent upon final approval of the K26 WG.

The motion was seconded by Keith Houser. There was no discussion. The motion was voted on by the main committee members and the motion carried.

There were two presentations to conclude the main committee meeting.

B. Presentations:

Presentation, H11 IEC/IEEE 60255-118-1, Synchrophasor for Pwr Syst – Measurements Martin

Presentation, C35 Guide for Protection Systems of Trans-to-Gen Interconnections Deronja

VIII. Subcommittee Reports

C: System Protection Subcommittee

Chair: Gene Henneberg

Vice Chair: Fred Friend

System Protection Subcommittee Scope

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

Meeting Minutes

The System Protection Subcommittee of the PSRC met on May 9, 2019 in Cincinnati, OH. The participants introduced themselves, a quorum was achieved (32 of 59 members and 42 guests). The January 2019 minutes were unanimously approved.

Advisory Committee and other Items of Interest

- WG Chairs required to post agenda at least two weeks prior to the meeting.
- The 123signup training at lunch on Tuesday seemed to come off well. We will probably see similar training offered at future meetings: WG officer training, IEEE Standards development, etc.
- A custom web page is available for each WG, if the WG Chair wishes to use it. Contact Rick Gamble, webmaster@pes-psrc.org
- WG meeting minutes due to Fred and Gene by this Friday, May 10.
- WGs that complete their work are encouraged to present it to the IEEE community through WEBEX. Contact PSRC officers or Cathy Dalton (Publicity Chair) for further information.

C-19 WG PC37.247, “Standard for Phasor Data Concentrators (PDC) for Power Systems” has been approved through the IEEE SA balloting process and is undergoing final SA editing.

C-21 Working group has successfully balloted their C37.250 “Guide for Engineering, Implementation and Management of System Integrity Protection Schemes” within the WG.

C-30 Working Group on Microgrid Protection has successfully balloted their report through the C subcommittee. WG officers will clean up a few final edits. This work will feed into the recently formed C-38 WG which is developing this subject into Standard P2030.12 “Guide for the Design of Microgrid Protection Systems”. C-30 has been disbanded.

The work of several WGs is being used in the initial development of the new P2800 Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems and P2800.1 Guide for Test and Verification Procedures for

Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems. These efforts are being coordinated through the new B-10 WG, with members limited to the chairs and vice chairs of the involved WGs.

Old Business

A brief review of the recent joint work with NERC work of CTF-34 and the ongoing work for which C24, C25, C32, D29, D38, D41, and J-18 are expected to make significant contributions regarding Inverter Based Generation to the new P2800 and P2800.1 standards.

New Business

Ideas were floated for new projects. We are not yet establishing a task force for further exploration pending completion of present work by several existing WGs.

- Impact on the power system of a successful cyber-attack at a substation
- Impact of Electro Magnetic Pulses (EMP) on System Protection

General Discussion

There was a brief discussion regarding the changes in WG schedules (70 minutes versus 75 minutes) that were used at this PSRC meeting.

Working Group Reports

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

Chair: Vasudev Gharpure

Secretary: Mital Kanabar

Output: IEEE Guide C37.247

Draft: 2.46

Established: September 2011

Expected Completion Date: May 2019

Scope:

Develop a standard for Phasor Data Concentrators for power systems.

The C-19 WG did not meet.

The proposed C37.247, "Standard for Phasor Data Concentrators (PDC) for Power Systems" has been approved through the IEEE SA balloting process and is undergoing final SA editing.

The WG does not anticipate needing to meet at the September 2019 PSRC meeting.

A new task force, CTF-40 will meet at the September 2019 PSRC meeting to discuss whether to develop a summary paper from the work of the WG C-19. Requirements for this meeting: Room for 20, single session and projector.

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

Chair: Yi Hu

Vice Chair: Gene Henneberg

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

Established: September 2013

Completion: December 2020

Working group C21 met on Wednesday, May 8, 2019 in Cincinnati, OH in single session chaired by Yi Hu and Gene Henneberg with 6 voting members, 1 non-voting member, and 5 participants attending. Each attendee introduced themselves and described their affiliation.

Yi Hu presented the IEEE patent slides. No attendee indicated any knowledge of any patents critical to implementation of the proposed PC37.250 Guide.

The proposed agenda was approved. A quorum was not achieved. The January 2019 minutes will be sent to WG's voting members for approval.

The PAR extension request for this work has been approved with the new completion date of December 2020.

The draft Guide was presented to the WG members for approval voting in February. The final result was 17 votes to approve (6 with comments) and 3 members not voting, for 85% approval with zero votes to disapprove.

The comments were generally accepted for the next draft. Most were editorial in nature, but all comments were incorporated in the next draft (V 1.01) and posted on imeet Central.

There was a remaining question regarding whether Fig. 10 and 11 were actually showing different things, or were substantially the same. It was decided to re-word/add some labels and add one vertical line in these Figures and add some clarifying language to the text of the Guide to highlight the differences in the Figures. Dean Miller will revise Figures 10 and 11.

Several other Figures, when inserted in the text of the Guide, had reduced font size, making them difficult to read. Yi Hu will modify these Figures to be more legible.

Gene Henneberg will incorporate the modified Figures from Dean and Yi in the next draft (V 1.02).

The WG will ask for permission to form a Ballot Body at the May 2019 PSRC Main Committee Meeting. (This motion was made by the C subcommittee chair, Gene Henneberg, and approved by the main committee on 5/9/2019.)

Yi and Gene will next request IEEE SA editing team support.

Yi and Gene will address comments from the IEEE SA editing team before the Guide is posted for balloting.

Meeting minutes by Gene Henneberg and Yi Hu 05/08/2019.

C-23: Coordination of Synchrophasor Related Activities

Chair: Mahendra Patel

Vice Chair: Allen Goldstein

Output: Ongoing Liaison

Draft: N/A

Completion: Ongoing

Assignment: The ongoing task force will provide three main functions:

- Liason with NASPI (North American Synchrophasor Initiative) (specifically the PRSVTT (Performance Requirements, Standards and Verification Task Team)) to keep the PSRCC 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 PSRCC including making recommendations which PRSVTT activities should be transferred to IEEE reports, guides and standards.

- Make recommendations to PSRCC for assignments that would require the creation of working groups in PSRCC 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.

Convened with 7 members and 3 guests.

Introductions

Patent Slides are not required since this WG has no PAR.

Members made aware of upcoming National Physical Laboratory (NPL, England) Webinar on ROCOF measurement and use at 11 am EST on 5/17/2019

Gustavo told us that Hydro Quebec is concerned with the use of TVE rather than Magnitude and Phase Angle Error when evaluating PMU performance.

Allen Goldstein gave an update on the NASPI PMU Applications Requirements Task Force (PARTF) and the open-source test framework available on Github. The task force has published a white paper on PMU data Quality available on the NASPI web site.

A NASPI task force is working on a white paper concerning Synchrophasor data under fault conditions. No expected completion date was announced.

IEEE Conformance Assessment Program announced that the 3rd revision of the Synchrophasor Test Suite Specification (TSS) was approved by the steering committee and is being edited by IEEE for publication.

Ken Martin reported on the progress of Streaming Telemetry Transport Protocol (STTP) standard. Expect to have an early draft of the specification.

Harold Kirkham reported on the beginning of work on a possible revision to IEEE 1459: IEEE Standard Definitions for the Measurement of Electric Power Quantities Under Sinusoidal, Nonsinusoidal, Balanced, or Unbalanced Conditions

Ken Martin reported that IEEE PC37.247 PDC standard has been approved by RevCom and is being edited for final publication.

Group discussed the future of the PMU standard. While research is being conducted by various organizations regarding the application of PMUs in distribution systems. It would be useful to have a white paper discussing what research should be conducted with the goal of understanding the performance requirements of PMUs used in distribution applications. Understanding not only the challenges of obtaining accurate synchrophasor, frequency, and ROCOF estimates in the distribution system electrical environment but also the accuracy needs of the applications themselves. This might be a good thing for the NASPI DISTT to work on.

Bill Dickerson reported on the new PSRC working group H50, tasked to create a report for time requirements for Protection and Control Systems.

There were no action items coming out of this meeting.

Adjourned

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

Chair: Sukumar Brahma (Clemson University)

Vice Chair: Evangelos Farantatos (EPRI)

Assignment:

- 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 2019 meeting
3. Updates on report and discussing major comments
4. Adjourn

The meeting started with introductions, and then the January 2019 minutes were approved with one minor correction.

First the status of the report was discussed. After the January meeting, the report was reviewed and comments were received from 4 members of the WG. Sukumar and Evangelos have addressed most of the comments. A few comments that required input from the WG were discussed during the meeting. One was the format of the table with respect to the negative sequence fault contribution. It was decided to split the table into two, one for positive sequence and one for negative sequence. It was also discussed that the values in the table depend on the pre-fault operating condition of the WTG, and the report will be revised to clarify that. The Appendix needs to be shortened, so it was requested from Athula who provided most of these data to update it.

With respect to manufacturer-data, Siemens-Gamesa provided some data, but they were not as per the requested format. Siemens-Gamesa will be approached again. GE is working on generating the data. Ratan Das presented during the meeting preliminary simulations for a Type III WTG. It is expected that GE will send data before the next meeting.

Finally, there was a discussion on inverter negative sequence control schemes. The report does not describe those, and there was an agreement among the attendees that adding details on those is out of the scope of this WG. Mohammad Zadeh volunteered to write a short description on that, which will be included in the conclusions/future directions section of the report.

With respect to next steps, Sukumar and Evangelos will continue to revise the report based on the comments received so far, and the expected new contributions as explained before. An updated version of the report will be sent to the WG before the September 2019 meeting.

There were total 34 attendees in the meeting, 11 members and 23 guests.

C-25: Protection of Wind Electric Plants

1.

2. **Chair: Martin Best**

Vice Chair: Keith Houser

Assignment:

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

Working Group C25 met in Cincinnati, OH in a single session on Tuesday May 7, 2019 with 9 members and 12 guests. After introductions, the agenda and minutes of the January 2019 meeting were reviewed.

The current draft of the report is 5.2.

- The group reviewed Jason Buneo's comments and revisions to sub-clause 3.1.1.1 on negative sequence overcurrent protection.
- There followed a review and discussion of Charlie Henville's edits to sub-clause 3.1.1.2 on directional overcurrent element settings. Charlie will revise the R and X-axis scales in Figure 17.
- Additional discussion of directional phase overcurrent setting considerations for WTG operation by Mohammad Zadeh were incorporated into Appendix A of the report.
- The working group then reviewed sub-clause 3.4.1 on the removal of WTGs from collector feeders under fault and clause 3.5 on capacitor and harmonic filter protection.

The group requests a single session, meeting room for 30 at the September 2019 meeting, and a computer projector. **It is requested that the meeting time for C25 avoid conflicts with the meeting times for C24, C30 and C32 working groups, to the extent possible.**

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

Chair: D. Ware

Secretary: M. Black

Scope: Revise C37.233 Power System Protection Testing Guide

The C26 working group met on Tuesday, May 7, 2019 with 13 members, 4 Guests, and 1 new member.

When attendance was taken at the beginning of the meeting quorum was not satisfied; therefore, minutes from January were not voted on for approval. We plan to have an email correspondence to satisfy this issue.

Don and Matt have discussed our scheduling issues with the Standards coordinator – Don Lukach and it has been decided to submit a PAR extension; since PAR was to expire 12/31/19. Therefore, the new goal for completion will be set for Sept. 2020, even though the PAR extension will be for two years.

Tony Seegers' has implemented work to include Nina Selak's list of suggestions. Tony suggested that Don's contribution on "taking load checks / in-service readings" should be re-located within document from section 1 to section 4.

Don received email from Mike Bloder with 3 small paragraphs on "lessons learned from not performing timely load checks" and Don to share with group and to discuss to use all or to summarize.

Action items: Date deadline with all assigned work asked to be sent in by May 31, 2019.

1. Mark Siira to address annex work with bibliography and references completed. Also, Mark and Wayne Stec have submitted new material on primary injection testing. Need to find location for input.
2. Mohit Sharma, new member has volunteered to do a review.
3. Don to edit writing on taking "in-service" load readings, and to add metered information from microprocessor relays by reading and saving HMI information on phasors, etc.
4. Scott Cooper to address end-to-end testing with mismatched test sets in order to correct timing issues. Scott has submitted this edit to the latest draft; therefore **complete**. Thank you Scott.
5. Eugenio Carvalheira to finish review of IEC-61850 and then Alex Apostolov to do final review.

6. There are many unaddressed comments that need to be accepted / rejected prior to WG/SC approval of the guide. Use of Web Meetings will be used to try to address comments.

Lastly, Zach Zaittz, as of Wednesday morning, has volunteered to become our Working Groups' new Secretary.

The draft version of the Guide C37.233 is ver. 2.29 as of May 8, 2019. Our next meeting will need a single session with room for 30 and a projector. We please request conflict avoidance with C31, C38, and H46.

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

Chair: Allen Goldstein
Secretary: Harold Kirkham
Output: IEEE Guide, C37.242
Draft: 1
Established: September 2015
Completion: November 2019

Scope:

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

Convened with 11 members and 2 guests. A quorum was in attendance.

Introductions

Patent Slides (no response)

Guide draft is out for working group vote to send to sponsor ballot. Voting will close on May 27.

Comments were received from three members. All comments received so far have been accepted.

Working group worked on comment resolution and revision of the draft.

Working group voted unanimously to form a sponsor ballot group.

Adjourn

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

Chair: Kevin Jones (beginning January 2020) **Vice Chair:** Mike Kockott
kevin.jones@xcelenergy.com mike.kockott@us.abb.com

ASSIGNMENT:

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

Mike Kockott filled in for Kevin Jones who was unable to attend this meeting.
(Jim van de Ligt took notes to become minutes)

WG Assignment: Create a report on test instructions/parameters to accompany the PSRC documents Application of Out-Of-Step Protection Schemes for Generators, and Tutorial on

Setting Impedance Based Power Swing Blocking and Out of Step Tripping Functions on Transmission Lines, to aid the users in quality testing of their settings and systems when following the working group outputs which recommend testing of complex relay settings and systems.

1. Introductions / Sign-up sheet / Approval of the January 2019 meeting minutes

- Introductions were made.
- 14 attendees – 7 members and 7 guests.
- The minutes of the January meeting were approved by consensus.
- Mike Kockott informed the group that Kevin Jones will not assume chairmanship of C29 until January 2020 because of his commitments to D29, but he does expect, barring unexpected situation, to attend the Sept. 2019 meeting.

2. Review the writing assignments due for this meeting (mostly sections II and III)

- Ratan Das apologized that he did not submit his section 2.3 Transients. He agreed that he would provide it by Aug. 05, 2019 to Mike Kockott – in the new report format so that it can be copied directly into the report. He also said that he did not need help to write his section.
- Section II (new section II) – Rob Fowler reported that the rest of the Types of Tests section wasn't ready yet. The new outline in the current version of the document for that section will help to organize the writing. Those present from that group stated that they will provide Section II content by Aug. 05, 2019 to Mike Kockott – in the new report format so that it can be copied directly into the report.
- Section III (new section III) – Mohit Sharma agreed to provide Section III content by Aug. 05, 2019 to Mike Kockott – in the new report format so that it can be copied directly into the report.
- Mike Kockott asked whether we would prefer to work on sections individually or as teams – like we are presently organized. After brief discussion the teams plan to continue.

3. Draft of report

- The present draft of the report was briefly reviewed.
C29_Minutes_050819_Cincinnati_amended2.docx
- Rama Gokaraju expressed interest in contributing RTDS based testing. He was advised to coordinate with Ratan Das who was planning to write the transients section.

4. Open discussion (new items for consideration)

- A question was raised about whether the report can become a tutorial instead of a report.
- Gene Henneberg said that the working group can choose to make it a tutorial or a report.
- The issue was further discussed about whether it should be a report or a tutorial. No definitive conclusion was reached.
- The history of this effort was discussed.
- Mike Kockott stated that once content was supplied for sections II and III was provided then the rest of the document would come together.
- Gene Henneberg suggested that C29 interface with C26 (C37.233) (Don Ware) to coordinate the use of common terms, etc. This will be done.
- A related document, the report from the J5 working group, is finished and available.

5. Other business

- None.

6. Adjourn

C-30: Microgrid Protection Systems

Chair: Michael Higginson

Vice Chair: Fred Friend

Output: PSRC Report

Draft: 7.0

Expected Completion Date: May 2019

Assignment

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

The working group meeting was conducted on Tuesday afternoon at 1:00 PM with 34 attendees, including 18 members and 16 guests.

The Chair opened the meeting with introductions. The minutes for the January meeting were not reviewed.

The chair reported the results from the subcommittee ballot, with 49 of 59 (83%) responding, 47 approving (96%), 1 disapproving, and 1 abstaining. The disapproving comment was reviewed and the proposed revision to add “external” to “the load condition and direction” in line 27 was accepted. The chair will incorporate this and the other editorial comments and submit it to the PSRC officers for approval and posting to the web site.

A motion to disband the working group was made by Ratan Das, seconded by Sukumar Brahma with unanimous approval.

The meeting was adjourned and the remaining time was allocated to the C38 working group, which will further develop this work into a guide.

C31: C37.120 IEEE Guide for Protection System Redundancy for Power System Reliability

Chair: Solveig Ward (sward@quanta-technology.com)

Secretary: Alla Deronja (aderonja@atcllc.com)

Established: September 2017

Output: Guide C37.120

Expected Completion Date: December 2021

Scope: This guide provides information about what factors to consider when determining the impact of protection system redundancy on power system reliability.

WG C31 met on Tuesday, May 7, 2019, in a single session with 13 voting members, 5 non-voting members, and 12 guests attending. The WG chair was not present, so the WG vice-chair conducted the meeting. The quorum was not met so the January 2019, April 4, and April 18, 2019, webex meeting minutes meeting minutes will be approved via email.

The meeting chair displayed the IEEE patent slides as required for the working group with PAR related activities. There were no patent claims from the meeting participants.

The chair reviewed the status of all assignments made at the previous WG meetings.

Outstanding action items:

1. **Derrick Haas** is to review Clause 4 *General Considerations*. Status: not received and dropped since we started editing the clause.
2. **Paul Thompson** is to review Clause 6 *Redundancy Applications Considerations*. Status: complete.
3. **Alla Deronja** is to review Robert Frye’s contribution to sub-clause 4.5 Basic principles of relay redundancy. Status: pending.
4. **Paul Thompson** will attempt to revise the presentation style of sub-clauses 4.5 *Basic principles of relay redundancy* and 4.6 *Redundancy simplicity considerations* to be more formal and fitting for the industry document. Status: pending.
5. **Solveig Ward** will review sub-clause 4.6 *Relay technology effect on redundancy* to retain only the material that supports the guide’s scope. Status: pending.
6. **Solveig Ward and Joerg Blumschein** will review the new material incorporated in sub-clause 5.9 *Timing system redundancy*. Status: not received.

7. **Tony Bell** to investigate the available power line carrier technical documentation and correct Figure 12 Two PLC channels, coupled together via phase to phase. Status: not received.
8. **Roy Moxley and Solveig Ward** are to add control application section to clause 6 if affecting protection. Status: not received.
9. **Mark Schroeder and Jim O'Brien** will write sub-clause 6.6 *Capacitor bank protection*. Status: received from Mark. Jim and Don Ware will review.
10. **Alla Deronja** will check if the topic of crossover/mixed-use SIPS/primary protection/automation is covered in new SIPS guide C37.250 IEEE Guide for engineering, implementation and management of SIPS. Status: checked with WG C21. This topic is not addressed in C37.250.
11. **Alexis Mezco** will review and revise sub-clause 4.4 *Industry practices* to replace term BES. Status: obsolete since sub-clause 4.4 has been removed.

The WG then discussed the status of sub-clause 4.8 *Asset management and maintenance considerations*. We were looking for a volunteer(s) to appropriately revise the sub-clause. Dave Morrissey volunteered. Thank you, Dave!

The WG then worked on finishing the review of sub-clause 5.1.1 *VT/CCVT circuits* rearrangement started at the April 18th webex. The WG agreed to keep a topic concerning the loss of potential effect on relay performance. Also, another option for achieving VT circuit redundancy was brought up that is based on utilizing voltage-independent protection function such as line current differential protection. Jay Anderson was asked to write a sentence or two for it.

A comment was made on a NERC document “highly recommending” redundancy for protection systems. Because of this comment, Don Ware brought a subject of redundancy for breaker auxiliary contacts. If a breaker failure or SIPS function uses them, the auxiliary contacts from two breaker mechanisms could be used to avoid a failure of one of the contacts due to a broken link between the breaker main and auxiliary contact mechanism for an example. Since the WG chair was absent and we did not have a quorum, the WG deferred deciding on this topic for later.

Sub-clause 5.2.2 *CT circuits* contained very little material. Angelo Tempone felt there was some more to be added and will work on extending the sub-clause.

New action items:

1. **Dave Morrissey** will revise sub-clause 4.8 *Asset management and maintenance considerations* to reduce its content and leave only the material pertinent to the guide’s scope for redundancy.
2. **Jay Anderson** will write a couple of sentences to address the VT circuit redundancy option based on utilizing voltage-independent protection function such as line current differential protection as part of 5.1.1 *VT/CCVT circuits*.
3. **Angelo Tempone** will add more material to sub-clause 5.2.2 *CT circuits*.

All the outstanding and new assignments are due to the Chair by **May 30, 2019** for our next scheduled webex meeting. Please email them to sward@quanta-technology and aderonja@atcllc.com.

The WG will continue bi-weekly Thursday webex meetings to review and edit the guide. A series of meeting is set up for the next three months and will be extended to the rest of the year.

C-32: Protection Challenges and Practices for interconnecting solar or other inverter based generation to utility transmission systems

Chair: Mukesh Nagpal

Vice Chair: Mike Jensen

Assignment: Write a report that addresses protection challenges and practices for the interconnection of inverter based generation to utility transmission systems.

There were 28 guests and 14 members.

1. Introductions
2. Meeting minutes from the 1/15/2019 meeting were reviewed with no objects from the group.
3. Mike Jensen provided the following presentation to the group with the following question and answer session:

Examples of different IBR faults due to IBR. California has a large transition from thermal and Nuclear to IBR. He showed how in early March, the system was running at 63.5% renewable, 70% PV, 17% wind.

He presented fault IBR example 1. There was only 20% I2 compared to I1.

On New Year's Day, there was a fault (Example 2) on the 115kV line. The zero-sequence contribution looked good from the transformer Yg winding. There was plenty of a fairly reasonable amount of I2 and I0 for directional element to pick up. The voltages from the islanded PV's were 115% of nominal and ramped down. They appeared to help the island for a while and kept supplying load for 0.613 s. Its most often 2 seconds based on 1547. But this was Rule 21 as it was in California.

California by 2045 would be 100% renewables, hydro units were left, thermals were taken out. Mike used ASPEN to understand what he would see "before" and "after" replacement of the thermals with IBR. The impedances in Z2 and Z0 were set to maximum, and the current limited to 1.1 pu.

- For 3 phase faults, vast majority of the system was unchanged (87%)
- SLG faults showed the biggest change (67%)

In the SCE system,

- For 3 Phase faults, there was a fair bit
- For SLG faults, the drop was bigger than earlier (55%)

According to Mike, the situation with extremely high IBR penetration may not be not as bad as we presently expect; the hydro-generators seem to be helping.

Overall, the current levels dropped much less the farther out from the PV we went < 5% compared to about 20%. i.e. It is a relatively localized phenomenon.

Adequate knowledge of the IBR fault characteristics can allow us to protect these systems.

Q1. What are you doing about the localized areas?

A: Mike said for those areas, 87L along with transfer trips is a strategy they are adopting.

Q2: Model you used for IBR is regular generator with limiters? The moment you go farther (a few buses away), you are going to see issues too because the model with the fixed impedance with a voltage source is not accurate.

A: Mike was using the models just so study the general impact. He will use better models as the next step.

Q3: We have a system with mixed system with rotating machines and IBR. How do we know the negative sequence came from the inverters? Was the directional element set based on negative sequence?

A: He explained that the directional elements were indeed set to negative sequence. Before they were set to Q only, now it is set to QV i.e. negative sequence first, zero sequence next.

Q4: On second example, were the inverters same manufacturers?

A: Mike doesn't know. It is a challenge getting inverter data out of inverter manufacturers.

Q5. Do you anticipate sensitivity issues? Would you want to use different setting groups during day vs night?

A: They set relays based on area, they don't increase sensitivity using different groups.

Q6. How much I2 as a percentage of I1 did you see?

A: I2: 540A, I1: 450A, one cycle after the fault. Purely coming from the IBR.

Q7: For IBR's connecting to your system, is I2 requested?

A: No

4. Started to go through Alla Deronja's report comments, did not complete the review, the highlights are listed below.

- Most of the comments were editorial in nature.
 - Figure titles need revision.
 - Group agreed to use POI definition as currently stated in C37.246.
 - Replace GSU with “interconnection transformer” for those that interconnect the IBR system to the transmission line since IBR’s also have feeder transformers and inverter step up transformers which could be considered a GSU transformer.
 - Verify Zone 1 gnd distance calculation on page 28
5. Requested volunteers to support formatting with the following accepting.
- Mohammad Zadeh
 - Athula Rajapakse
6. Meeting adjourned.

C-33: IEEE P2004 Working Group and IEEE PSRC CTF-33 Task Force Joint Meeting

Chair: Michael “Mischa” Steurer
Vice Chair: George Lauss
PSRC Chair: Dean Ouellette
PSRC Vice-Chair: Sakis Meliopoulos
PSRC Secretary: Arron Findley

P2004 Scope: This recommended practice provides **established practices** for the use of the method of **Hardware-in-the-Loop (HIL) Simulation based Testing** of Electric **Power Apparatus** and **Controls**. It is intended to be **generically applicable** in synergy (in conjunction) with any specific testing standard (if applicable).

PSRC Scope: Support the development of this IEEE recommended practice in cooperation with PELS, IAS, and IES efforts.

WG C33 of the PSRC did not meet at the May meeting in Cincinnati, OH.

CTF-34: Inverter-Based Short Circuit Current Impacts

Chairman: Kevin W. Jones
Vice Chair: Gary Kobet

ASSIGNMENT: Coordinate/communicate the efforts of the PES/NERC Low Short Circuit Current Impacts Task Force and PSRC working groups addressing the issues of inverter-based resources.

OVERVIEW:

ATTENDANCE

42 Total with 6 members and 36 Guests.

GENERAL ITEMS

WG CTF34 met in single session on May 8, 2019 in Cincinnati OH with 6 members and 42 guests.

Introductions were made.

The minutes from the January 16, 2019 meeting in Garden Grove were reviewed and approved.

In the absence of the Chair, the Vice-Chair reviewed action items for other PSRC working groups as noted in the document (NOTE: The Vice-Chair plans to send bullets from the NERC/PES TR68 document to each PSRC WG below to remind them of the recommendations of the NERC/PES task force.)

- C24 Modification of Commercial Fault Calculation Programs with Wind Turbine Generators - Evangelos Farantatos: Report being balloted, expect completion by end of 2019.
- C25 Protection of Wind Electric Plants - Martin Best: expect completion by end of next year.
- C32 Impact of Inverter Based Resources on Utility Transmission System Protection - Mike Jensen: Working group report about 95% complete, webex meetings are planned between now and the September meetings. It was stressed to C32 that the primary deliverable expected is a recommendation on negative sequence current injection from IBR during system fault conditions.
- D29 Tutorial on Setting Impedance-Based Power Swing Blocking and Out-of-Step Tripping Functions on Transmission Lines - No representative present
- D38 Impact of High SIR on Distance Relaying - Christopher Walker: Working group just starting, will incorporate examples of high SIR due to IBR.
- D41 Coordination of Activities Related to Line Protection Inverter-Based Sources - Evangelos Farantatos: The Working Group deliverable is primarily educational, with the following assignment: "To monitor and collect line protection events, coordinate with other industry activities, and provide guidance to line protection subcommittee to improve line protection response when connected to inverter-based sources." The working group has developed a data request form that will be used to request information from the industry.
- J18 Investigate the effect sub-synchronous oscillations due to inverter based resources (IBR) on rotating machinery protection and control- Jim Van De Ligt: Working group just starting, will be reviewing 30+ technical papers. Primary tasks include learning how to detect the interaction of IBR with rotating machinery and subsequently ensuring protection system security during sub-synchronous oscillation events.
- NERC - Bob Cummings/Rich Bauer:
 - P2800/P2800.1 - Leadership holding weekly teleconferences, aggressive completion targets, Jens Boehmer chairing P2800
 - NERC working on the following standards:
 - PRC-002 Disturbance Monitoring and Reporting Requirements
 - PRC-019 Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection
 - PRC-024 Generator Frequency and Voltage Protective Relay Settings

There was significant discussion over what to expect/require from IBR during fault conditions. It was noted the injection of positive sequence current without negative sequence current during system unbalanced fault conditions would likely result in dangerous overvoltage on the unfaulted phase(s).

It was also mentioned that the IEEE P2800 project consider the impacts on circuit breakers, as this concern has been raised with IEEE Std 1547 (e.g., TRV , continuous overvoltage, etc.).

C-35: IEEE transactions paper development for C37.246 IEEE Guide for Protection Systems of Transmission-to-Generation Interconnections

Chair: Alla Deronja (aderonja@atcllc.com)
Vice Chair: Keith Houser (keith.houser@dom.com)
Output: Conference and IEEE transactions paper
Established: January 2018
Expected Completion Date: May 2019

Assignment:
Write a conference paper for C37.246 IEEE Guide for Protection Systems of Transmission-to-Generation Interconnections.

The WG did not meet in May of 2019, but requested to not disband the WG yet to monitor the paper presentation at the scheduled conferences.

The following WG members from C18 and C35 have volunteered to make presentations at the relay conferences:

Texas A&M – **Abu Bapary or Jim O'Brien** (not committed). Call for another volunteer!

Georgia Tech – **Manish Patel** (committed)

Western Protective – **Mike Jensen** (committed)

MIPSYCOM – **Alla Deronja** (not committed). Call for another volunteer!

The paper was presented at the PSRC Main Committee meeting in May 2019 in Cincinnati, OH.

C-36: IEEE Transaction Paper Development from C2 Report: Role of Protection Relaying in the Smart Grid

Chair: Roy Moxley

Vice Chair: R. Benjamin Kazimier

Established, Jan 2018

Output: IEEE Transaction Paper

Expected Completion Date: Sept 2019

Assignment: To develop an IEEE transactions paper based on the C2 report “Role of protective relays in the Smart Grid”

C-36 met on Tuesday in Presidential II at 5pm. There were 5 voting members, 1 non-voting member, and 9 guests present. The group reviewed the combined assignments and made decisions with regard to which parts to further trim such that the length limit for a transaction paper can be met. The group agreed to return the writing assignments in by June 7th. This will allow ample time to format the draft after which an interim web meeting will be scheduled before the end of August. This should keep the working group on track to complete the assignment by the Sept 2019 meeting.

Writing Assignments:

Mehrdad Majidi: Introduction. Due after next draft is completed.

Steve Klecker: Revise sections 7 and 8. Due June 7th.

Jay Anderson: Review and if necessary revise section 9. Due June 7th.

Rob Fowler: Section 17. Due June 7th.

Yuan Liau: Perform formatting. Due June 28th after being sent the next draft from the June 7th submissions.

Alex Apostolov:

Create 2 versions of conference presentations, one for 15 and another for 30 minutes long.

Create 150 word abstract for conference submissions.

Link to C2 paper:

<http://www.pes-psrc.org/kb/published/reports/PSRC%20WG%20C2%20-%20Role%20of%20Protective%20Relaying%20in%20the%20Smart%20Grid.pdf>

Currently on Draft 2.1

C-38: Guide for the Design of Microgrid Protection Systems

Chair: S. S. (Mani) Venkata

Secretary: Michael Higginson

Output: IEEE Guide, P2030.12

Draft: 0

Expected Completion Date: February 2022

Scope

This guide provides for the design and selection of protective devices and coordination between them for various modes of operation of the microgrid. These include grid connected and islanded modes as transitions between modes.

Purpose

To facilitate the deployment of protection systems, given the challenge of protecting equipment and assets in the different modes of operation of the microgrid, including grid connected or islanded modes and during transitions between modes. The guide proposes different approaches, centralized and decentralized, passive and active, to detect and take proper actions to dependably and securely protect the microgrid and its equipment.

3. May 7, 2019 Meeting Minutes Cincinnati, OH

Officer Presiding: Mani Venkata

Minutes Prepared By: Michael Higginson

This meeting was an in-person face-to-face meeting. There were 46 attendees, with 21 members and 25 guests. The working group did not meet quorum.

The working group began with introductions, followed by reviewing our assignment and the patent slides.

Michael Higginson started by recapping the status of the C30 working group. See C30 minutes for details.

Minutes from the March meeting were reviewed. The working group did not have quorum, so the minutes could not be approved at this time.

The working group reviewed the agenda for this meeting. Ratan Das motioned to approve it, and Ward Bower seconded the motion. The working group unanimously voted to approve the agenda.

Next, the working group reviewed the draft table of contents, and discussed progress that individual groups have made since our last meeting. Updates and discussion were as follows:

- Section 4: Definitions
 - Our definitions section is section 4. This needs to be section 3. See the style guide.
 - Ward Bower spoke on this section.
 - They are considering including "interoperability" in the microgrid definition.
 - The working group discussed several relevant definitions. They will be uploaded for working group members to review. Also include 1547-2018.
- Section 5:
 - Steve Klecker spoke for this section.
 - The group was waiting for the reports Mani sent for background information.
 - The group will proceed and meet to prepare a draft after this meeting.
- Section 6:
 - Mike Bloder and Matt Reno spoke for this section.
 - This section is now merged from the previous sections 6 + 7.
 - This section has a new outline, which will be included in the new draft guide.
- Section 7:
 - Matt Reno spoke for this section.
 - This section has a new outline, which will be included in the new draft guide.
 - Ratan commented that educational components should be in appendix. Body of document should be recommendations.

- The WG discussed the flow of the document. For now, the sections will be left in the order as-is.
- Mani clarified that we can use content from C30 in our work now.
- Section 8:
 - Ratan Das spoke for this section and indicated that it is still in progress.
- Section 9:
 - Scott Manson set in a draft but was not present to discuss.
 - The group discussed PCC and POI. Mark Siira will send information to consider.
 - Gustavo raised the point of black start considerations in section 9. Lalitha will bring this to the group to discuss.
- Section 10:
 - Sukumar Brahma spoke for this section.
 - Sukumar raised the point that this now includes overlap with the revised section 6.
 - The WG reviewed the outlines for each section as well as C30 and decided that there is still a need for a separate section for studies.
 - Studies to be discussed should include short-circuit, dynamic stability, and power flow.
 - Amin proposed a need for inertia to limit frequency deviation to less than 3 Hz/s.
 - The working group agreed that section 6 + 7 should address relaying challenges of low inertia systems.

Mani suggested the possibility of having an in-person meeting along with a web meeting for our next meeting. It was proposed to meet at a similar time and location IEEE 1547.2 in June. It was proposed that we meet for at least 4 hours if it is in person. The working group agreed to set up a poll on dates and locations.

Mani Venkata closed the meeting by thanking everyone for their contributions.

All sections are requested to have a completed first draft prior to the next meeting.

Finally, the meeting was adjourned.

C-39: Guide for Testing Auto Voltage Control Systems in Regional Power Grids

Chair: Yufei Teng

Secretary: TBD

Output: IEEE Guide (C37.252)

Scope: This guide describes the application philosophy, limitations, and testing methods for the automatic voltage control (AVC) system of the regional power grid. This guide applies to the testing for reactive-power-control-based AVC systems in the regional grid.

Purpose: The purpose of this guide is to describe the methods of testing the functions and technical performance of the regional AVC systems, with a view to finding the potential defects of AVC systems and improving the operational performance of AVC systems.

The Working Group did not meet in Cincinnati. The project kickoff meeting is scheduled for May 29-31 at State Grid Sichuan Electric Power Research Institute, 16 West Jinhui Second Street, Hi-Tech Zone, Chengdu, Sichuan Province, P.R.China.

This effort has been initiated by members from China as an entity developed standard. The expectation is that the WG will meet in conjunction with PSRC once per year, tentatively at the upcoming Denver (September) meeting.

D: Line Protection Subcommittee

Chair: Karl Zimmerman

Vice Chair: Bruce Mackie

Line Protection Subcommittee Scope

Investigate and report on the relaying techniques and systems used for transmission and distribution (T&D) line protection. Develop statistics and recommend protection practices for improving line relaying performance. Develop and maintain standards for line protection.

The Subcommittee meeting was called to order on Wednesday, May 8, 2019 with 27 members and 52 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (27 out of 43 members present).

Minutes from the January 2019 meeting in Garden Grove were approved after motion made by Rick Gamble and seconded by Randy Crellin.

The Chair reviewed items of interest from the Advisory Committee.

- WG Chairs – please send minutes to Chair and VC
- Line Protection SC Updates needed for PAC World
- Please send agendas one month prior to meeting
- Policies and Procedures is available on website – includes membership changes including 50% requirement to continue to be a voting member
- Review pes-psrc.org website for accuracy - Rick Gamble is webmaster for D Subcommittee
- Continental breakfast provided tomorrow
- Privacy Clause – due to privacy concerns, the roster shall not be distributed, except to the IEEE-SA staff, IEEE-SA Board of Governors and IEEE-SA Standards Board, unless everybody on the roster has submitted their written approval for such distribution

Working groups gave reports on their activity.

Reports from the WG Chairs:

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

Chairman: Brian Boysen

Vice Chair: Claire Patti

Established: 2013

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

Draft :2.3

Expected Completion Date: 2019

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 via web meeting on Tuesday, May 7, 2019, 9:20 am EDT.

There were 13 members and 14 guests in attendance.

The patent slides were presented. No concerns were voiced.

The January meeting minutes were presented. Randy Crellin motioned to approve, and Fred Friend seconded the motion. The motion carried.

The April web- meeting minutes were presented. Don Lukach motioned to approve, and Hugo Monterrubio seconded the motion. The motion carried.

The Working Group reviewed the existing Bibliography and determined which entries that are not specifically referenced in the body of the document should be retained.

Don Lukach motioned to send the revised document for recirculation ballot and agreed to reject the comments that the Working Group had previously proposed for rejection. Randy Crellin seconded the motioned. All Working Group Voting Members present voted to approve.

Don Lukach motioned to extend the PAR 2 years. Pat Carroll seconded the motion. All present members voted to approve the motion.

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

Chair: Kevin W. Jones

Vice chair: Normann Fischer

Assignment: Create a tutorial on setting impedance-based power swing blocking and out-of-step tripping functions related to transmission line applications. Specific relay settings examples will be provided. Other methods of detecting out-of-step conditions that exist will be summarized and referenced, but will not be discussed in detail.

WG D29 met in single session with 4 members and 10 guests.

GENERAL ITEMS:

Aaron Martin from BPA gave a presentation on an unusual event that occurred on the BPA intertie lines to California. The event activated the Out-of-step (OOS) logic in the protective relay but does not appear to be an OOS event since there was no exchange of active power between the two systems but an exchange of reactive power between the systems.

WRITING ASSIGNMENTS:

The chair sent out the latest draft document to the Vice-chair but due to email issues at the hotel the vice chair could not download the document to discuss at the meeting. The chair has reorganized the document. Before the next meeting the chair and the vice chair are going to review the outline and reorganize as necessary. Look at the document title and modify change if necessary. Find volunteers for the section where we still need volunteers. Align the document with the 2005 D6 document.

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

Chair: Karl Zimmerman, Schweitzer Engineering Labs

Vice Chair: Ted Warren, Southern Companies

Output: Tutorial

Established: January 2014

Expected Completion Date: Jan 2020

Draft 4.0

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

Working group D30 met in a single session with 7 voting members and 13 guests. After introductions, the WG Chair reviewed the outline from the previous meeting.

The Working Group discussed at great length some comments from Craig Holt on Section IV, the comparison of mho v quadrilateral characteristics. He had cited several references, including those from Mooney, etc, S. Ward, and some articles from van Warrington. We also looked at the material in the existing line guide.

The WG agreed this section should be strengthened by including some of the merits of both mho and quad, which were outlined nicely in several of the cited references. Craig Holt and Karl Zimmerman agreed to collaborate on this section.

The WG also discussed the merits of finishing the tutorial in the present report format versus creating Powerpoint for presentation. The WG preferred thought the report format is better for archival reasons and can be more easily read and distributed.

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

CHAIR: Normann Fischer

VICE CHAIR: Joe Mooney

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

D35: Evaluation of Transmission Line Pilot Protection Schemes

Chair: Rick Gamble

Vice Chair: Brandon Lewey

Established: January 2017

Output: Technical report to the Line Protection Subcommittee

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

Expected Completion date: September 2019

Draft: 6

Working Group D35 met on Tuesday, May 7, 2019 at 2:20pm in a single session with 21 members and 10 guests.

Started off with a presentation from Sebastien Billaut regarding the addition of a summary table to the report.

The working group then reviewed 2 writing assignments.

Several comments from the chair were reviewed, and a few re-work assignments were made.

Draft 7 will be distributed to working group members for review.

For the next meeting, WG D35 will need a room for 40 and a computer projector.

Action Items:

- Rick Gamble and Brandon Lewey to scrub draft 7 to resolve existing comments by 7/1/2019.
- All Members: Review and provide comments to draft 7 by a 9/1/2019.

D37: Impact of series compensation on transmission lines

Chair: Mike Kockott

Vice Chair: Luis Polanco

Secretary: Nuwan Perera

Working Group Assignment: Create a report the impact of fixed series compensation on transmission line protection.

D37 met as scheduled with 8 attendees (5 members plus 3 guests).

WG chair proposed Nuwan Perera as the secretary. This was approved.

Few writing / review assignments were received. WG reviewed the following sections of the Document:

- Section 3.2.5 on current harmonic distortion on series capacitor.
- Sec 5.1.2 on Impact of the capacitor protection and bypassing mechanism on the line protection.
- Section 3.2.2 on voltage and current inversion.

Reviewed the list of assignments and updated as follows.

Nuwan Perera

- Update the current document with IEEE report template
- Merge Section 3.2.5 into the main document
- Provide draft for the Section 7.2 on Faulted Phase Selection
- Provide draft for the Section 7.5 on Staged Fault Testing

Roy Moxley (need to find a new volunteer if Roy will no longer attend)

- Provide draft on Section 3.4.4. (Delayed Current Zero Impact)
- Provide review comments on the Fault Levels Section 3.3

Luis Polanco

- Provide review comments for section 3.1 on what are series capacitors and why are they required.
- Research on three (3) Gas-Turbine Generator failures that occurred on South America few years back to incorporate in Section 5.2.1
- Provide review comments for Section 5.2 (a&b) on motivation of upfront real-time dynamic simulator studies, and benefits
- Provide review for Section 4 on planning for addition of series capacitors

Normann Fischer

- Provide draft for Section 7.4.1 on New Technologies (Travelling Wave applications) and for Section 3.2.3 on Low Frequency Oscillations
- Special testing requirements for new technologies

Mike Kockott

- Update Section 3.2.2 based on the comments on voltage inversion and current inversion
- Provide review comments on the 3.4.2 Sub-synchronous Resonance section
- Provide draft for Section 7.1.1 on Impact of Series Compensation on the Permissive Over-Reaching Transfer Trip (POTT) scheme

Charlie Henville

- Review comments provided on Section 5.1.2

WG chair to send draft 1.01 converted to the new IEEE PES format to all WG members.

With no further business, the meeting was adjourned.

D38: Impact of High SIR on Distance Relaying

Chair: Chris Walker

Vice Chair: Greg Ryan

Working Group Assignment: Prepare a technical report to the line protection subcommittee to evaluate the impact of high SIR on line protection.

We met with 43 Attendees (9 Voting Members – 3 Non-Voting Members – 31 Guests)

We started with introductions and determined if quorum was met. Quorum was met and we voted to approve the minutes. Craig Holt motioned and Don Lukach seconded. We voted and approved the minutes with no discussion. Chris introduced the outline and noted that the main intent of the meeting today was to get volunteers for writing assignments. Chris then read through the outline that we have. Chris mentioned that we need to add a section on the effect of inverter based resources on high SIR and line relaying. Chris suggested that we add that section to "WHAT IS SIR" section. After some discussion we added a section "IMPACT OF INVERTER BASED RESOURCES ON SIR" as a stand-alone section and agreed that as the report evolves it may make more sense to move that section into another section. We discussed the possible different definitions: is it based on line impedance or based on zone reach. We concluded to mention some of them but to define SIR for our paper and make it what is in the TX Line Guide today and then work from there. Don Lukach volunteered to work on that section – What is SIR. Chris Walker will follow up on the Impact of IBR on High SIR for next meeting. Pratap Mysore volunteered to write on Voltage Transformers. Pratap has transient waveforms from CCVT manufacturers and has asked for Low Level information as well. Pratap mentioned the paper by Bogden for GE as a great reference: "Digital Relays and Capacitive Voltage Transformers: Balancing Speed and Transient Overreach". Steve Klecker volunteered for Current Transformers. Craig Holt took on the section of Relay Accuracy and Karl Zimmerman offered to work with him. Brandon Lewey took Distance Protection. Bruce Mackie offered to work with Ted Warren on Instantaneous Overcurrent sections. Supervisory Elements was taken by Meyer Kao. We are going to wait on Solutions until the paper is further along. Tony Seegers suggested to swap the IBR section with the Challenges of SIR section. Writing assignments are due by mid-August for the writing assignments to be compiled and posted for the working group on the PSRC website prior to the September meeting in Denver.

Current Outline

Prepare a technical report to the line protection subcommittee to evaluate the impact of high SIR on line protection.

1. INTRODUCTION
2. WHAT IS SIR – Don Lukach
 - a. Define SIR
 - i. SIR based on line impedance
 - ii. SIR based on zone reach
 - b. Line length defined by SIR
 - c. Electrical vs Physical Line length
 - d. How to calculate SIR
 - i. Phase SIR
 - ii. Ground SIR
3. CHALLENGES OF HIGH SIR
 - a. Instrument Transformer Accuracy
 - i. Current Transformer – Steve Klecker
 - ii. Voltage Transformer – Pratap Mysore
 1. Steady-State
 - a. Low level
 2. Transient
 - a. Active Filter

- b. Passive Filter
 - b. Relay Accuracy – Craig Holt and Karl Zimmerman
 - i. Digital
 - 1. Accuracy
 - 2. Operating Speed
 - a. Filtering
 - b. Sub-cycle Elements
 - ii. Electromechanical
 - iii. Solid-state
 - c. Distance Protection – Brandon Lewey
 - i. Phase Distance
 - ii. Ground Distance
 - iii. Mho Expansion
 - d. Instantaneous Overcurrents – Ted Warren and Bruce Mackie
 - e. Supervisory Elements – Meyer Kao
- 4. IMPACT OF INVERTER BASED RESOURCES ON SIR
- 5. SOLUTIONS
 - a. Practical Solutions
- 6. EXAMPLES
- 7. REFERENCES

D39: Revise C37.104 IEEE Guide for Automatic Reclosing on AC Distribution and Transmission Lines

Chair: Manish Patel

Vice Chair: Brandon Armstrong

Established: May 2018

Output: C37.104 – IEEE Guide for Automatic Reclosing on AC Distribution and Transmission Lines

Draft : 0.3

Expected Completion Date: December 31, 2022

Working Group Assignment: Revise C37.104 IEEE Guide for Automatic Reclosing of Circuit Breakers for AC Distribution and Transmission Lines

Working Group D39 met on Wednesday, May 8, 2019 at 9:20 a.m. in a single session with 21 members and 10 guests. No Quorum.

After brief introductions, the minutes from the previous meeting were reviewed, though no quorum existed to approve them.

All assignments from January meeting were received. WG chair noted that sections 4, 6 and 7 have been the focus so far, but section 5 (autoreclosing for distribution systems) needs some work as well. He further noted that any revision to section 5 needs to be coordinated with guide C37.230, which is going through the balloting process at this time. Bruce Mackie and Brian Boysen took assignments to look at section 5 and look for overlap and consistency with guide C37.230.

Progress on previous assignments was discussed: Gary Stoedter and Ted Warren revised the content of section 4.5. Rafael Garcia revised section 4.6. A new content was added as well as these sections are better organized now.

The WG spent a most of the meeting time discussing Adaptive Reclosing and organization of this section. Craig Holt, Wayne Hartmann and Addis Kifle presented two options for WG's consideration. A consensus was reached that the first option is appropriate and should be organized into following two subsections:

1. Internally adaptive (i.e. reclosing relay modifies reclosing internally)
2. Externally adaptive (reclosing relay action is changed from a downstream device, etc.)

Then WG discussed an application of supervisory intervention and if it should be considered as Adaptive Reclosing which led to discussion on following:

- Should "Adaptive Reclosing" be an IEEE defined term? It was noted that "Adaptive Relaying" and "Adaptive Control" are already defined terms.
- Should any manual action that modifies the reclosing scheme (SCADA changing to setting group with different number of shots, open intervals, etc.) be considered adaptive.

- The above items are related in that “Adaptive Relaying” and “Adaptive Control” are specific that only automated actions (not manual) are considered adaptive. The overall feeling is that the term “adaptive reclosing” should be defined similarly to the other previously defined “adaptive ___” terms.
 - This discussion will be continued at the next meeting.
- Where do we draw the line on “adaptive reclosing?” Should reclose block for high current faults be considered? Reclose block for OOST? Reclose block for fault outside of underreaching impedance (or other) zone?
- WG briefly discussed inclusion of Manual Close in the guide.
 - This topic will be discussed further at the September 2019 meeting, with WG chair doing some research on existing language before then.

Assignments:

- As previously mentioned, Bruce Mackie and Brian Boyson to look at Section 5
- Adi Mulawarman has provided some edits for section titled “Wind Turbines” but also expressed that there is some opportunity for improvement. WG chair mentioned that this section could be further split into two with a focus on type I, II WTGs and type III, IV WTGs and PV based resources. Michael Higginson offered to review/edit from distribution connection perspective. Need a volunteer to review/edit from a transmission point of view.
- Josh Lamb volunteered to review/edit/resolve comments for sections 6.3.8, considerations for transformer in line and section 6.3.9, considerations for multi-terminal lines
- Brandon Armstrong and Matt Garver volunteered to review/edit/resolve comments for section 6.3.11, transmission line reclosing & interfacing with automatic sectionalizing schemes.
- WG chair requested Craig Holt, Wayne Hartman & Addis Kifle to develop a preliminary definition for “Adaptive Reclosing.”

Volunteers with experience and knowledge in following area are needed: Multi-Phase autoreclosing, Ethernet based applications to autoreclosing.

Contributions are requested by August 2nd, 2019.

D40: Manage the Development of Line Protection Topics

Chair: Jeff Barsch

Vice Chair: Don Lukach

Assignment: Manage the development of line protection topics and harmonize efforts with IEEE Std C37.113-2015, IEEE Guide for Protective Relay Applications to Transmission Lines.

The D40 working group met with 15 members and 8 guests. A motion to approve the January 2019 minutes was made by Bruce Mackie with a 2nd by Alla Deronja. There was a unanimous vote to approve the minutes. A motion to approve the agenda was made by Steve Klecker with a 2nd by Dom Fontana. There was a unanimous vote to approve the agenda.

The following topics were discussed based upon action items from the January meeting.

- Multi-terminal lines
- Load encroachment and loadability
- Loss of Potential overcurrent scheme
- Dual element spot networks

The WG reviewed references provided by members regarding each of these topics.

Members volunteered to take the following actions. Work is requested to be completed by August 30, 2019.

- Steve Klecker & Dom Fontana: Review load encroachment and loadability content in the existing guide. Make a recommendation as to what, if any, additional material should be added from the previously found resources.
- Daniel Lebeau: Review the D7 WG report entitled “Loss of AC Voltage Considerations for Line Protection” to make a recommendation as to what, if any, of that information should be included in the next revision of the guide.
- Gary Stoedter: Research protection for lines with long radial taps. Present his findings, as well as his company’s experiences, at the September meeting.

- Abu Zahid: Review the guide for information related to parallel transmission lines similar to his company's example of a dual element spot network. Make a recommendation as to what, if any, additional material should be added regarding this subject.
- Mehrdad Majidi: Review the guide regarding ground directional polarization methods. Research what other references are available on this subject. Make a recommendation as to whether or not the information in the guide should be expanded or reduced.

D41: Coordination of Activities that Impact Line Protection Due to Increasing Penetration of Inverter-Based Sources

Chair: Ilia Voloh

Vice Chair: Evangelos Farantatos

Assignment: To monitor and collect line protection events, coordinate with other industry activities, and provide guidance to line protection subcommittee to improve line protection response when connected to inverter-based sources

The meeting started with introductions and then the WG chair described the scope of the WG.

1. There was no quorum and minutes of the January 2019 meeting were not approved.
2. Presentation - Derek (Gefei) Kou, Dominion Energy. "Fault Characteristics of Distributed Solar Generation"
3. Presentation – Dr. Ali Hooshyar, University of Toronto. "Understanding IBR DC-AC conversion and Control modes"
4. Presentation – Rich Bauer, NERC "Inverter and Relay Manufacturers Collaboration meeting update"

There were total 42 attendees in the meeting, 11 members and 31 guests.

For the next meeting in September 2019, we need a room with capacity of 30, and a computer projector. Please avoid conflict with WG C24, C32, B10, CTF34 in that order.

Coordination Reports

T&D Committee / Distribution Subcommittee

The next T&D Committee / Distribution Subcommittee meeting will occur during the IEEE PES General Meeting in Atlanta, GA, 4-8 August 2019.

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 Sal Martino, Vice-Chair Fred Friend, Secretary

P1854: Smart Distribution Application Guide has been balloted and recirculated and recirculated. Awaiting word if the comment resolutions are adequate for the negative balloter.

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.

Volt-VAR Control Task Force

Mike Simms, Chair Suresh Gautam, Vice-Chair John Sell, Secretary

Work is slowing resuming on P1885 'Guide for Assessing, Measuring and Verifying Volt-Var Control Optimization (VVO) on Distribution Systems'. The task force is preparing for final review with balloting expected later this year.

Working Group on Switching & Overcurrent Protection <http://grouper.ieee.org/groups/td/dist/sop/>

Fred Friend, Chair Casey Thompson, Vice Chair Joe Viglietta, Secretary

Continued working on the “Guide for Reliability Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment”, P1806 with the plan to go to ballot in late 2019. A PAR extension was granted until 2020.

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.

There is a Task Force in the Distributed Resources Integration Working Group working on *Microgrid Design Considerations* in collaboration with PSRCC C38 working group.

There are two Task Forces in the Distribution Reliability Working group looking at outages from Mylar Balloons, and the revision of IEEE 1656 *Guide for Testing the Electrical, Mechanical, and Durability Performance of Wildlife Protective Devices on Overhead Power Distribution Systems* – both chaired by Yamille del Valle of NEETRAC.

Old Business

None

New Business

The Chair discussed a request to provide standards on High Voltage DC lines. The Officers of the PSRC will continue to discuss.

General Discussion

None

Line Protection operations of interest

Iliia Voloh made a presentation regarding a current differential mis-operation event. .

The meeting adjourned.

H: Relaying Communications and Control Subcommittee

Chair: Galina Antonova

Vice Chair: Aaron Martin

Relaying Communications and Control Subcommittee Scope

Evaluate and report on the characteristics and performance of protective relaying communications and control systems. Recommend communication requirements, operating and test procedures which assure reliable performance of the overall protection and control system. Report on new relaying equipment designs tailored to specific communication requirements.

Included are matters necessary to the function of such systems employed in the generation, transmission, distribution, and utilization of electrical energy, and their effects on system operation. Control systems include data acquisition and processing from devices such as transducers, Intelligent Electronic Devices (IEDs), and Human Machine Interfaces (HMIs) including the low-level interfaces to

these systems.

Power System control issues associated with Power System Dynamics are excluded from this scope.

SC H met on May 8, 2019 in Cincinnati, OH with 28 members and 33 guests present comprising a quorum. Minutes of January 2019 SC H meeting were approved unanimously (M. Benou moved, M. Swanson seconded)

Announcements:

1. Announcements from AdCom
 - a. New items from May 2018 Adcom Meeting
 - i. Lunch and Learn on Signup123 was provided
 - ii. WG Training including iMeet is being prepared
 - iii. Give presentations to the Main Committee upon completion
 - iv. WPRC Abstracts from PSRC are due May 17, 2019
 - b. New items from Awards and Recognition Meeting
 - i. Officers to communicate WG completion/status
 - ii. WG officers to review their WG information posted on PSRC website.
 - c. New items from Standards Coordination Meeting
 - i. Sept 17, 2019 is SA deadline for all 2019 approvals.
 - d. Reminders carried from prior meetings.
 - i. Please announce meeting cancellations in advance
 - ii. GDPR compliant rosters, emails not to be visible (bcc is ok)
 - iii. WG presentations to be reviewed by SC Officers
 - iv. Please apply for IEEE Senior Membership
 - v. List all avoidance in meeting room requests
 - vi. Standard format for SC H vote mailings (Subject line): **(2014-10 by May 31, 2019” to “(201X-XX) by [201X-XX-XX]**
 - vii. Minutes are due in 2 weeks so successive minutes assembly levels stay on 60-day schedule.

WG business:

H11 completed its assignment. The WG will continue at least to the September meeting in case there are issues with the WPRC conference that need to be dealt with.

H38 completed its assignment. Bill Dickerson made motion to disband group. Marc Benou seconded the motion. 27 HSC members voted to disband group. Chris Huntly abstained.

H44 selected Ralph Mackewitz as Vice Chair to replace Qiaoyin Yang.

HTF47 Requested to form a WG titled “Impacts of IEC 61850 sampled values, GOOSE and PTP time synchronization on protection and control applications using process bus” with the following assignment: “In a digital substation Protection and Control (P&C) devices rely on Sampled Values (SV), GOOSE and time synchronization (PTP) together over process bus to communicate with Merging Units (MUs). This Working Group will generate a report evaluating the discrepancies in the communication of SV, GOOSE or PTP messages and their impact on protection and control applications such as performance and behavior.” and below leadership:

Chair: Mital Kanabar
Vice-chair: Antonio Riccardo
Secretary: Dean Ouellette

Ratan Das made a motion to approve Alex Apostolov seconded the motion. SC H approved the motion unanimously.

A discussion followed on connecting this work with on-going IEC efforts with the same scope. Eric Udren and Alex Apostolov to act as liaisons to IEC group.

During H50 report Ratan Das shared that there is a GIGRE group with a scope that includes time sources for electrical substations. It was suggested to work with Rich Hunt (PSRC CIGRE liaison) to connect these groups.

Ratan Das commented on the new meetings schedule, and emphasized the importance of time coordination for PSCC and PSRC meetings.

Standards Nearing Expiration:

Revision of IEEE C37.239 – Standard for Common Format for Event Data Exchange (COMFEDE) for Power Systems needs to start in 2019. A previous Task Force [HTF43] already concluded in September 2017 that the standard should be re-approved as is without changes. As re-affirmation process is no longer available a TF to be formed. A volunteer to chair a TF for reapproving the standard is requested.

Revision of IEEE C37.232 (COMNAME) standard needs to be initiated in 2019-2020 (The standard expires in 2021). Those interested to lead this work to reach out to SC H Officers.

Old business:

Mark Adamiak named Secretary of WG H17 that has been suspended. As a secretary Mark will edit existing work and submit for comments to H17 WG members before requesting to circulate to SC.

SDN Task Force, D. Holstein provided a proposal. SC H Chair suggested not to start any new work (unless required for standards nearing expiration), until on-going work is completed.

New business:

The meeting was adjourned (M. Benou moved, K. Fodero seconded). Attendees approved adjournment.

Reports from the WG Chairs

H3 Time Tagging for Intelligent Electronic Devices (IEDs) – COMTAG

Chair: W. Dickerson

Vice Chair: J. Hackett

Output: IEEE Standard, PC37.237

Completion Date: 2018 December 31

Current Revision: D1.01

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.

H3 did not meet and its work is complete. Standard was published effective Dec. 31 2018. A small group is working on a paper.

H6: IEC 61850 Application Testing

Chair: C. Sufana

Vice Chair: B. Vandiver

Output: Report

Established: 1999

Expected completion date: December 2019

Draft: 10.1

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 9 members, 5 guests, and 1 officer present for the May 07, 2019 meeting. Quorum was not achieved.

The new patent slides were also presented with no objections voiced. The minutes from the last meeting will have to be approved by email circulation.

The Chair began with a review of the report's status – it's prior circulation to the SC for approval vote resulted in many editorial comments that have been resolved. Out of 191 comments, about 51% have been addressed. As Craig Preuss submitted most of the comments this session focused on those.

Some progress was made on the comments resolution, but too many remain and will have to be addressed offline. Once completed, it will be resubmitted to the SC for final approval and subsequent posting. Once the Report has received final SC approval, the SC will be requested to approve disbanding the H6 WG.

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

Chair: K.E. Martin

Vice Chair: A. Goldstein

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.

Par expiration date: 31-December-2018

WG H11 met Tuesday May 7, 2019, 9:20 – 10:30 am.

The attendance was 5 members, and 4 guests. Attendees introduced themselves, and a sign-in was circulated. The chair made the patent announcement and reviewed the current status:

The standard was approved September 10 and published December 17 by the IEC. It was also approved September 27 and published December 19 by the IEEE. So the standard itself is complete. The WG completed 2 summary papers. One paper was accepted and presented at the Texas A&M relay conference in March by Shane Jin from RTDS. It was well received by an audience of 30-40 people. The second paper has been accepted for the CIGRE meeting in Tromso, Norway, and the ISGT meeting in Chengdu, China. The WG has also sent in a proposal for WPRC in Spokane but papers have not been selected for the conference yet.

The support liaison with the European sponsored ROCOF research was discussed. That project has been investigating ROCOF measurements including the required measurement parameters and methods for making a better measurement. They have coordinated their work to consider the standards that we have produced. They are concluding their work and will present findings in a webex on May 17.

The WG also discussed the future of the WG. If there are no new issues that need to be addressed, the work can be considered complete and the WG can disband. The WG will continue at least to the September meeting in case there are issues with the WPRC conference that need to be dealt with.

H22/C19 – Guide for Categorizing Security Needs for Protection Related Data Files

Chair: Amir Makki

Vice Chair: Cesar Calix

Secretary: Hugo Monterrubio

Ballot Administrator: Rick Cornelison

Output: Guide - PC37.249

Established: January 2014

Expected Completion Date: December 2019

Draft: 8.8

Assignment: Identify and categorize protection and automation related data files based on content, use, and risk of disclosure or compromise (confidentiality, integrity, and availability). Protection and automation

related data files include, but are not limited to, files used for configuration, management, and analysis of protective relaying systems.

The Working Group met on time with 12 members and guests in attendance. Quorum was not established. The minutes will be posted to I-Meet Central and will be approved electronically. The Chair went over the status of the PAR. The title is being changed to: Guide for Categorizing Security Needs for Protection, Automation and Control (PAC) Related Data Files (adding the word Control for consistency with the new PSRCC designation). The scope plus other sections will need to be updated because of the title name change however it is just a title change. The title change should be in by August 17, 2019.

Tony Johnson sent in a big submission (draft 8.8) that integrated the assignments with the body of the draft guide. TW Cease reviewed the draft with the WG. Abstract and Keywords need to be added (abstract needs to be high level). Minor formatting tweaks need to be done. Craig Preuss will do a technical merge of concept from the various drafts. For example, setting files need to define information type and then harmonize the classifications with the types. Clause 3.2 needs to be written (Amir will do that after the meeting). Craig suggested the use of Word's built-in tools for searching for acronyms.

There was also discussion on the use of the word shall. All uses of the word should be changed to should as the output is a Guide. Craig indicated that there is no real guide on the number of shall(s) or should(s) that can be in a Guide. There are 13 shall(s) and 40 should(s) presently in the draft. The group also agreed to move the definition of what C, I, and A mean before Table 2 and to scrub the figures for compliance with copyright requirements. Craig suggested the use of SNAG IT software for graphics cleanup. The graphic with RSA Secure-ID also needs to be redone.

H27: PC37.251 Standard for Common Protection and Control Settings or Configuration Data Format (COMSET)

Chair: Mario Capuozzo

Vice Chair: Benton Vandiver

Secretary: Zach Makki

Output: Standard

Established: 2013

Estimated Completion Date: December 2020

Draft: 0.4

Assignment: Develop a standard file format for exchange of protection and control configuration data between engineering tools and asset management tools.

The working group met with 15 members and 6 guests in attendance.

We opened with a presentation from the chair. The presentation starts with a recap of the work that has been done in recent meetings. The next few slides detail a proposal the chair is making to have two different models produced, one as an enhancement to 61850 and the other as a standalone file similar to what COMTRADE does for transient data exchange.

The last few slides show the work that has been done in between the January and May meetings to map the already created UML model to 61850 and the idea of a generic logical node for settings that won't fit into 61850.

A comment was made asking if we are doing anything with logic. The chair and multiple members would rather discuss the two-file format being proposed and the mapping into 61850.

There was not full consensus that the work done here to fill gaps in 61850 will be adopted by working group 10 of the IEC TC57. Some members seemed confident this could be done; others were less confident.

Multiple members agree with the idea that a generic settings logical node needs to be added, so as to host settings that do not naturally map to a specific LN, such as a PTOC block.

Multiple members agree to first come up with a model that fill the gaps of both 61850 and the COMSET UML model, at which point two things can occur:

1. Development of a file format that borrows syntax from Substation Configuration Language.
2. Development of a stand-alone CIM serialization in either XSD or RDF.

The group could simultaneously develop a data mapping between the different serializations. It is possible that the first file, a sort of "SCL light" file, may suffice for all use cases. However, because the

COMSET UML model will be constructed in tandem, it would be possible in the future to serialize to CIM in very little time utilizing Enterprise Architect.

A member mentions that the dream outcome for this working group and for H31 would be the ability to design relay settings in a non-vendor specific software tool and then push those settings to devices from any vendor. This would only be possible if those vendors adopted the semantics/naming conventions produced by H31.

A question was raised if we should store all values as primary. There was not consensus on this topic among the members.

All members agree this working group needs to address the mRID (UUID/GUID) issue. Namely, there is concern that 61850 in its present form only supports UUIDs are certain locations in the file. Herb says that the future 61850 standard will include more support for more unique identifiers.

Action Items: Chair will set up the next interim GoToMeeting to continue work on the COMSET UML model and also the gap-analysis on 61850 settings data.

H30: IEC 61850 User Feedback

Chair: D. Maragal

Vice Chair: A. Martin

Secretary: D. Tessier

Output: User Feedback

Established: September, 2014

Estimated Completion Date: Ongoing

Draft: 0.8

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.

Introductions – 20 attendees
Reviewed Agenda

Deepak presented 61850 Utility Forum Subjects including
Testing tools,
Network design,
Logic Diagrams & practices,
cyber security,
Virtual Machine technologies for testing.
PTP resynchronization testing
Fiber vs. Copper in standard connections.
Optical PTs and CTs
Lifecycle and version control

Antonio Riccardo of National Grid to provide suggestions for Lock Out logical Nodes

Deepak mentioned that H30 website will begin including links to publications from PAC world.

Herb Falk recommend using WG10 form for providing feedback.

Alex Apostolov listed the following Cigre Working groups
B5-53 Test Strategy for PAC on IEC61850

B5-60 Protection, Automation and Control Architectures with Functionality Independent of Hardware

B5-68 Optimisation of the IEC 61850 Protection, Automation and Control Systems (PACS) engineering process and tools

PTP vs. 61850 9-LE Merging Units

Aaron Martin suggested referring to PTP merging units as Layer 1 merging units and 61850-9 Merging units at Layer 2 merging units

H31: Common Protection & Control parameters for COMSET

Chair: D. Maragal

Vice Chair: A. Apostolov

Output: Report

Established: September, 2015

Estimated Completion Date: September, 2020

Draft: 4

Assignment: Develop generic models and parameters of protection functions.

H31 Met Tuesday May 7, 2019 at 8 AM with 8 members and 16 Guests. The chair discussed the format and content of spreadsheet and highlighted the following key aspects:

- PSRC's generic model and alignment with IEC 61850's model
- Automated lookup and tabulation of IEC 61850 functions
- List of all protection & protection related parameters and their descriptions
- Reference list of IEC 61850 attribute nomenclatures and their descriptions
- Reference list of IEC 61850 logical nodes and their mapping to IEEE C37.2 functions

The group further discussed the specifics of Blocking functions in reference to Function LN, Frequency protection LN, Power Factor protection LN, and Voltage Control LN. The concern of duplication of attributes for the same meaning was highlighted and discussed. The group could not come to any specific conclusion and more investigation was needed to look into vendor's implementation.

H32: Performance requirements for Ethernet circuits applied to teleprotection

Chair: K. Fodero

Vice Chair: W. McCannon

Output: Report

Established: September, 2014

Estimated Completion Date: December 2019

Draft: 10

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

The WG met on Wednesday, with 9 members and 8 Guests in attendance.

Draft 10 was discussed. We have been trying to resolve issues raised during our subcommittee review. We have resolved most of the comments and issues and are still in the resolution process. At this meeting, we discussed many changes. We agreed to get a revised draft to the working group for review within the next month. Once we get the approval of the revisions from the WG we will ask the H subcommittee to share this version with the D or K subcommittee for comments.

H35: XML Translation for COMTRADE

Chair: M. Adamiak

Vice Chair: Z. Makki

Secretary: M. Capuozzo

Output: Report

Established: May, 2015

Estimated Completion Date: December 2019

Draft: 12

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

Mark Adamiak presented that we submitted the draft of the report for voting by the H subcommittee. 21 votes received, - just over 50%. Need 75% to pass the report. We have comments to review and incorporate.

Craig Preuss comments were addressed regarding quality bits and allowing variable bit size for the channels, such that something like a 16 bit value doesn't need to be mapped to a 32 bit value, and thus waste space.

We held a very lengthy discussion regarding comments made about 61850's relationship to COMTRADE and the language around this statement was clarified

Further discussion was had on some of the remaining comments that were received. The report will be re-formatted and re-submitted to the H Subcommittee.

Action Items: Complete the review of the comments and re-format the report.

H40: Databases used in SAS

Chair: J. Bougie

Vice Chair:

Output: Guide

Established:

Expected completion date: December 2020

Draft: 1.5

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

No Meeting. No Report.

H41: Revision of IEEE 1646 Communication Delivery Time Performance Requirements

Chair: D. Holstein

Vice Chair: T.W. Cease

Output: Standard

Completion Date: 2021

Draft: 2

Assignment: Revision to IEEE Standard 1646-2004

The WG met on Tuesday, with 6 members and 4 guests in attendance. A quorum (6 of 9) was present. This was the third official meeting. Attendees introduced themselves and affiliation.

Attendees signed the attendance list and indicated if they were a member or guest.

Action item 03-01: Update iMeet to include new members and guest with an invitation to register for P1646 [DH].

The WG met on Tuesday, with 6 members and 4 guests in attendance. A quorum (6 of 9) was present.

This was the third official meeting. Attendees introduced themselves and affiliation.

Attendees signed the attendance list and indicated if they were a member or guest.

- Action item 03-01: Update iMeet to include new members and guest with an invitation to register for P1646 [DH].

The call for patents was presented – no response.

The agenda was reviewed and approved without change.

Meeting #2 (Jacksonville, FL) minutes were reviewed and approved as written.

Action items were reviewed and all action items from meeting #2 were closed.

WG P1646 started clause-by-clause review.

The approved PAR title P1646 "Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation." The scope states "This standard defines communication delivery

times of information to be exchanged within and external to substation integrated protection, control, and data acquisition systems.”

- Action item 03-02: Include definition of communication delivery time [CP].
- Action item 03-03: Check with Mel Swanson to define style guide/rules for definitions [DH & CP].
- Action item 03-04: Reach out to P1854 to understand the synergism with P1646 [CP].

Definitions will be revisited and updated based on the context in which they are used. No changes were recommended for clauses 1.2, 1.3 and 1.4.

Clause 2, Normative references, includes IEEE Std 1588:2002. Unless this standard is cited as a normative requirement in clause 5.5 it will be deleted or moved to the bibliography as an informative reference with the note that it is updated.

Beginning with clause 4, the clause-by-clause review will continue at the next meeting.

New business: A new CIGRE JWG B5/D2.67 has formed. Holstein is a members and will keep the group updated on its relevance to P1646.

Action Item 03-04: Post their terms of reference on iMeet [DH].

H44: Monitoring and Diagnostics of IEC 61850 GOOSE and Sampled Values Based Systems

Chair: A. Martin

Vice Chair: R. Mackiewicz

Established: May 2018

Expected completion date: January 2021

Draft: 0

Introduction – 18 Members, 3 Guests

Past meeting minutes to be approved via email.

Patent statement read – no comments

Policy statement read – No comments

Chair announced that a new Vice Chair was needed and asked for a new volunteer.

Chair announced that an iMeet central is now setup. The iMeet group is named P2030.100.1. A number of the members reported that they have not received the invite from iMeet or do not see it in their iMeet account. Chair will continue to work on it to ensure all Members have access to site.

The following assignments included:

4. Explanation – Overall approach – Aaron Martin

4.1 Publish Subscribe Model – Ralph Mackiewicz

4.2.1.2 Simulation Indication - Jose Ruiz

4.2.1.3 Test Indication – Jose Ruiz

5.1 LGOS – Herb Falk, Dean Oulette

5.2 LSVS – Qiaoyin Yang

5.3 LCCH Communiation Channel – Silvio Roesler

6.1.1 IEC 62351 part 7 – Aaron

6.1.4 IEC 62439-3 – Alex Apostolov

6.2.2 Modbus – Craig Preuss

6.3.1 SDN – Qiaoyin Yang

7.1 Conditon based Maintenance of Automation system and network structures

7.2 Awareness of Test or Simulation conditons – Antonio Ricardo, Alex Apostolov

7.3 Response to failure conditions Charlie Sufana, Jay Anderson, Antonio Ricardo

7.4 Cyber Security / Intrusion detection – Antonio Ricardo, Alex Apstolov

8. Categorization IEC 61850 & SV Validation & Supervision Mechanisms – Dustin Tessier

H45: Guide for Centralized Protection and Control (CPC) Systems within a Substation

Chair: R. Das

Vice Chair: P. Myrda

Secretary: M. Kanabar.
Expected Output: Guide
Established: May 2018
Expected completion date: January 2022
Draft: 0

Assignment: Develop a guide for Centralized Protection and Control (CPC) Systems within a Substation.

The WG met on May 8, 2019 with 25 participants (23 in person and 2 remotely, with 15 members and 10 guests).

After the introductions, Slides related to IEEE patent policy and other guidelines for WG meetings were shown and discussed.

Minutes of the January meeting as approved by email stands approved without any changes. Minutes of March (web) meeting is discussed and could not be approved due to quorum issue – it will be circulated to members for approval via email.

Project plan was discussed and no comments were received to revise the project plan.

Assignments allocation till date and allocation matrix were shared with the participants. New assignments were allocated – details will be provided to members through email and revised allocation matrix will be provided in the iMeet Central.

All (who has an assignment allocated to them) are requested to submit their assignment by August 2.

A web meeting will be held during the week of either Aug 5 or August 12.

H46: Recommended Practice for Human-Machine Interfaces (HMI) used in Substation Automation Systems (PC37.1.3)

Chair: M. Black

Vice Chair: C. Preuss

Secretary: S. Haveron

Output: Produce a Recommended Practice for Human-Interfaces (HMI) used in Substation Automation Systems (PC37.1.3)

Draft: N/A

Established: September 2018

Expected Completion Date: January 2024

Assignment: Produce a Recommended Practice for Human-Machine Interfaces (HMI) used in Substation Automation Systems

The chair called the meeting to order on Monday 5/6/19 at 13:00 EDT. The chair commented that he had not submitted the PAR to NesCom prior to the January meeting, but that he had subsequently done so, and that the PAR was approved by NesCom 3/25/19. There were 19 in-person attendees: 10 members, 9 Guests; as well as 6 remote attendees: 1 member, 5 guests. The Agenda was approved with Shane Haveron making the motion to approve and Craig Preuss seconding the motion. The Agenda was approved with Shane Haveron making the motion to approve and Craig Preuss seconding the motion.

The IEEE patent slides shown with no patent claims made. The IEEE copyright policy was reviewed. A review of all changes made by NesCom to the PAR was performed articulating that all modifications were editorial in nature. An action item is to take the statement at the end of the original Purpose regarding future action, which was removed by NesCom, as a suitable addition to the introduction to this Recommended Practice.

No presentations were offered, though the chair did issue an invitation to approach him should any attendees desire to present at subsequent meeting.

During the Old Business section of the meeting the previous meeting's business to address negative votes to forming WG H46 was acknowledged. Hugo Monterrubio's negative vote was discussed, which was the last remaining unaddressed comment. The WG has decided that adherence to Recommended Practice PC37.1.3 will ultimately be a decision to be made by each vendor as it is not a requirement. There are no prohibitions for going beyond what is addressed in the forthcoming recommended practice.

The Chair recommended responding to each dissenting comment in-turn and giving an official WG response. The Vice-Chair suggested that we should take care to follow any requirements regarding an official WG statement by following closely the WG P&P Manual for the PSRCC.

The Vice-Chair had taken an opportunity to start an outline for the PC37.1.3 prior to the meeting. ISA101.01 is being used as a starting point (in addition to C37.1), so a point was made to request access to this standard through our IEEE-SA Liaison as well. The Chair had previously requested C37.1 and IEC TC57's current standard(s) as-relates to HMI.

A comment was made and noted that application of PC37.1.3 to SCADA/EMS screens should be avoided unless a current SCADA/EMS vendor is involved in the development of PC37.1.3. The Chair and Vice-Chair made note of this request and as an action item will follow-up with a request to said vendors for representation in H46. A similar comment was made and noted that the application of PC37.1.3 to protective relays with small screens should be excluded from the scope of work but the WG felt that relays and other IEDs could benefit from standards-based design, even when the HMI is simple text.

The WG decided that a definition for HMI was needed and referenced ANSI/ISA-101.01-2015 and the IEEE Standards Dictionary. A suitable definition will be included in PC37.1.3. A section will also be included listing devices and applications that have a HMI and are used with substation automation systems. There was a question raised about discussion HMI user roles and whether user roles will be inherited from sub-roles or do they inherit on their own. There was a question whether mouse and keyboards as input devices would be discussed.

An attempt at Brain-storming/Outline development was made. Relevant sections named were: Introduction, Normative References, Definitions, Input Methods (Mounted Keyboard, On Screen controls), Control Rights (Profiles/Privileges [roles inherited from sub roles or stand on their own]), Identifying HMI (categorizing in black & white similar to ISA101.01, but more extensively), and HMI Screen Hierarchy. Due to running out of time, an action item was given to all attendees of WG H46 to continue to think about what sections should be included in this Recommended Practice. A Web meeting will be held in the next 2-4 weeks at which time we will finalize the outline and start accepting volunteers for writing assignments.

The last order of business was to ask for a volunteer for the position of Secretary of WG H46. Shane Haveron graciously accepted the position. The Chair and Vice-Chair are both appreciative of his willingness to help with the administrative side of running our WG

HTF47: Impact of Digital Communications on Protection & Control Applications

Chair: M. Kanabar

Vice Chair: A. Riccardo

Secretary: D. Ouelette

Output: Recommendation for WG

Completion Date: May 2019

Draft: N/A

Assignment: to determine if working group should be formed on Impact of Digital Communications on Protection & Control Applications.on Protection & Control Applications.

TF reviewed & discussed existing published IEEE reports to understand what is covered.

TF converged & agreed to the following Title & Assignment to propose for WG in H-subcommittee:

Title: Impacts of IEC 61850 and supporting technologies on protection and control applications in digital substations

Assignment:

Develop a report on impacts of IEC 61850 and supporting technologies on protection and control applications in digital substations.

HTF47 met on Tuesday afternoon with 14 members and 10 guests. We reviewed the approved title and assignment, as well as worked on in-scope and out-of-the-scope for this report. Eric Udren shared a presentation from IEC TC95 adhoc working group-2 on Digital IO for protection IED. Alex Apostolov agreed to be liaison with this IEC as well as CIGRE working group who are also working on similar topic.

The title and assignment are revised after the previous H-subcommittee meeting, and we received approval from 24 members & guests; and we didn't receive any response from 1 negative vote from H-subcommittee member.

With 18 members and 7 corresponding members, The Task Force recommends to H-subcommittee to form a working group with the below title, assignment and leadership.

Proposed WG Title: Impacts of IEC 61850 and supporting technologies on protection and control applications in digital substations

Proposed WG Assignment:

Develop a report on impacts of IEC 61850 and supporting technologies on protection and control applications in digital substations.

Proposed WG Leadership:

Chair: Mital Kanabar
Vice Chair: Antonio Riccardo
Secretary: Dean Ouellette

HTF48: Education/Outreach for Synchronized Measurements

Chair: W. Dickerson

Vice Chair: R. Midence

Output: Recommendation for a WG

Completion TBD

Current Revision: N/A

Assignment: Investigate the needs and opportunities for outreach and education regarding synchronized measurements, especially Phasor Measurement Units (PMU).

The Task Force met for our third meeting as a task force in Cincinnati. We had a bit smaller group of seasoned synchrophasor experts and newcomers this time.

Discussions continued from where we left off in our first two meetings, and was mostly a brainstorming session. This meeting produced some new concepts, and we are continuing to move toward defining (a) work product(s) for the group. This meeting identified a new objective of developing a resource portal based on the plethora of existing work in the relevant areas.

A new assignment was made:

Paul Myrda, Mark Adamiak, Mahendra Patel, and Jason Allnut will work on an iMeet sharespace to collect existing work that could form a basis for a central resource, perhaps sponsored by IEEE/NASPI tbd.

We anticipate one more meeting as a task force before we will have a concrete proposal for the Subcommittee.

HTF49: Tutorial on the Use of Packet-Switched Communication Channels for Protection and Control

Chair: S. Ward

Vice Chair: R. Midence

Output: Recommendation for WG

Completion TBD

Current Revision: N/A

Assignment: To provide a recommendation to the subcommittee whether to form a WG or not

No meeting. No report

H50: Requirements for Time Sources in Protection and Control Systems

Chair: D. Ouellette

Vice Chair: J. Anderson

Output: Report

Completion Date: 2019

Current Revision: 2022

Assignment: To produce a Report on Requirements for Time Sources in Protection and Control Systems

Introductions

IEEE IP Policy Slides - none

Report's scope discussion

WG H50 met for the first time with 19 attendees. WG Chair led the meeting over a remote connection. After introductions, IEEE IP Policy slides were presented. No IP-related issues were identified. A lively discussion followed on the scope and content of the report. It was clarified that currently there is no document that specifies requirements for time sources in electrical power substations. Various topics were discussed including applications using time, time distribution interfaces and protocols including extensions, environmental requirements. Various issues related to clock operation and their effect on applications were raised. Topics of timescales, leap seconds, GPS rollovers were included as well. Work on document outline was initiated. A few references to be included into this work were listed as well. 11 attendees expressed interest in being WG Members. Allen moved, Jay seconded to Adjun,

I: Relaying Practices Subcommittee

Chair: Brian Mugalian

Vice Chair: Jim Niemera

Relaying Practices Subcommittee 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 relay and relay systems. Evaluate and report on pertinent aspects of protective relaying not addressed by other PSRCC Subcommittees. Maintain applicable protective relaying standards.

1. Welcome and Introductions – a new signup sheet was passed to the attendees
2. Determine a Quorum (39 members total in I SC); 22 members and 14 guests, quorum was met
3. Minutes of the January 2019 meeting were Approved – Motion to approve was made by M. Meisinger and seconded by M. Dood.
4. Coordination & Advisory Committee Meetings Items of Interest
 - a. 240 attendees, with 10 newcomers
 - b. Breakfast on Thursday before Main Committee Meeting
 - c. Future Meetings:
 - i. September 16-19, 2019 – Denver, CO

- ii. January 12-16, 2020 – JTCM –Jacksonville, FL
 - iii. May 4-7, 2020 – Nashville, TN – Relay Jam – bring your instruments and voices.
 - d. Policies and Procedures for: Power System Relaying and Control Committee Working Group December 2018 for use in 2019; approved version sent to Subcommittee members 31-December 2018 by email for review
 - i. Three officers: Chair, Vice-Chair, Secretary
 - ii. Please read this new version
 - e. **Working Group sign-in sheets – new 123SignUp procedure!!!**
 - i. Michael Thompson will send out the slide presentation on how to create your Working Group roster and attendance list for handout at your meeting. Email addresses are no longer permitted to be placed on your sign-in sheet. Attendees must add their email address when they register for our meetings.
 - ii. <https://www.123signup.com/>
 - f. For PAR related work, please present the new patent slides and record *in your minutes* whether essential patent claims exist. If there are none, please write this into the minutes. **Do this at every working group meeting.** New 2018 slides available and are at <http://standards.ieee.org/about/sasb/patcom/materials.html>.
 - g. Looking for Webinars to publicize our PSRC work products as part of Global Outreach
 - i. Availability of WebEx for presentations by IEEE. Every WG that has completed their work is encouraged to present it to the IEEE community through WebEx which will project our work. Please contact Cathy Dalton, Chair of Publicity group or Russ Patterson, Murty Yalla, or Michael Thompson.
 - h. Looking for presentations for the Main Committee meetings – please contact I-SC Vice Chair Jim Niemira. We have I26, I32, and I33 in progress that could be possible candidates for presentations.
5. Administrative Items
- a. Plans upcoming for training on P&P, O&P, SA work activities
 - b. New procedure for PARs, new 2017 P&P (sent by email):
 - i. All PAR related activities must be approved by the PSRC Main Committee members
 - ii. See examples provided of how to request at the Main Committee – a Working Group Chair makes a motion at the Subcommittee meeting for the SC Chair to create a slide and then send it to the Main Committee Officers for inclusion on the slide set at the Main Committee meeting. The SC Chair reads the motion (s)
-
- Main Committee motions template.ppt
- iii.
 - iv. Includes creation of a new PAR
 - v. Includes approval to proceed to IEEE-SA for creation of a balloting body or to proceed to sponsor ballot
 - vi. Includes changes to a PAR title, scope and/or purpose**
 - vii. Working group submits to the Subcommittee the new or revised PAR, scope, purpose, minutes of their meeting, attendees, their affiliations, any disagreements are noted in the minutes.
 - viii. The Subcommittee reviews it, and then the SC Chair **submits the PAR/name/ID number and reason for approval to the Main Committee Secretary to put in the slide deck. The slide is displayed while the SC Chair reads the request to the Main Committee members. A vote is then taken.**

- ix. Motion to approve the new or modified PAR is done at the Main Committee meeting
- x. PSRCC is the Sponsor
- xi. myProject™ Volunteer User Guide – good stuff
https://mentor.ieee.org/etools_documentation/dcn/11/etools_documentation-11-0014-MYPR-myproject-user-guide.pdf
- c. Technical Report template for working group reports – please use for new reports
- d. From IEEE-SA: WG/TF Agendas and Minutes: “**The 14-calendar-day rule**” – **the Standards Association requirement in O&P**
- e. Review Draft 1 of the PSRC meeting agenda as soon as the meeting notice arrives in your inbox – to avoid meeting conflicts and multiple agenda revisions. Contact Jim Niemira for your requested changes – we will consolidate them and forward to Michael Thompson.
- f. Make sure that on the Meeting Room Request (MRR) form for the **September 2019** meeting that you include “do not conflict with I50, D87, ...”
- g. As Chair or Vice-Chair of WG or TF, please contact Brian Mugalian and Jim Niemira **if you cannot attend your session**. Do this when the PSRC meeting agenda is sent, or during the update phone calls we have.
- h. Non-PAR related document drafts can be shared with anyone who is interested. Please add a note that this is a draft version subject to change. Once this document is complete and approved it will be posted on PSRC website which is open to all.
- i. All PAR related document (IEEE related) drafts cannot be forwarded by the WG member to anyone else – there is a public review period for all IEEE documents where anyone can submit their comments.
- j. When submitting “comments resolution” CSV file back to IEEE-SA in myProject, make sure that your draft is updated to reflect all the changes made – must match up to the CSV file!
- k. Email WG or TF Minutes *including membership list* to Jim Niemira at: Jim.Niemira@sandc.com
- l. PSRC Website – Email items to post on the I web pages to Brian Mugalian and Jim Niemira. Review your working group’s officers and assignment. We will review and forward to: webmaster@pes-psrc.org
- m. Working Group/Task Force Chairs and Vice-Chairs: please use the “documents” button on your web page to upload files, agendas, and minutes for use by others – this way we can include links in our correspondence.
- n. **iMeet Central** (formerly Central Desktop) is to be used for IEEE Guide/Recommended Practice/Standard documents with a PAR
- o. **Standards WG Awards** - The IEEE Standards Association Working Group Awards has a new Procedure to request certificates of appreciation for completed (Approved Standard) work. These certificates have to be requested by the Chair or VC of the WG directly from the IEEE SA. These awards can be shipped to our next PSRC meeting for announcement and distribution. The request for the SA certificates must be made at: <http://standards.ieee.org/develop/awards/wgchair/wgawards.html>
- p. **Reports/Paper Final Output** – To be considered for PES level award the output of all Working Groups with a Technical Output including Technical Reports, Transactions/Journal and conference papers must be completed in PES Format and submitted and posted in the PES Resource Center.
- q. Links to PES:
 - PES Technical Resource Center: <http://resourcecenter.ieee-pes.org/>
 - PES - Technical Report Template: https://www.ieee-pes.org/images/files/doc/tech-council/PES-Technical-Report-Template_Jan_2016.docx

- PES - Technical Paper Template: <https://www.ieee-pes.org/templates-and-sample-of-pes-technical-papers>
- PES Resource Center Submission Checklist with instructions on how to get your report or Paper submitted please use this link: http://ieeepes.org/images/files/doc/tech-council/Submission_Checklist_PES_Resource_Center.docx

6. Working Group Reports

I2: TERMINOLOGY REVIEW WORKING GROUP - DEFINITIONS FOR IEEE DEFINITION DATABASE (FORMERLY IEEE STD. 100)

Chair: M. Swanson

Vice Chair: F. Friend

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

Established Date: N/A

Expected Completion Date: On-going

Draft: N/A

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 8, 2019 with 7 members and 1 guest.

Quorum was achieved and minutes from the September meeting in Minneapolis were reviewed and approved (Tony Seegers motioned, Oscar Bolado seconded).

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

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

The working group chair is to send the approved working group draft to Erin Spiewak e.spiewak@ieee.org, IEEE SA, to begin the editorial review process in order to expedite the review process.

All working groups are reminded the database is available to them for use during their document development. All IEEE members have access to The *IEEE Standards Dictionary Online* using their IEEE account credentials at <http://ieeexplore.ieee.org/xpls/dictionary.jsp>.

Any standards work with a PAR (and IEEE Transaction Papers) must be submitted for review and approval of terms from I2. The output from a working group in the form of a report does not need the mandatory review; however, these will be accepted for review and comment upon request to the chair.

Words from approved Standards and Guides with a Section 3 (Definitions) have been incorporated into the IEEE database. An alphabetical listing of the words not in the database, but useful to the PSRC is posted on the web site under "TERMS" link under the "Knowledge Base" tab.

I4: INTERNATIONAL STANDARDS DEVELOPMENT WORKING GROUP

Chair: Eric A. Udren

Vice Chair: Norman Fischer

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

Established Date: 1990

Expected completion date: Meetings are continuing

Draft: N/A

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

The WG met on May 7, 2019 with 6 members to review TC 95 standards activities. There were no comments on the January 2019 minutes; not a quorum to vote them. Principal circulated documents and discussion points were as follows:

- 95/407Q and 95/391/DC - AHWG 3 Use cases of digital sampled values (e.g. from merging unit in switchyard) instead of analog inputs – WG 2 under Volker Leitloff is starting. The scope is virtually identical to that of new PSRC HTF47. The AHWG3 has already done some work, and coordination with HTF 47 is important going forward. [Later at PSRC – HTF 47 saw the WG 2 presentation and seeks coordination as well.]
- 95/403/Q - proposed TC 8 WG on frequency measurement for DER – we had submitted through USNC vote comments the NERC report on Blue Cut Fire trips, along with what we expect for output from WG. Both frequency measurement and application logic/behavior specifications are needed. The NERC report and comments were circulated to other NCs by IEC. We need to follow ongoing work with Normann Fischer and Ryan Quint of NERC helping us.
- 85/681/NP – New work item proposal for Technical specification for travelling wave fault locator of high voltage transmission line, from TC 85 Measuring Equipment for Electrical and Electromagnetic Quantities. A Chinese fault locator maker initiated this work outside the P&C mainstream. We developed the following points for the TC 95 leadership in dealing with this request:
 - This is a protective relay. It falls exactly under definition of what TC 95 does - measuring relays and protection equipment – and also includes matters of fault information gathering and reporting e.g. 60255-24.
 - TC 95 should take the lead and should consider supporting a JWG with TC 85.
 - Existing 60255 standards (-1, -26, -27) define the product design and type-testing requirements for products categorized as measuring relays or protection systems and related/included functions. No new standards in this area are needed or appropriate.
 - For reporting of fault information, 60255-24 (COMTRADE) is presented as a widely-used existing solution so that no new standardization is needed or appropriate for data reporting.
 - The appropriate model for the requested standardization is 60255-121, a functional performance standard which incorporates testing requirements and methods.

Update from Murty Yalla on TC 95 development topics in TC 95 Program of Work, based on MT4 Vienna meeting results March 13-15:

- 60255-1 Ed.2, Common Requirements – still under revision.
- IEC 60255-187-1: Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers – going to FDIS.
- IEC 60255-187-2: Functional requirements for busbar differential protection. Still in Table of Contents (TOC) & early text stage.
- IEC 60255-187-3: Functional requirements for biased (percentage) differential relays for transmission lines – still being drafted with help of Normann Fischer. In Sept, PSRC D34 will get a draft to discuss.
- AHWG 3 has become WG 2 on merging unit data effects on relaying – see above. They know PSRC HTF47 will coordinate. Eric must propose Normann for US WG 2 member.

- 60255-132 & -167 functional standard on directional relays – scope now defined and TOC being developed. 132 is first.

The next meeting of MT 4 will take place October 7-11 in Glasgow. In May 2020 they meet in Dubrovnik, Croatia, jointly with TC 38.

I26: MATHEMATICAL MODELS OF INSTRUMENT TRANSFORMERS

Chair: Mike Meisinger (S&C)

Vice Chair: Steve Turner (Electrical Consultants, Inc.)

Secretary: Amir Makki (Softstuf)

Output: Report

Established Date: January 2014

Expected Completion Date: December 2020

Draft: 2.2

Assignment: Recommendation to update and expand the IEEE Transactions paper on Mathematical Models of Instrument Transformers (IEEE Transactions on Power Delivery, Jan 2000, Vol. 15, No. 1, p62), mathematical models of instrument transformers and transducers, including interface electronics such as merging units, for use in both off-line and real time transient simulation. There are now new transducer types such as optical, Hall Effect and Rogowski coils in addition to improved models for conventional CTs, VTs and CVTs.

The working group met on time with 6 members and guests present. The group discussed the final assignments of reporting on merging units and auxiliary transducers. The group agreed that the assignments can be completed by just adding references to the work by I24 and others.

The group then discussed assembling the final report. It was agreed that the compiled CT saturation examples and remnant modeling studies should be added to the report and distributed for review by the members in time for the next meeting.

The group plans to meet again at the next meeting.

Respectfully Submitted,

Working Group I26

I29: REVISION OF C37.110 – GUIDE FOR THE APPLICATION OF CURRENT TRANSFORMERS FOR PROTECTIVE RELAYING PURPOSES

Chair: Joseph Valenzuela

Vice Chair: Michael Higginson

Output: Guide

Established Date: September 2014

Expected Completion Date: May 2019

Draft: 20190115

Assignment: Review and revise C37.110. Include microprocessor relay applications.

The working group did not meet in May 2019. A balloting body is being formed in IEEE-SA.

I30: REVISION OF C37.235 – GUIDE FOR THE APPLICATION OF ROGOWSKI COILS USED FOR PROTECTIVE RELAYING PURPOSES

Chair: Ljubomir Kojovic

Vice Chair: Robert Frye

Output: Guide

Established Date: 2014

Expected completion date: 2019

Draft: 7.0

Assignment: Revise C37.235

I-30 met on Tuesday, May 7, 2019 with five members and two guests. A quorum was obtained.

The patent slides were reviewed and no concerns were expressed.

There was no January, 2019 meeting, and no associated minutes to approve. The meeting minutes from September 2018 had been approved through email.

Since the September meeting, Draft 07 has been circulated to the members and was approved by 7 of 8 members to proceed to balloting. One member requested several changes be made to the document. The chair made these changes and presented them to the working group at the May, 2019 meeting.

The group reviewed these changes and Ratan Das moved to vote on Draft 08 and move to Balloting, and Peter McLaren seconded. A vote was held and the motion passed with all five members present voting to approve. The chair will remove the highlighting in the document and it will be renamed as Draft 08_final.

The working group was reminded by Don Lukach that our PAR was set to expire in December and we need to request a PAR extension. This must be filed by September 17 to be complete by the end of the year.

We are on Draft 08_final of the document.

I31: IEEE 1613 –STANDARD FOR ENVIRONMENTAL AND TESTING REQUIREMENTS FOR DEVICES WITH COMMUNICATIONS FUNCTIONS IN ELECTRIC TRANSMISSION AND DISTRIBUTION FACILITIES

Chair: B. Mugalian

Vice Chair: Jerry Ramie

Secretary: Craig Preuss

Output: Standard

Established Date: February 5, 2016 (PAR approval date)

Expected Completion Date: December 31, 2020

Draft: 0.35

Assignment: N/A

WG I31 met with 17 local participants and 1 remote participant (shown below).

The working group chair called the meeting to order at 8:01 am local time. A quorum was announced (11 of 18 members present). The Chair announced that Chris Goodney was removed as a participant in the working group by request. The Chair announced that Richard Worley has been given voting membership.

A motion to approve the meeting agenda was made by Jay Anderson, seconded by Jerry Ramie. The motion carried unanimously via voice vote.

The patent slides were shown and no claims were made. The IEEE copyright policy was reviewed.

A motion to approve the January 2018 meeting was made by Jay Anderson and seconded by Jerry Ramie. The motion carried unanimously via voice vote.

Under new business, the chair indicated that the PAR has not been moved to the PSRC in myProject. Erin indicated this should happen in about a week. The vice chair described work that had taken place between the officers of the several working groups to harmonize the titles of 1613 and the related C37.90 series. The proposed new title was discussed: "IEEE Standard for Environmental and Testing Requirements for Devices with Communications Functions used with Electric Power Apparatus". The working group would like to wait to submit the new title for subcommittee approval until all C37.90 working groups approve the related changes in title so that all five changes are reviewed by the subcommittee at the same time.

Jerry Ramie made a motion to approve the proposed title, which was seconded by Jay Anderson. The motion carried unanimously via voice vote.

There was discussion about how to incorporate references to the C37.90 series, with a proposal to remove some text and just refer to the appropriate C37.90 standard. But most of those working groups are just getting started, so it was confirmed that keeping the text for now with harmonization with the other working groups' work. In the future, an amendment can be used to update the text so that appropriate sections simply reference the appropriate C37.90 standard.

The Secretary made a motion to change the revision of the draft to 1.0 and accept all edits but leaving any comments. New edits would start with showing the changes in title, scope, and purpose. The motion was seconded by Jerry Ramie. The motion carried unanimously via voice vote.

More technical edits will be made on the document as necessary.

Future meeting times for web conferences were discussed to review the draft. 1 pm central time on June 11, July 16, and August 20.

A picture was provided to indicate why the working group needs to ensure this work is maintained. The picture shows clogged fans on a popular IED being installed at a utility to monitor transformers.



Clogged Fan on a [REDACTED]

Clair Patti made a motion to adjourn. Mike Dood seconded the motion. The motion carried unanimously via voice vote. The meeting was adjourned at approximately 8:46 am local time.

The attendee list follows:

Members	
Brian Mugalian	S&C
Craig Preuss	Black & Veatch
Jerry Ramie	ARC Technical Res.
Richard Worley	Dell Technology

Fred Friend	AEP
Jay Anderson	ComEd
Mike Dood	SEL
Claire Patti	PGE
Mark Simon (remote)	Consultant
Tony Bell	Ametek
Mario Ranieri	Electroswitch
Guests	
Jim Niemira	S&C
Roger Whittaker	Self
Jeff Burnworth	Basler Elec. Co.
Erin Spiewak	IEEE-SA
Tim Farrar	TRC
Robert Frye	TVA

I32: A SURVEY OF PROTECTIVE SYSTEM TEST PRACTICES

Chair: Andre Uribe

Vice Chair: Don Ware

Output: Report

Established Date: May 12, 2015

Expected Completion Date: May 2019

Draft: 3.2

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

The Working Group met on Wednesday, May 8th, 2019

The working group reviewed and addressed 3 subcommittee members comments submitted by:

- a. Jeff Pond
- b. Jeff Long
- c. Eric Udren

WG Chair will submitted all comments and responses to I-subcommittee

Scott Cooper will address comments made on section “Elements vs Functional Testing”

WG Chair will contact Eric Udren to address his request on PBM and CBM

Meeting Adjournment at 10 am

I33: REVIEW OF RELAY TESTING TERMS

Chair: Scott Cooper

Vice Chair: Hugo Monterrubio

Output: Report

Established Date: Jan 2017

Expected completion date: Dec 2019

Draft: 1.8

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

Working Group I33 met on Tuesday, May 7, 2019 with 5 members and 2 guests.

The following items were discussed during this meeting:

1. Guest Tony Seegers suggested that we coordinate with the IEEE dictionary with enhanced definitions
2. The WG continued to review of the list of terms in the report and discussed the proposed changes submitted by contributors to the existing definition.
3. Assignments:
 - a) The group will be working on the remainder of the definitions

Respectfully Submitted

Scott Cooper, I33 Chair

I35: PC37.2 – STANDARD FOR ELECTRICAL POWER SYSTEM DEVICE FUNCTION NUMBERS, ACRONYMS AND CONTACT DESIGNATION

Chair: Mike Dood

Vice Chair: Marc Lacroix

Output: Standard

Established Date: 2017

Expected Completion Date: December 2020

Draft: 0.3a

Assignment: Review and revise the C37.2 standard.

I35 met with 6 members and 1 guest.

The patent slides were shown to the participants.

The document has not modified since the last meeting.

Mike has all the material to complete the document and it will be put on iMeet Central.

The goal is get working group approval to and complete the work by September.

A PDF line numbered version with will be put on iMeet Central.

An excel sheet should be used for comment.

This sheet will also be on iMeet.

A first webex meeting is planned before June 10.

A second one will be in early July.

A doodle poll will be set to have members availability

Next meeting will be in September.

Attendees list is below.

Attendees List

Members	
Mike Dood	SEL
Marc Lacroix	EMCREY Canada

Eric Thibodeau	Gentec
Oscar Bolado	ZIV
Tim Farror	TRC
Ed Cenzone	SEL
Guests	
Mario Ranieri	Electroswitch

I36: REVISION OF C37.90.2 – STANDARD FOR WITHSTAND CAPABILITY OF RELAY SYSTEMS TO RADIATED ELECTROMAGNETIC INTERFERENCE FROM TRANSCEIVERS

Chair: Jeffrey Pond

Vice Chair: Jeff Burnworth

Output: Revision of IEEE Std. C37.90.2

Established Date: September 2017

Expected completion date: September 2020

Draft: N/A

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

Working Group I36 met on Tuesday, May 7th at 3:40pm in a single session with 10 attendees. Jeff Burnworth chaired the meeting in Jeff Pond's absence.

After introductions, the IEEE patent slides were reviewed.

Following confirmation of a quorum, the minutes from the January 2019 meeting in Garden Grove, CA, were reviewed and approved.

The PAR modification has been approved to include the EMC Society is joint sponsor. The working group was also reminded that the SA encourages references to other guides are included in the standard, and permissions are required to use copyrighted material from IEC or others.

The review of Draft 1.01 revisions were continued from the previous meeting, that consisted of the Annex sections. The review concluded that most all figures provided in the Annex B will require replacement or permission for use. New figures and/or permission statements will be acquired by Jerry prior to the September meeting. Annex C, Bibliography, will require updating.

A proposal for title revision was discussed and approved by the group. This change will harmonize the title with the PSRCC and the other C37.90.X standards.

Previous title:

IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

New title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – Radiated Electromagnetic Interference Withstand Capability Requirements and Tests The proposed scope and purpose to be included in the PAR was discussed and revised as shown following, to correlate with the new standard title.

Meeting was adjourned.

Jeff Burnworth

I37: REVISION OF C37.90 - STANDARD FOR RELAYS AND RELAY SYSTEMS ASSOCIATED WITH ELECTRIC POWER APPARATUS

Chair: Oscar Bolado

Vice-Chair: Marilyn Ramirez

Output: Standard

Established Date: January 2018

Expected Completion Date: December 2022

Draft: 2.0

Assignment: Review and revise of C37.90 Standard for withdrawn in 2021; PAR expiration 31-DEC-2022

Working Group Meeting No. 5

Assignment: Revision of C37.90 Standard for withdrawn in 2021. PAR Expiration 31-Dec-2022

Working group C37.90 met on Tuesday, May 7th at 1:00 PM with 6 out of 9 members and 8 guests present. Quorum was met. The following items were discussed:

1. Meeting agenda was reviewed.
2. IEEE-SA Patent Slides 0 to 4 were presented with no comments nor patent claims.
3. Minutes of the previous 2 meetings were reviewed and approved. September 2018 (motion, R. Frye, second T. Farrar) and January 2019 (motion, J. Burnworth, second T. Bell).
4. A proposal for title revision was discussed and approved by the group. This change will bring the title in line with the PSRCC, I subcommittee, and the other C37.90.X documents.

Previous Title:

Standard for Relays and Relay Systems Associated with Electric Power Apparatus

New Title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – General Requirements and Tests

5. A draft of Section 3, Definitions was reviewed. Suggestions included:
 - a. Do not differentiate between relay types in the definitions and outline
 - b. Define control device and electrical power apparatus
 - c. Coordinate the nomenclature of signal inputs with C37.90.1
 - d. Investigate NERC relay definitions
 - e. Investigate overlap with 1613 regarding comm ports
6. A revision for the outline is proposed that doesn't differentiate the requirements by technology. In case that some paragraphs are technology specific this will be pointed in the paragraph. This revision will be circulated before the next meeting.

With no additional business to discuss the meeting was adjourned.

Respectfully submitted,

Oscar Bolado

Chair

I38: REVISION OF C37.92 STANDARD FOR ANALOG INPUTS TO PROTECTIVE RELAYS FROM ELECTRONIC VOLTAGE AND CURRENT TRANSDUCERS

Chair: Robert Frye

Vice Chair: E.A. Udren
Output: Standard
Established Date: January 2018
Expected completion Date: December 2019
Draft: N/A

Assignment: Approved IEEE Standard C37.92, *Standard for Analog Inputs to Protective Relays from Electronic Voltage and Current Transducers*

I-38 met on Tuesday, May 7, 2019 with 5 members and 8 attendees total.

After introductions, the Chair reviewed IEEE patent slides; attendees reported no patent concerns. A quorum was not achieved, and the January minutes could not be approved.

The membership list is being pruned of those who are not regularly attending.

The Chair distributed and reviewed the results from balloting of the existing legacy C37.92 standard, previously shared with the agenda distribution. Extensive comments have been categorized in advance by the WG leadership into 3 classes:

1. Editorial comments.
2. Technical comments.
3. Comments on coordination or conflict with specific IEC TC 38 instrument transformer standards.

Some of the latter category comments questioned the role of or need for C37.92. The WG faces a choice among three alternative courses from here:

- Withdraw C37.92.
- Maintain C37.92 as-is.
- Revise C37.92 to publish a new edition.

To decide on a course, the WG hypothesizes that C37.92 uniquely defines relay input specifications and system application use cases not covered in any of the cited IEC standards, and likely aligns with IEC standards where there are interfaces. To validate or disprove the hypothesis, WG members will study relevant IEC standards and will quote specific clauses which interface, overlap, or duplicate requirements in C37.92. With all of the related IEC requirements tabulated, the role and revised content of a new edition of C37.92 will be defined, or a decision to withdraw would be recognized if in fact the IEC standards cover all the needs that C37.92 addresses. Expert members of WG I38 have reviewed IEC content in the past and believe that core parts of C37.92 remain critically useful. The WG process will yield a documented technically-specific result. In the case of a decision to revise C37.92 and rebalot, the WG will then deal with technical comments and revisions, as well as any requested editorial changes in text that survives the rewriting.

The WG leadership is requesting from IEEE review copies of the IEC TC 38 standards 61869-1, -6, -9, -10, and -11 for the coordination study and documentation work. Three WG members took assignments to speak personally with certain commenters to negotiate apparent misunderstandings reflected in comments. Others agreed to address specific comments via IEC standard reviews when the IEC standards are available. WG members Ritwik Chaudhury and Mark Adamiak have suggested a new role for a C37.92 analog interface in wideband applications such as traveling wave analysis for protection and fault location. This will be considered in specifications in a revised C37.92.

140: REVIEW OF IEEE C37.90.1 – STANDARD FOR SURGE WITHSTAND CAPABILITY (SWC) TESTS FOR RELAYS AND RELAY SYSTEMS ASSOCIATED WITH ELECTRIC POWER APPARATUS

Chair: Jeff Burnworth

Vice Chair: Todd Martin
Output: Standard
Established Date: Sep 2018
Expected Completion Date: Dec 31, 2022
Draft: N/A

Assignment: To determine if IEEE C37.90.1 – Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus should be revised.

Task Force ITF40 met on Tuesday, May 7, 2019, at 2:20pm in a single session with 15 attendees.

After introductions, the IEEE patent slides were reviewed.

Minutes from the January 2019 meeting in Garden Grove, CA, were reviewed and approved.

A request was again stated for a volunteer to Chair the I40 Working Group, with no responses received. A call for a volunteer will be made at the I Subcommittee meeting. Todd Martin has accepted the position of Vice-Chair.

A proposal for title revision was discussed and approved by the group. This change will harmonize the title with the PSRCC and the other C37.90.X standards.

Previous title:

IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

New title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – Surge Withstand Capability (SWC) and Electrical Fast Transient (EFT) Requirements and Tests

The proposed scope and purpose to be included in the PAR was discussed and revised as shown following, to correlate with the new standard title.

Proposed scope:

This standard specifies design tests for relays, relay systems, and control devices used for Protection and Control of Electric Power Apparatus, that relate to the immunity of this equipment to repetitive electrical transients. Two types of tests are specified, the oscillatory (SWC) and electrical fast transient (EFT) tests.

Proposed purpose:

This standard establishes a common and reproducible basis for evaluating the performance relays, relay systems, and control devices used for Protection and Control of Electric Power Apparatus, when subjected to repetitive transients on supply, signal, control, and communication lines or connections. This standard establishes that an evaluation is performed during both normal (non-tripped) and abnormal (tripped) relay operating conditions.

Jerry Ramie gave a presentation - Comparison of figures and text in IEEE-C37.90.1 vs. IEC-61000-4-18 and IEC-61000-4-4. Discussions were had throughout the presentation on needs and differences of present and expected additional requirements to the IEC documents. The presentation will be retained for informational use by the working group.

Some final discussion was had on industry activities and testing for electromagnetic pulse (EMP) testing. The discussion concluded that any type of EMP tests or requirements would not be included in this document.

Meeting was adjourned.

Jeff Burnworth

ITF41: REVIEW OF IEEE C37.90.3 - IEEE STANDARD ELECTROSTATIC DISCHARGE TESTS FOR PROTECTIVE RELAYS

Chair: Steve Turner

Vice Chair: Open

Output: Standard

Established Date: September 2018

Expected Completion Date: N/A

Draft: N/A

Assignment: Review and revise the C37.90.3 standard

The meeting was called to order Tuesday, May 7, 2019, at 5:00 PM in the Garfield Room of the Westin Cincinnati, Cincinnati, OH.

The meeting was chaired by Jim Niemira in absence of the WG Chair.

13 people attended including 5 Members and 8 Guests. A membership roster was not available so quorum was unknown.

Patent slides were shown and discussed. No essential patents issues were raised or made known.

Minutes from the January 2019 meeting in Garden Grove were not available. They will be routed to the WG membership for email approval.

A revised title for the document was presented to harmonize with the other C37.90.x documents and with the 1613 standard. No objection was raised by members present. The revised title will be routed to the WG membership and balloted by email.

Existing Title:

IEEE Standard Electrostatic Discharge Tests for Protective Relays

Proposed Title:

Standard for Relays, Relay Systems, and Control Devices used for Protection and Control of Electric Power Apparatus – Electrostatic Discharge Withstand Requirements and Tests

Jerry Ramie made a presentation about issues in the existing document requiring revision and the group discussed. The document should be harmonized with IEC 61000-4-2. Jerry will provide a copy of his presentation for distribution to the WG membership.

WG Chair should request copies of those standards that are proposed to be incorporated by reference so that WG members can review.

A Vice-Chair for the WG is still needed.

WG membership is largely product manufacturers. Additional participation from users will be welcomed.

Members present:

Tony Bell Ametek

Dave McGuire Hubbell

Jerry Ramie ARC Technical

Richard Worley Dell Technical

Jeff Burnworth Basler Electric

Guests present:

Jim Niemira S&C Electric Company

Oscar Bolado ZIV

Roger Whittaker Self

Erin Spiewak IEEE
Vanessa LaLite IEEE
Mario Ranieri
Craig Palmer PowerComm Solutions
Robert Frye TVA

Respectfully submitted,
Jim Niemira
5/8/19

ITF42: SCOPE REVISION AND NAMING OF THE I SUBCOMMITTEE

Chair: Brian Mugalian
Vice Chair: Not assigned
Output: Draft of Revised Scope
Established Date: 2019
Expected Completion Date: 2019
Draft: 1.0

Assignment: Review and revise the Scope of the I Subcommittee

This TF did not meet. A proposed scope is being circulated by e-mail for SC approval.

7. Liaison Reports

TRANSFORMERS COMMITTEE

Liaison: Fred Friend

The next Transformers Committee meeting will occur October 27 - 31; Hyatt Regency, Columbus, OH. More detail may be found at the following url: <http://transformerscommittee.org>

The following is the status of active work related to Instrument Transformers:

Approved New Standards

PC57.13.7 Standard for Current Transformers with a Maximum mA Secondary Current of 250mA

Pending PAR Approvals

PC57.13.8 Standard Requirements for Station Service Voltage Transformers
PC57.13-2016/Cor 1 Standard Requirements for Instrument Transformers

8. Old Business

Creation of new Task Forces for IEEE standards expiring in 2021, 2022, and 2023

- General update and review of Standards Coordination spreadsheet
- Request volunteers that participated in the existing revision
- **Note that Task Force Chair does not need to become the Working Group Chair**

9. New Business

- a. Harmonization of I31 (P1613) and the C37.90 standards
- b. **Request for Working Group Officers, Chair for C37.90.1, Vice-Chair for C37.90.3**
- c. Robert Frye reports that President Trump issued Executive Order on investigation of EMP protection by all government agencies. TVA is coming up with grounding standard and EMP protection for control buildings in substations. EMP rise time is in nanosecond rise time; MOV will not respond in that short a time. May require filters on every conductor entering or leaving the control building. Robert Frye proposes a new TF be formed to investigate the issue – are there already any existing international standards? Request help from EMC society. – note, EMP is excluded from the 1613 standard for communications equipment used with electric power apparatus. Robert will write up a paragraph and send to I-SC Chair.

Motion to Adjourn was made by Kevin Donahoe; second by Mike Meisinger; motion carried without objection.

Meeting Adjourned.

Respectfully submitted,
James K. Niemira, PE
I-SC Vice Chair / Secretary
4-June-2019

J: Rotating Machinery Protection Subcommittee

Chair: Dale Finney
Vice Chair: Gary Kobet

Rotating Machinery Protection Subcommittee Scope

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

J SC met with 17 out of 33 members and 23 guests, reaching quorum. January 2019 J SC meeting minutes were approved.

The following ten J SC WGs met

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

Chair: Sudhir Thakur
Vice Chair: Manish Das
Output: Report to the Subcommittee
Established: 2011

Status: 19th Meeting

Working Group 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 report should be in the format that could be used as feeder material into the next revision of C37.102-IEEE Guide for AC Generator Protection

WG Report

The Working Group met for a single session with 5 members and 10 guests present. The Vice-Chair of ran the meeting in absence of the Chair.

The Vice-Chair stated that the report has been updated with almost all subcommittee ballot comments addressed, and with that a 100% approving votes among the balloters was received. The final report has been published and submitted to the J subcommittee chair to submit to PSRC officers. A copy of the report is available at the old J webpage at <http://www.pes-psrc.org/old/j/j05/j05.html> (click on Documents).

A summary paper has been drafted, and will be sent out for review. A member commented on whether there might be any copyright issues to consider when presenting at university conferences. Also, it was suggested that a statement be added to the paper noting it is based on a report produced by the PSRC WG J5. It was confirmed that the paper Abstract already states that. It was also mentioned that the WG made a presentation to the PSRC main committee in January.

On behalf of the chair, the vice-chair thanks all the WG members for their valuable contributions, and the subcommittee members for their help in reviewing this report.

The WG will remain in place until the paper is completed, however no further meetings are requested.

J12: Improved Generator Ground Fault Protection Schemes

Chair: Dale Finney

Vice Chair: Manish Das

Established: Jan 2013

Output: Report to subcommittee

Status: 18th Meeting

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

WG Report

The WG met on Wednesday, May 8, 2019 with 10 members and 13 guests.

There were no comments on the minutes from the January meeting

WG received 83% of approved ballots, exceeding the passing threshold.

Several remaining ballot comments were reviewed and resolved during the meeting.

The report will now be sent to the J subcommittee for ballot.

The working group will have its 19th meeting in Sep 2019.

J13: Modeling of Generator Controls for Coordinating Generator Relays

a. Chair: Juan Gers

Vice Chair: Phil Tatro

Assignment: Work jointly with the Excitation Systems and Controls Subcommittee (ESCS) of the Energy Development and Power Generation Committee (EDPG) and the Power Systems Dynamic Performance Committee (PSDP) to improve cross discipline understanding. Create guidelines that can be used by

planning and protection engineers to perform coordination checks of the timing and sensitivity of protective elements with generator control characteristics and settings while maintaining adequate protection of the generating system equipment. Improve the modeling of the dynamic response of generators and the characteristics of generator excitation control systems to disturbances and stressed system conditions. Improve the modeling of protective relays in power dynamic stability modeling software. Define cases and parameters that may be used for the purpose of ensuring coordination of controls with generator protective relays especially under dynamic conditions. Write a report to the J-Subcommittee summarizing guidelines.

WG Report

The working group met in two sessions with 12 members and 12 guests present. A quorum was achieved.

The working group approved minutes of the January 16, 2019 meeting.

Juan Gers reported on his meeting with Bikash Pal from PSPDC . Bikash has provided input to the report. Juan plans to provide the report to PSPDC and give a presentation when PSPDC meets at the PES General Meeting this summer.

Juan has already incorporated ballot comments that are editorial in nature or otherwise deemed to-be non-controversial.

The working group reviewed the substantive comments on Chapters 1 through 4. In light of significant work within the industry on Distributed Energy Resources (DERs) since the working group began this report, a decision was made to eliminate Chapter 4 – Impact on and from DERs.

The chair and vice chair will review substantive comments on the remaining chapters. A webinar will be scheduled, if necessary, to review any comments that require consultation with the working group to resolve. The goal is to have a complete revised document, with all comments addressed, by the end of June.

J14: Plant Protection Issues Associated with Black Starting of Generators

Chair: Chris Ruckman

V Chair: Zeeky Bukhala

Established: May 2014

Output: Report to Subcommittee

Expected Completion: January 2017

Status: 14th Meeting

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

WG Report

- I. Vice Chair kicked off the meeting at 5:00 pm with introductions.
- II. Status Update
 - a. Paper is complete and has been approved by the working group.
 - b. Paper has been forwarded to the J Subcommittee for comment and approval.
 - c. Paper needs to be converted to IEEE PES online publication format.
- III. Section Review. None
- IV. General Discussion
 - b. Chair announced that the paper has received the votes necessary for working group approval.
 - c. Chair thanked the working group for their efforts and participation.
- V. Next Steps:

- a. Chair/Vice Chair will incorporate any editorial comments received from the J Subcommittee. Any technical comments will be forwarded to the working group for incorporation via email
 - b. There will be one last meeting in Denver to wrap up any pending comments.
- VI. Meeting adjourned at 5:30pm.

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

Chair: Wayne Hartmann

Vice Chair: Joseph Valenzuela

Established: 2015 (1/15)

Output: Report

Status: 13th Meeting (190508)

Assignment:

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

WG Report

1. The Working Group (WG) met May 7th, 2019 with 15 members and 1 guest.
2. The WG assignment was reviewed as well as a brief history of WG activities.
3. Previous WG writing assignments were reviewed. The Chair checked with the membership to inquire if his compilation of the individual works were faithfully completed. Several assignments could not be verified and will have to be responded to by email.
4. The proposed Introduction was vetted by the WG.
5. The "Overview, Purpose, and Scope" section were discussed. It will remain bulleted per consensus.
6. The history of the 1.33 V/Hz limit was discussed. D. Finney questioned the history of 1.33 V/Hz that if in-fact it was found that the historically reason was due to being based on a 3 phase fault on the motor terminals. It was also asked if limits existed, based on research for a torque-based criterion. It was agreed that no one knows the history of 1.33 V/Hz, there is no historical evidence.
7. A call was made for a review of "Types of oscillography triggering and use for MBT current and torque ratio study" including the drawings. Assignments in section below.
8. "MBT Field Data from MV Buses" section was discussed in general and a request for review was made. Note when this section was written the modeling was not yet completed.
9. "Modeling Results for MBT Modelling Team A" was discussed and a request was made for reviewers of this section.
10. "Modeling Results for MBT Modelling Team B" was discussed and a call for reviewers was given.

WG Assignments: *Note for comments use "track changes" and a comment bubbles.

1. Review the Introduction (All WG Members)
2. Contributors of Literature Reviews to email Chair with *fidelity approval* of draft compilations.

- Randy Hamilton will provide the information for Matt Basler.
3. Assignment: Review Types of “Oscillography Triggering and Use for MBT Current and Torque Ratio Study”
 - Jason Espinosa
 - Mani Sankaran
 - Molson Parvin
 4. “MBT Field Data from MV Buses”
 - Dale Finney
 - Mani Sankaran
 - Prem Kumar
 5. “Modeling Results for MBT Modelling Team A”
 - Doug Weisz
 - Nate Klingerman
 - Ryan Carlson
 6. “Modeling Results for MBT Modelling Team B”
 - Jason Espinosa
 - Mani Sankaran
 - J.C. Theron
 7. Review assignments due on August 15, 2019, so Chair can create Draft 2.
 8. Chair to issue Draft 2 before the next WG meeting.

Adjournment

J16: PC37.101, Guide for Generator Ground Protection

Chair: Nate Klingerman

Vice Chair: Sudhir Thakur

Established: 2016

Output: Guide

Status: 7th Meeting

WG Report

The group met on May 7th, 2019 in Cincinnati with 12 members, and 9 guests in attendance. Quorum was not achieved. Membership will be revised prior to the next meeting based on past attendance.

The Chair presented the patent slides, no claims were made.

Ritwik Chowdhury presented a writing assignment on third harmonic schemes. An additional writing assignment from Dale Finney, Jason Espinosa, and Sungsoo Kim was reviewed. Productive discussion on both sections ensued with opportunities for improvements and additional information were identified.

The Chair reviewed the other writing assignments listed on iMeet and expects additional assignments to be turned in prior to the next meeting.

J17 - Revision of C37.102 Guide for AC Generator Protection

Chair: Manish Das

Vice Chair: Gary Kobet

Output: IEEE Guide

Draft: 1.6

Established: May 2017

Status: 8th WG meeting, Cincinnati OH

Expected completion date: December 2021 (initial sponsor ballot by January 2021)

Assignment: Revise C37.102 Guide for AC Generator Protection

WG Report

Working Group J17 held its meeting in a single session on Wednesday, May 8, 2019. This was the eighth in-person meeting for this working group.

There were 19 out of 40 members present; a quorum was not reached. 4 guests attended the meeting. It should be understood that those members who have made no contribution and have not responded to requests for contribution will be removed from the membership.

Minutes from the Jan 2019 meeting will be approved via email.

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

The Chair then began by review of the draft Annex A, and the following discussions took place:

- It was noted that the GSU in the example is sized larger than the generator. The WG agreed that this is OK to use. Nameplate GSU ratings for fan cooling stages (OA/FA) will be shown.
- Significant discussions took place on how to handle the potential overlap in the ground fault calculations between C37.101 and the Annex A in C37.102. A decision will be made later (and consistency will be sought w.r.t any overlap with C37.106).
- Figures presently shown may require some cosmetic improvements
- A member commented that the selection of 120 degrees and 3 seconds in the out of step protection calculations should be expanded upon. The chair mentioned this protection will be redone after comments from the recently completed J5 Out of Step report is implemented into the body of the guide.
- A member suggested adding language about harmonics and 46 protection. Another member commented that not all manufacturers provide guidance on harmonics to set the 46 protection. C50.13 will be reviewed for how manufacturers build their machines for heating and harmonics. **Reviewer TBD.**
- A procedure describing how to manually calculate the SSSL has been provided by Russ Patterson. **Doug Weisz and Murty Yalla** will review. The WG agreed there is value in adding it to this guide.
- The chair mentioned that new verbiage has been added in Clause 1.0 of the guide regarding potential regulatory/coordination requirements that users should be aware of. Generic statements will be added at the end of each relevant protection functions in the Annex calculations to highlight the potential need for coordination or regulatory compliance. The WG agreed that no references to specific PRC standards should be made.

The draft Annex A calculations will be further worked and the updated document sent out for review in the September meeting. Those assigned to review figures in the body of the guide should submit any updated figures within the next few weeks.

Subclause Review Assignment Instructions:

- Any new review comments must be made in the latest C37.102 word draft found in iMeetCentral folder "C37.102/Drafts/Drafts in Progress" using "tracking on" and include your proposed new verbiage. In general, comments that don't offer suggested verbiages will not be considered.
- Address comments in the below 3 files available in folder "C37.102/Comments from previous revisions":
 - C37.102 -2012 Reaffirmation – ALL comments.xlsx
 - C37.102_Comments_Alla Deronja_201110509.docx
 - J3 Power Plant and Transmission System Protection Coordination – Final Report – 2012.pdf
- A copy of NERC TRD Power Plant Transmission System Protection Coordination, Revision 1, July 2010 is also available in the above folder.
- Coordinate with the Figures group if your subclause figures need to be updated.
- Address any formatting, editorial or other comments made by the IEEE-SA team (Daniella Martinez and Michelle Turner) in the C37.102 word document. Note that there's one major change since the 2006 version which is that all figures have been renumbered to appear in the draft sequentially rather than by clause #.
- Each group must only upload a single commented word copy with input from all group members. Identify the clause/subclause # in the filename.

Latest Subclause Assignments

Subclause	Description	WG Member
<i>Figures</i>	Accuracy & consistency of Figures throughout C37.102	Don Burkart, Jason Espinosa, Dale Finney, Meyer Kao
3.0	Description of generators, excitation systems, and generating station arrangements	Onur Usmen, Normann Fischer
4.2	Field Thermal Protection	Onur Usmen, Normann Fischer
4.4	Generator Rotor Field Protection	Onur Usmen, Normann Fischer
4.8	Excitation System Protection	Onur Usmen, Normann Fischer
4.1	Generator Stator Thermal Protection	Dale Finney, Nate Klingerman, Russ Patterson
4.3	Generator Stator Fault Protection (Excluding 4.3.3)	Dale Finney, Nate Klingerman, Russ Patterson
4.3.3	Stator GF w/ concurrent review of C37.101	Gers, Beckwith, Hartman, Klingerman, Finney, Nader
4.5.1	Loss of Field	Gary Kobet
4.5.2.	Unbalanced Currents	Russ Patterson, Bob Pettigrew, Sudhir Thakur
4.5.3	Loss of Synchronism	Jason Espinosa, Dennis Tierney
4.5.4	Overexcitation w/ concurrent review of C37.106	Will English, Jason Espinosa, Murty Yalla
4.5.5	Motoring	Kelvin Barner, Jason Espinosa
4.5.6	Overvoltage	Ryan Carlson, Prem Kumar, Manish Das
4.5.7	Undervoltage	Ryan Carlson, Prem Kumar, Manish Das
4.5.8	Abnormal Freq w/ concurrent review of C37.106	Jason Espinosa, Lifeng Yang
4.6	Backup Protection	Phil Tatro, Mike Thompson
4.7	Gen BF w/ concurrent review of C37.119	Phil Tatro, Mike Thompson
4.9	Power Transf Prot through mechanical fault detection	Don Burkart, Zeeky Bukhala
5.1	Current Transformers	Hasnain Ashrafi, Zeeky Bukhala
5.2	Voltage Transformers	Hasnain Ashrafi, Zeeky Bukhala
5.3	Protection during Startup or Shutdown	Sungsoo Kim, Ratan Das
5.4	Inadvertent Energizing	Russ Patterson, Jun Verzosa
5.5	SSR	Steve Conrad, Outside SME
5.6	Transmission Line Reclosing w/ review of J7 output	Gary Kobet, Chris Ruckman
5.7	Synchronizing	Randy Hamilton, Mike Thompson
6.0	MGPS	Gustavo Brunello, Kelvin Barner
7.0	Protection Specification	Manish Das, Sungsoo Kim
Annex A	Sample Calculations	Onur Usmen, Juan Gers, Ritwik Chowdhury, Nate Klingerman
Terminology Review	Review C37.102 for terms not appearing in IEEE Dictionary that may need new definitions	Claire Patti, Doug Weisz, TBD, TBD

Relevant NERC Standards Review Assignments:

NERC Document	Assignees
SPCS Technical Reference Document - Power Plant and Transmission System Protection Coordination - Revision 2	Arman Vakili
PRC-001-1.1(ii) System Protection Coordination	Luis Polanco
PRC-004-5(i) Protection System Misoperation Identification and Correction	Kelvin Barner
PRC-005-1-1b Transmission and Generation Protection System Maintenance and Testing	Kelvin Barner
PRC-006-2 Automatic Underfrequency Load Shedding	Mircea Rusciior
PRC-019-2 Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection	Juan Gers
PRC-024-2 Generator Frequency and Voltage Protective Relay Settings	Sudhir Thakur, Mircea Rusciior
PRC-025-1 Generator Relay Loadability	Sudhir Thakur, Ritwik Chowdhury
PRC-026-1 Relay Performance During Stable Power Swings	Meyer Kao

Recent and Ongoing J Reports to be used as feeder into C37.102:

J Publication	Status	Assignees (WG Chair/Vice Chair)
J2 Protection Considerations for Combustion Gas Turbine Static Starting (2011)	complete (2011)	Mike Reichard, Zeeky Bukhala
J3 Power Plant and Transmission System Protection Coordination (2012)	complete (2012)	Phil Waudby, Sungsoo Kim
J5 Coordination of Generator Protection with Generator Excitation Control and Generator Capability (2007)	complete (2007)	Mike Reichard
J5 Application of Out-of-Step Protection Schemes for Generators (2019)	complete (2019)	Sudhir Thakur, Manish Das
J6 Protection Issues Related to Pumped Storage Generation (ongoing)	complete (2017)	Joe Uchiyama, Dale Finney
J7 Avoiding Unwanted Reclosing on Rotating Apparatus (2017)	complete (2017)	Mike Reichard, Steve Conrad
J8 Tutorial on the Protection of Synchronous Generators (2011)	complete (2011)	Mike Thompson
J12 Improved Generator Ground Fault Protection Schemes (ongoing)	Ongoing, est. completion 2018	Dale Finney, Manish Das
J13 Modeling of Generator Controls for Coordinating Generator Relays (ongoing)	Ongoing, est. completion 2018	Juan Gers, Phil Tatro
J14 Plant Protection Issues Associated with Black Starting of Generators (ongoing)	Ongoing, est. completion 2018	Chris Ruckman, Zeeky Bukhala

All PSRC published publications: <http://www.pes-psrc.org/kb/published/reports.html>

J18 Investigate the effect sub-synchronous oscillations due to inverter based resources (IBR) on rotating machinery protection and control

CHAIR: Normann Fischer

VICE CHAIR: Rene Midence

Output: Report

Established: September 2017

Status: WG

ATTENDANCE:

Total 26; Guests 22; Members 4

OVERVIEW:

The Chair gave a presentation of SSCI (Sub synchronous Control interaction) and briefly discussed SSTI (Sub synchronous torsional interaction). The presentation proposed definitions of different SSO terminology, such as SSR, IGE, SSCI, SSTI these definitions may not fully agree with the IEEE definitions, but these are the definitions presently used in most papers on this topic.

The chair will talk to the PSRC committee to see if it is possible to post papers about SSCI and SSTI on the PSRC website so that members can review these and deliver comment on these at the next meeting

J19 IEEE Std C37.106 Guide for Abnormal Frequency Protection for Power Generating Units

Chair: Ritwik Chowdhury

Vice Chair: Jason Espinosa

Output: Guide

Draft: 1.2

Established: January 2019

Status: 2nd WG meeting, Cincinnati OH

Expected Completion Date: May 2021

Assignment: To revise and update C37.106, IEEE Guide for Abnormal Frequency Protection for Power Generating Plants

The working group met with 11 members (out of 15 total members) and 13 guests. A quorum was achieved. The meeting minutes from January 2019 meeting was approved (Jason and Dale).

- We went over the assignment to Jason, Phil Tatro, and Daniel
 - We discussed comments/revision to the sections
 - We accepted/rejected comments provided by the above members
 - We modified the coordination language between generator 81 protection schemes and UFLS scheme
 - We discussed the use of two electromechanical frequency relays connected in series too provide security.
 - **Doug Weisz and Dale** to investigate these existing schemes and determine if they are still valid.
 - **Ritwik and Jason** will check LOP (blown fuse) language and breaker status in standard for redundancy
 - Added language to alarm for over frequency conditions
 - We did not find any language in C50.13 to backup the statement that 105% V/Hz is the standard continuous rating
 - We need to add a paragraph to add Doug Weisz torsional mode example (81 and 46)
- **Jason, Ritwik, Doug, and Mani S** will work on adding Annex section (Lead by Doug)
- **Jason, Will, Manish, Ritwik, Phil** Figure 6 revision to show better coordination
- WG should review section 4, 5, and 6. We will review in next meetings
 - Section 4: **Sung Soo and Doug**
 - Section 5: **Mani S, Vinod**
 - Section 6: **Jean Francois**
- **Vinod and Dale** to start working on the figures for this document, ongoing assignment.
- **Ritwik** will produce and send the latest draft (2.0) to all members so they may start working on the assignments.
- **Kelvin** talked about an issue had seen about pumped storage hydro and staggering the trips. Discussion whether we want to talk about pumped storage units at the September meeting.

J20 Practices for Generator Synchronizing Systems

CHAIR: Jason Espinosa

VICE-CHAIR: TBD

Output: Report

Established: January 2019

Status: WG (1st meeting 20190508)

WG Report

- The primary goal of the meeting was to assign sections to start the writing process.
- Jason cleaned up the table of contents the WG reviewed in the previous JTF1 meeting; the WG reviewed the revised table of contents
 - There was some discussion about instrument transformer safety grounds. Mike talked about the rationale of where that came from. Jason then made a note to move this sub-section from “Commissioning Practices” to “Design Practices”.
 - There was some discussion about whether 25A is a control or protection or not. More discussion to be had in later meetings about this topic
 - There was some discussion on the performance of the schemes, instantaneous torque being one of the discussed measurements.
 - Tom mentioned some loss of life type of calculations for the machine. Dale talked about a similar EPRI study. These references will be used by the group.

- **Action Item:** Tom/Dale to provide reference papers for these algorithms/calculations
 - The following section assignments were made:
 1. Will and Wayne
 2. Tom
 3. Vinod and Randy
 4. Ritwik
 5. Tom, Jean Francois
 6. Kelvin, Ryan
 7. Nate, Kelvin, Luis
 8. Zeeky, Dale, Luis
 9. Chris, Ryan, Kelvin
 10. None
 11. None
 12. Dale
- Luis talked about measurement errors from PTs during synchronization. We should add language in the paper to discuss taking into consideration instrument transformer errors
- Mike talked about coordination of 25 with 25A, resulting in issues like delayed close or a close fail. Tom mentioned a 900MW plant example, where there were severe delays. There was good discussion to not add time delays to the synchronism. Language should be added to the report to discuss this
- There was some discussion on DCS, and the variety of technologies and signal requirements. Some new exciters have auto-voltage matching etc. Different systems have different requirements, e.g. fixed pulses vs proportional pulses etc.
- Mike T indicated he has seen customers that will open the motor operated disconnect switches if they don't sync within certain time-periods. Mike Jensen talked about the same situation where if the breaker is under-sized. C37.13 is the first reference to check to talk about HV vs LV rating. The manufacturer is about out-of-phase and a flash-over. The HV breakers are not sized for C37.13. Add C37.13 to reference and add language in section 4
- There was a discussion about semi-automatic based on a previous IEEE survey. Semi-automatic is not a well-defined term. It is believed that Semi-automatic refers to when the Operator is in the loop, but he is being supervised by a synch. check system. Jean mentioned that there is a logical increase in the voltage and frequency, but the operator issues a close.
- Steam units have a finite time (1-2 hours) before they need to be brought online to cover over-heating issues. This may be an issue during commissioning etc.
 - **Action Item:** Chris will provide it in the write-up for the commissioning section.
- Ryan mentioned Caterpillar's standard for the black-start units using IEC-61850 and communication-based synchronization. PLC makes a determination based on data they provide on the ethernet network. Nate mentioned cases where they wanted to keep the two DC systems isolated. But this is based more on isolation than communications.

Liaison Reports:

Electric Machinery Committee - M Yalla - No report

Industry Applications Society (IAS) / Industrial & Commercial Power Systems (I&CPS) - M Donolo - No report

Nuclear 1E WG - Prem Kumar - No report

Old Business

Will English raised the issue of overlap between C37.101, C37.102, and C37.106. Dale Finney has an action to arrange a meeting at the September 2019 PSRC meetings to discuss and settle the issues. Tom Beckwith volunteered to send some background/history regarding how/why the documents cover the items as they presently do.

New Business:

A new task force will begin in September 2019 titled "Motor Protection Tutorial", based on IEEE Std C37.96 Guide for AC Motor Protection. The task force will be chaired by Kelvin Barner. Normann Fischer asked if the tutorial will address DFIG (doubly-fed induction generator) protection, which is the type of machine (variable speed) used for many wind turbine generators (Type III WTG) as well as modern pumped storage units. Wayne Hartmann stated the tutorial expects the tutorial will address whatever is presently covered by the existing C37.96 guide. Normann Fischer stated that synchronous motors are a subset of DFIG machines. Dale Finney stated while C37.96 does cover synchronous motors, it does not specifically address DFIG protection. Wayne Hartmann suggested a task force might be established that would lead to a J WG to produce a report on DFIG protection, which could be incorporated into a future revision of C37.96. Dale Finney did mention that the J15 output could possibly be incorporated into that same future C37.96 revision.

Dale Finney announced that in the September 2019 J-SC meeting, Normann Fischer will be presenting the results of staged fault testing on a hydro machine which was to be rewound. The presentation will include video and oscillography.

Dale Finney announced the Western Protective Relay Conference holds a slot open for IEEE PSRC. Dale mentioned that J5, J14 and possibly J12 may wish to present their work at this regional relay conference. The conference is held the 3rd week in October annually.

Meeting was adjourned

K: Substation Protection Subcommittee

Chair: Jeff Barsch

Vice Chair: Adi Mulawarman

Substation Protection Subcommittee Scope

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

Advisory Committee and other items of interest were discussed:

1. Standards WG Awards - Reminder that the IEEE Standards Association Working Group Awards has a new Procedure to request certificates of appreciation for completed (Approved Standard) work. These certificates have to be requested by the Chair, VC or an officer of the WG directly from the IEEE SA. These awards can be shipped to our next PSRC meeting for announcement and distribution or they can be shipped directly to every member if addresses are provided.

The request for the SA certificates must be made at: <http://standards.ieee.org/develop/awards/wgchair/wgawards.html>

This procedure and associated links will be posted in the PSRC website in the next week or two for easy access.

2. Reports/Paper Final Output – Reminder that to be considered for PES level award for Technical Reports, Transactions/Journal and conference papers, these must be completed in PES Format and submitted and posted in the PES Resource Center.

Links to PES

PES Technical Resource Center: <http://resourcecenter.ieee-pes.org/>

PES - Technical Report Template: https://www.ieee-pes.org/images/files/doc/tech-council/PES-Technical-Report-Template_Jan_2016.docx

PES - Technical Paper Template: <https://www.ieee-pes.org/templates-and-sample-of-pes-technical-papers>

PES Resource Center Submission Checklist with instructions on how to get your report or Paper submitted please use this link: http://ieee-pes.org/images/files/doc/tech-council/Submission_Checklist_PES_Resource_Center.docx

Reports from the WG Chairs

K10 SCC21 Distributed Resources Standard Coordination

Chair: R. Benjamin Kazimier

Vice Chair: Mark Siira

Established, 1999

Output: Standard through the SCC 21

Expected Completion Date: 20xx

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

K10 met on Tuesday 05-07-2019 at 3:40pm in the Harrison room. There were 5 voting members and 4 guests.

1547.1 has been sent to IEEE SA for balloting. The end date is May 10th, if you wish to join the ballot pool please sign-up before the end of the day on Friday.

We also discussed 1547.1/UL1741 rollout dates which indicate that 1547-2018 compliant inverters will be available to the market at the earliest, Q4 of 2020 but not exceeding Q4 of 2021.

1547.2 and 1547.9 will meet in Minneapolis, hosted by Xcel Energy on June 4-5 for 1547.2 and June 6th for 1547.9. the registration link will be in the meeting minutes.

We discussed other 1547-dot standards, 2030 standards and gave general update on SCC21 activities. This was followed by an open discussion which mainly consisted of discussing recent 1547 related outreach activities.

K11 Open Phase Detection for Nuclear Generating Stations

Chair: C. Sufana

Vice Chair: M. Urbina

Output: Report [Draft 7.30]

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 2 members, 4 guests, and 0 SC officer in attendance for the May 7, 2019 meeting in Cincinnati, OH.

The minutes from the January 16, 2019 K11 meeting were read but quota was not met, so the minutes will need to be approved later. The working group also saw the patent slides and no objections were noted.

Charlie then went over the report draft 7.50. The report was sent out to the working group after the September meeting but received no comments from the working members.

Prior to this meeting, Jeff Barsch who is the K SC chair, had sent comments on some sections that were late clarified. Draft 7.40 was then sent out to the working group for their approval. Several comments were received from working group members Ljubomir Kojovic, Ted Warren, and Wayne Johnson. The comments from Ted and Ljubomir have been cleared but the ones from Wayne needed some discussion. Wayne suggested a change of the report title, clause 2.1.5 Hybrid Scheme, and Clause 5 Conclusion. Those attending today's meeting agreed to change the title but not change the Conclusion table. Clause 2.1.5 still needs to be reviewed.

Prem Kumar commented that TVA might be using a new scheme to detect open phases. He suggested that Mark Bowman might be able to provide some answers.

Once the working group has voted on new draft 7.50 and any issues cleaned up, then the report will be sent to the K Subcommittee for their consideration to allow the report to be posted to the PSRC webpage. The K Subcommittee Chair has requested that the Working Group provide a draft for balloting as soon as possible.

K12 P1032 Guide for Protecting Transmission Static Var Compensators

Chair: Satish Samineni

Vice Chair: Martin Best

Established: May 2013

Output: Guide for Protecting Transmission Static VAR Compensators

Expected Completion Date: December 2020(?) (I9 holds PAR which expired in 2018 - they need to obtain a new PAR.)

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 Working Group K12 met on Tuesday, May 7, 2019 with 3 members and 3 guests. Quorum was not met.

The IEEE-SA patent and copyright policies was presented, and no one had any responses or disclosures to make.

The K12 meeting minutes from January JTCM meeting with the Substations I9 Working Group was reviewed. The meeting minutes will be approved after the meeting through email. The meeting notes were reviewed from the March 26 joint I9-K12 Web meeting, during which Figures 10 and 12 were updated

There were no additional items to add to the agenda.

The current draft of the Guide is 20.2

Technical topics:

- 1.) The WG reviewed and accepted comments in Section 4.8 on Breaker Considerations for DC Offset.

- 2.) The working group also reviewed and provided additional comments in Section 7.3.1 on Transformer Protection.
- 3.) The working group also reviewed and provided additional comments in Section 7.4.2 on Medium Voltage Bus Protection.
- 4.) The working group also reviewed and provided additional comments in Section 8 on Protective Functions in the SVC Control System.

Action items : None.

Recesses and time of final adjournment:10:30 AM, 5-7-19

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

Chair: Will English

Vice Chair: Steve Conrad

Established: 2014

Output: Guide

Expected Completion Date: 2020

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

Motion to go to SA ballot by Mike Thompson, second by Randy Crellin, unanimous approval.

The meeting was called to order by the chair at 3:40PM on May 7, 2019 at the Westin Hotel, Cincinnati, OH. The working group met with 16 members out of 30 attendees. Quorum was achieved throughout the meeting.

IEEE-SA slides 1-4 containing patent policy and guidelines for WG meetings were displayed. A Call for Patents was made by the chair. No one acknowledged or identified having a patent claim.

The minutes from previous meeting were called for approval by the chair. Garden Grove – January 2019 Motion Pat Carroll, Second Brian Boysen. Meeting minutes were approved at this meeting motion carried by unanimous vote.

Technical topics:

1.) Draft 14.1 was discussed which incorporated the comments received from the WG consensus ballot.

Figure 22 on REF was discussed concerning the use of the aux CT in the neutral circuit. WG agreed to use the modified figure with the note shortened.

Clause 7.6.2 relating to the ANSI designations for transformer vector grouping, it was decided to remove the D/d0/d0//d0 designation and replace with Delta-delta designations.

Clause 7.6.3.2 added discussion on harmonic blocking.

Clause 9.7 the example figure shows multiple vendor V/Hz curves, the WG decided to use the figure as is.

Clause 14, the specific values of dc currents for GMD could not be reference substantiated, therefore these were removed.

Figure A.6 modify the text to remove the word Should.

C.6.3 Removed the text associated with the thermal time constants etc.

2.) Having reviewed all WG ballot comments, a motion to move the document to SA for balloting was made by Don Lukach and second by Paul Elkin, motion carried by unanimous vote. A ballot comment will accompany this transfer stating the two Annexes E and F are to be combined. Also, a review of the citations and their applicability in the document is to be completed.

Having no more business a motion to adjourn was made by Pat Carrol, second by Paul Elkin motion carried.

Recesses and time of final adjournment:4:50 pm on 5/7/2019

K17 Geomagnetic Disturbances (GMD)

Chair: Qun Qiu

Vice Chair: Luis Polanco

Established: 2015

Output: Report

Expected Completion Date: 2019

Assignment: Create a report

Brief Summary

K17 met on Tuesday May 8, 2019 with 18 participants (12 guests and 6 signed members).

Chair presented summary of the previous meeting minutes from January 2019.

Chair indicated that K17 report was approved by all 15 WG members, receiving seven (7) approvals without comments and seven (7) approvals with comments.

Chair discussed the major comments receive during ballot process, including document references on page footers, discussions and observations to update report figure 2-2 to include primary CT, and references to the figures 1-5 related to the Harmonic component magnitudes versus per-unit GIC, and other miscellanies editorial changes.

Chair will clean-up the report and submit to the K-subcommittee for their review.

Other discussions about possibility of proposing developing a summary paper and presentation slides with the intent of participating in industry conferences will be further discussed in September.

The next steps are to have a meeting for to discuss and resolve any comments received from the K Subcommittee leadership.

For next meeting chair requests a single-session and a meeting room for 20 persons, with AV capabilities. The session time is requested to avoid a conflict with D39, H45 and H47 WG sessions

The WG report draft # is 7.1

Submitted to the Subcommittee on May 8, 2019

Recesses and time of final adjournment:10:30am 5/8/19

K18 PC37.108, Guide for Protection of Secondary Network Systems

Chair: Adi Mulawarman

Vice Chair: Roger Whittaker

Established: May 2015

Output: Guide

Expected Completion Date: December 31st 2019

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

The meeting was called to order by Vice Chair Roger Whittaker. The patent slide was displayed and Roger called for any patent issues to be reported to himself. None occurred.

After introductions and announcements of attendees affiliations, a call for quorum was made to count the attending voting members. A quorum was achieved as six voting members (11 total voting members) were in attendance along with 8 guests.

A motion was made by Robert Frye, and seconded by Rafael Garcia, to approve the January 2019 Garden Grove meeting minutes. The minutes, as published were approved by a unanimous vote.

There were no items added to the previously published agenda however an unscheduled presentation by Bruce Mackie about a faulted Network Vault event was encouraged.

Technical topics:

- 5.) Roger announced the result of the electronic mail vote by the workgroup voting members, which requested their approval to present draft 2.18 to the K Substation Protection subcommittee for permission to go to IEEE sponsor ballot.

Permission is granted as ten of eleven members responded to the Email vote, and all responders voted to approve. There was one editorial comment as a member was accidentally listed twice on the membership identification section of the draft. Thus it was agreed that Roger would announce this request at the K subcommittee meeting.

- 6.) Roger gave a brief overview of draft 2.18 that was approved for ballot submission by the workgroup.
- 7.) No formal motions other than approval of minutes were made during the meeting.
- 8.) As previously mentioned, a presentation about a fault that occurred recently within or adjacent to a network vault was made by Bruce Mackie. The fault record was displayed and several members discussed the protection response. Bruce's utility has since decided to add a current limiting fuse in series with the primary feeder circuit breaker.

Action items :

- a. Roger will present the request to go to ballot, of draft D2.18, to the K Subcommittee.

Motion to go to SA sponsor ballot by Roger Whittaker, second by Charlie Sufana, unanimous approval.

1.

PLEASE DOWNLOAD LATEST DRAFT FROM THIS LINK BELOW

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

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

K22 PC37.234 IEEE Guide for Protective Relay Applications to Power System Busses

Chair: Abu Bapary

Vice Chair: Alla Deronja

Established: January, 2017

Output: Guide

Expected Completion Date: December 2021

Assignment: Revise and ballot IEEE Standard C37.234 prior to its expiration in 2019.

Call to order

The IEEE patent and policy slides were presented. There were no responses or questions regarding the slides.

Quorum was achieved. The meeting was attended by 17 voting members, 2 non-voting members, and 6 non-members.

A motion was made by Don Lukach to approve the minutes from the January 15 JTCM meeting, the February 14 webex meeting, the March 28 webex meeting, and the April 25 webex meeting. The motion was seconded by Brian Boysen. The minutes were unanimously approved.

Technical topics:

- 1.) It was discussed if optical current transformers (ECT) should be addressed in a separate sub-clause as is done in the guide for linear couplers (7.1.5) and Rogowski coils (7.1.6). Optical CTs are only mentioned in 6.1. The group concluded that was sufficient, and it is not necessary to add another section.
- 2.) The issue of considering VT inrush current for bus protection sensitivity and VT secondary faults for secondary fuse/bus protection coordination was discussed. *It was decided to remove this topic from 8.7 and revise the wording in 7.1.3.1 and 8.1.*
- 3.) **The term “release”, used twice in section 8.9, was reviewed. After discussion the word was removed and the paragraphs were revised for clarity.**

Action items :

- a. **The action item regarding 7.1.4 review of low-impedance term is complete.**
- b. The action item regarding the review of 7.1 is on hold.

- c. IEEE Std. C37.110 contains the information of lead resistance as mentioned in A2 of C37.234. Several references were found, but more direction is needed.
- d. Review of 7.2.1 is to be done by July.
- e. Action items related to 8.5 and 8.6 are to be done by July.
- f. **Section 8.7 action items are in progress.**

Recesses and time of final adjournment : 05/07/2019, 2:10 pm EST

Next Meeting : One webex meeting will be scheduled for June, July, and August

K24 Summary paper for PC37.245, Guide for the Application of Protective Relaying for Phase Shifting Transformers

Chair: Brandon Davies (filled-in by Hillmon Ladner)

Vice Chair: Hillmon Ladner (filled-in by Lubomir Sevov)

Established: January 2019

Output: Summary Paper for PC37.245 PST Guide

Expected Completion: January 2020

Assignment: Write a summary paper for the recently completed PC37.245 Guide for the Application of Protective Relaying for Phase Shifting Transformers (PST) for presentation at regional conferences.

The K24 working group met on May 8th at the PSRC in Cincinnati, Ohio with – 6 members and 4 guests present.

The WG started the meeting with a review of the Short Circuit study section for the paper and recruited a volunteer to create draft for this last remaining section of the paper. – Lalitha

Then discussion started around the need to review and update the Introduction section of the paper. More description of purpose of the PST to be added, it was agreed to insert fig. 3 and fig. 4 and remove fig. 1 – Lubo volunteered to review and update it.

The use of the figures from the guide was discussed, and the group concluded that only the most important figures should be used as a highlight in the context of the paper, with provision referring to all other figures from the guide.

The complete paper should be approved by the WG and submitted for review by the K-subcommittee by October 2019 to have it ready for the January 2019 meeting. The group discussed to have a Webex WG meeting sometime in mid-July.

The time frame for completion of the paper was discussed. Jeff Barsch mentioned that abstract of the paper can be sent to WPRC (April), Texas A&M (August) and GA Tech (September) conferences for 2020 (the actual due dates for submitting abstracts to be checked for each conference).

The group discussed requesting a volunteer to develop the first draft of the presentation during the next meeting (~15 slides and may have more figures than paper). The WG could then review and suggest changes if needed.

Current draft of the paper is Rev. 0

For the next meeting K24 requests a single session with a room for 20 people and a projector.

Assignments:

Insert the SLD (top left figure from figure 11) of the most common PST into the PST types section from the paper but mention the other types of PST in the text. Also remove Figure 1 and substitute Figures 3 and 4 from the guide. - Lubo.

Short Circuit study: review the section (the group decided not to show figures, but describe the variation of zero seq. impedance throughout the phase angle variance) - Lalitha

Conclusions to be added in the paper by also including references to the Annexes from the Guide. - Charlie

Review of the paper after integration of the comments from the assignments to be performed by the members of the group before finalizing it. Assignments are due until July 1st, 2019.

Webex meeting to be scheduled sometime in July.

K25 C37.99 Revision of IEEE Guide for the Protection of Shunt Capacitors

Chair: Meyer Kao

Vice Chair: Rick Gamble

Established: January 2019

Output: Guide

Expected Completion Date: 2022

Assignment: Revise the existing C37.99 IEEE Guide for the Protection of Shunt Capacitors

Call to order, introductions, Chair's remarks

A review of task force meeting minutes leading to decision to form a full working group was presented by the Chair. The Chair also discussed the PAR process and showed the WG a draft PAR for further discussion. No changes were to be made to the scope or purpose of the guide. A recommendation was made to remove the 'new technology' wording in the PAR section 5.5 Reason for Project. Claire Patti moved to approve the PAR with Eric Thibodeau seconding the motion, which was approved by the WG membership. The Chair will submit the PAR. Additionally, a meeting space in iMeetCentral is being setup by SA.

The contents of the existing guide were discussed in detail. Assignments were made to review each section. Three major revisions for consideration are: 1) the review of the tables in section 8 for cleanup, 2) the need to revisit the overarching 110% protection limit in all guide calculations, and 3) dispersing the section on microprocessor relaying amongst the rest of the document. Several other minor enhancements and revisions were also discussed.

Correspondence and review of other IEEE publications on the subject will be underway, including IEEE 18, IEEE 1036, and IEEE 1531.

PAR kept existing document scope and purpose. Motion to approve PAR by Meyer Kao, second by Gene Henneberg, unanimous approval.

K26 C37.109 Revision of IEEE Guide for the Protection of Shunt Reactors

Chair: Kamal Garg

Vice Chair: Ilia Voloh

Established: January 2019

Output: Guide

Expected Completion Date: 2023

Assignment: Revise the existing C37.109 IEEE Guide for the Protection of Shunt Capacitors

1. Introductions

2. 27 people in presence. (13 Voting members and 2 Non-voting members).

3. May 4 web meeting minutes from last meeting will be approved by e-mail

4. PAR presented and approved without objections. However there are some suggestions from the C committee meeting subsequent to working group meeting to remove some language from scope. Chair/Co-chair will seek approval from WG voting members via email.

5. Pratap Mysore presented new method for turn fault protection

6. Gary Kobet presented TVA bad experience during tertiary reactor fault and changing TVA practice.

7. Proposed guide content was presented. WebEX meeting-10 people agreed

8. Charlie confirmed that BC hydro is using grounded reactor in unrounded system on the tertiary.

9. Adjourn

PAR was to keep existing scope and purpose, SC suggested removing text about improved protection and microprocessor relays, also changed "used on" to "connected to", noted that WG K26 must approve the PAR change, motion to approve PAR as modified subject to WG K26 approval was made by Mike Thompson, second by Steve Conrad, unanimous approval.

Recesses and time of final adjournment : 05/08/2019, 11:50 am EST

Next Meeting : Denver

Liaison Reports:

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T&D Committee, Capacitor Subcommittee

Pratap Mysore

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

(see Pratap's report)

TX Committee

Fred Friend

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

The next Transformers Committee meeting will occur October 27 - 31; Hyatt Regency, Columbus, OH. More detail may be found at the following url: <http://transformerscommittee.org> The following is the status of their work:

Approved New Standards

PC57.13.7 Standard for Current Transformers with a Maximum mA Secondary Current of 250mA

Approved Revisions to Transformer Standards

C57. 12.23 Standard for Submersible Single-Phase Transformers: 250 kVA and Smaller; High Voltage 34 500GrdY/19 920V and Below; Low Voltage 600 V and Below

PC57.105 Guide for Application of Transformer Connections in Three-Phase Electrical Systems
PC57.127 Guide for the Detection, Location and Interpretation of Sources of Acoustic Emissions from Electrical Discharges in Power Transformers and Power Reactors

Pending Standards Approval (most were on the 2 May 2019 RevCom agenda)

C57.12.32 Standard for Submersible Equipment - Enclosure Integrity

PC57.12.51 Guide for Mechanical Interchangeability of Ventilated Dry Type Transformers

P60214-2 Tap-Changers - Part 2: Application Guide

PC57.93 Guide for Installation and Maintenance of Liquid-Immersed Power Transformers
(on the 20 March 2019 RevCom agenda)

PARs for New Standards

PC57.32.10 Guide for the Selection of Neutral-Grounding Devices for High Voltage Direct Current (HVDC) Converter Transformers (Entity)

PARs for Revisions

PC57.12.20 Standard for Overhead-Type Distribution Transformers 500 kVA and Smaller: High Voltage, 34 500 V and Below; Low Voltage, 7970/13 800V and Below (expires 2023)

PC57.12.24 Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 Volts and Below; Low Voltage, 600 Volts and Below (expires 2023)

PC57.12.30 Standard for Pole-Mounted Equipment - Enclosure Integrity for Coastal Environments (expires 2023)

PC57.12.31 Standard for Pole Mounted Equipment - Enclosure Integrity (expires 2023)

PC57.98 Guide for Transformer Impulse Tests (expires 2022)

PC57.100 Standard Test Procedure for the Thermal Evaluation of Insulation Systems for Liquid-Immersed Distribution, Power and Regulating Transformers (expires 2022)

PAR Extensions Approved

P1276 Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Distribution, Power and Regulating Transformers (December 2020)

P62014-25 Tap-Changers - Part 2: Application Guide (December 2019)

PC57.12.23 Standard for Submersible Single-Phase Transformers: 250 kVA and Smaller; High Voltage 34 500GrdY/19 920V and Below; Low Voltage 600 V and Below (December 2019)

PC57.12.51 Guide for Mechanical Interchangeability of Ventilated Dry Type Transformers (December 2020)

PC57.21 Standard Requirements, Terminology, and Test Code for Shunt Reactors Rated Over 500 kVA (December 2020)

PAR Modifications Approved

PC57.104 Guide for the Interpretation of Gases Generated in Oil-Immersed Transformers

Pending PAR Approvals

PC57.12.40 Standard for Network, Three-Phase Transformers, 2500 kVA and Smaller; High Voltage, 34 500 V and Below; Low Voltage, 600 V and Below; Subway and Vault Types (Liquid Immersed)

PC57.13.8 Standard Requirements for Station Service Voltage Transformers

PC57.19.100 Guide for Application of Power Apparatus Bushings

PC57.169 Guide for Determination of Maximum Winding Temperature Rise in Liquid-Immersed Transformers

PC57.13-2016/Cor 1 Standard Requirements for Instrument Transformers

Old Business:

None

New Business:

Gary Kobet suggested writing a report on tertiary bus ground protection as this protection is not included in C37.91. Discussion ensued but no action taken.

Adjourn: motion by Steve Conrad, second by Pat Carrol, unanimous approval.