



**POWER SYSTEM RELAYING AND CONTROL COMMITTEE
OF THE IEEE POWER AND ENERGY SOCIETY
MINUTES OF THE MEETING
September 16-19, 2019, Denver, CO**

I. Call to order / Introductions: Russ Patterson

Russ Patterson, called the meeting to order at 8:00 am on Thursday, September 19, 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 68 voting members in attendance out of a total membership of 127 voting members. An attendance sheet was routed.

II. Sponsors

The committee thanked the following companies that supported our meeting by sponsoring coffee breaks.

- Patterson Power Engineers
- Power Grid Engineering
- Xcel Energy

III. Approval of Minutes / Financial Report: Michael Thompson

A motion to approve the minutes of the January meeting of the PSRC Committee in Cincinnati, OH was made by Phil Winston. The motion was seconded by Mal Swanson. There was no further discussion. The motion was approved.

The PSRC committee financial status is fine. It was anticipated that we would use some reserve for this meeting.

IV. Chairman's Report: Russ Patterson

We had 272 attendees for our September 2019 meeting in Denver, CO including 28 newcomers.

This was our second meeting using 123Signup for registration. Thank you for your patience as we transition to the new system. Mike Thompson has done an excellent job handling the transition for us.

We have our hands full with Inverter Based Resources and will have no lack of work to do for the foreseeable future. We also have several of our larger standards open for revision. The PSRC has great expertise to handle these new technical challenges as well as improving our long standing standard documents based on new developments/improvements. It is good to see how our committee has engaged on all of these fronts.

Thank you to all PSRC attendees for making our September 2019 meeting a successful meeting. I look forward to seeing you all in Jacksonville, Florida for our January 2020 meeting.

Sincerely

Russ Patterson

V. Reports of Interest

A. Technical Paper Coordinator's Report: Murty Yalla

PES GM 2019 in Atlanta

- PSRC committee had two transactions paper sessions (5 papers each), one poster paper session (18 papers) and one panel session

T&D 2020 (Chicago, IL April 20-23, 2020)

- 13 papers submitted and they are under review at present

2020 GM is in Montreal, Canada (Aug 2 to Aug 7)

- Paper submission deadline 7th Nov, 2019

B. Future Meetings: Murty Yalla

- 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.
- September 2020 Meeting, Peppermill Casino, Reno, NV September 21-24, 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:

- 60255-1 Ed.2, Common requirements – the prior CDV was rolled back to CD due to technical changes, and 95/418/CD received US comments submitted September 13. There is now advice for setting and energizing relays under test, and requirements for documenting those test settings in a near-operated state. The US requested that products with communications ports for process input data are able to be compliant with either IEC 61850 or with non-IEC/proprietary communications services and protocols.
- 60255-26 Ed. 4, EMC requirements – the prior CDV was rolled back to CD due to technical changes, and 95/418/CD will receive US comments on September 20. There is now setting and energizing advice as for Part 1. Some test parameters have been updated. The USNC is requesting clarification of compliance criteria for non-relay communications devices carrying protection data.
- The PSRC is soon to get insight on the initial draft contents of a technical report (TR) by TC 95 WG 2 on use cases of digital sampled values (e.g. from MU) to relays instead of analog inputs. PSRC HTF47

has virtually identical scope and is looking at receiving and sharing technical developments. WG2 and HTF47 have agreed to collaborate to drive towards unified industry guidance.

- TC 95 leadership had requested Joint Working Group (JWG) participation in response to a new work item proposal (NP) on travelling wave fault locators used on high voltage transmission lines, from TC 85 Measuring Equipment for Electrical and Electromagnetic Quantities. TC 85 was interested in protection applications and product standards but had gotten little international support for this expansion of its scope. A JWG for a functional standard is now under discussion between the TCs.

Other previously-reported standards development projects continue:

- 60255-187-1: Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers – going to final draft international standard (FDIS) for international vote of acceptance in September.
- IEC 60255-187-2: Functional requirements for busbar differential protection - Still in draft review, with recent changes in CT sections inherited from 187-1.
- 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. Focus is presently on communications topics.
- 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 standard development teams MT2, 3, 4 and WG2 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. NERC Report: Bob Cummings

Summary of Activities: BPS-Connected Inverter-Based Resources and Distributed Energy Resources

https://www.nerc.com/comm/PC/Documents/Summary_of_Activities_BPS-Connected_IBR_and_DER.pdf

Summarizes the various activities

System Planning Impacts of Distributed Energy Resources (SPIDER WG):

The NERC Planning Committee established to address impacts of DER on the Bulk Power System from a transmission planning and system analysis perspective, including:

- Modeling
- Verification
- Studies
- Coordination

Continuing to Monitor and Analyze Disturbances involving Inverter Based Resources

- Four disturbances analyzed thus far
- Two NERC Alerts issued

NERC Reliability Guideline: BPS-Connected Inverter-Based Resource Performance

Guide for performance for IBRs connected to the BPS.

NERC Reliability Guideline: Improvements to Interconnection Requirements for BPS-

Guide on technical considerations for BPS-connected IBR interconnection agreements – stopgap until P2800 Standard is in place.

6. NERC IRPTF Modeling and Studies Technical Report

7. 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:

- Summary of Activities: BPS-Connected Inverter-Based Resources and Distributed Energy Resources
https://www.nerc.com/comm/PC/Documents/Summary_of_Activities_BPS-Connected_IBR_and_DER.pdf
- 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

E. P2800 Report: Bob Cummings

Kickoff at 2019 JTCM –

- The P2800 Working Group met in May 2019 at the NERC offices, and a “strawman draft” was created based on 1547-2018, with the distribution-centric issues removed and the NERC IBR

Guidelines added. The draft was distributed to the Sub-Groups to use in drafting the standard.

- The Sub-team scopes have been established and the Sub-Groups have been meeting by WebEx every two weeks since.
- A first initial draft has been issued to WG members for discussions at the upcoming meeting in Salt Lake City.
- The P2800 WG is meeting on September 25-26, 2019 in Salt Lake City at the WECC office, and in December in the Phoenix area, in conjunction with the NERC IRPTF.

F. CIGRE B5 Activities Report: Rich Hunt

New Working Groups

No new Working Groups have been formed since the May PSRCC meeting.

New Publications

TB 768 Protection Requirements On Transient Response Of Digital Acquisition Chain. This Technical Bulletin focuses on the transient response of process bus based protection systems.

CIGRE 2019 B5 Colloquium, Tromso, Norway

The B5 Colloquium was held June 23 through June 29, 2019 in Tromso Norway. 5 papers from US and Canada authors were included in the Colloquium.

The business side of the meeting recommended the creation of 3 new B5 Working Groups:

1. PACS Communication requirements for inter-substation and wide area applications
2. Experiences and future trends related to functional integration
3. Modelling of Protection Systems for Power System Planning

These still have to go through the CIGRE process for approval, so watch for announcements looking for working group members.

Also, work has been restarted on the B5 Green Book “Practice Guide to IEC61850 Interoperable Substation Automation Communication Standard Systems” Chaired by Peter Bishop, AU/NZ.

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. 81 papers over 5 CIGRE Study Committees. 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/>.

2020 CIGRE General Session, Paris, France, August 2020

Synopses have been submitted and approved. Final papers are due XXXX

Preferential Subjects:

PS 1 Human Aspects In Protection, Automation And Control Systems (Pacs)

PS 2 Communications Networks In Protection, Automation And Control Systems (Pacs) : Experience And Challenges

Tutorial Topics:

- Distribution Protection
 - Grounding (including the impact on protection for fire mitigation)
 - Reverse Power flow

- Abnormal operating conditions
- Metering in Substations
 - What is metering (types and challenges of metering)
 - Coordination of accuracy requirements in the measuring chain (comparison of traditional vs digital)
 - Data security/privacy
 - Challenges of metering distributed energy resources

CIGRE 2021 B5 Colloquium

The 2021 B5 Colloquium will be hosted by CIGRE India in New Delhi. More details to follow. Preferential subjects will be:

- Interoperability for IEDs of different manufacturers integrated in one PACS
- Fast Transient based protection
- Mitigation Strategies and Methodologies to Manage the Impact of Low-Inertia and Low Fault Level Networks On PACM

Next year will be my last member as the B5 Regular Member from the U.S., so I am actively recruiting a new Regular Member for the U.S.

For more information on CIGRE B5 activities, please contact me directly. CIGRE membership is by country, so if you live outside the U.S., I can put you in touch with the Regular Member for your country.

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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. 123 Signup 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:

- Database of participants
 - 703 records
 - 200 have completed profiles
 - Incomplete profiles will eventually be purged
- All but 14 WG rosters have been loaded
- Membership types, active participants, have been updated
- Some tips for using the system:
 - The 123signup profile and administrator links can be found on the membership page of the website.
 - Be careful to not create duplicate profiles when registering.
 - Members need to Opt In. Several have not checked this box and therefore, the committee cannot send any notices.
 - WGs no longer need to use the sign-in sheet with the IEEE permission blurb and collect any contact information.
 - There is a 2MB limit for attachments when using the listserv function. If necessary, email using the bcc line when sending an email with an attachment larger than 2MB.

I. Standards Coordinators Report: Don Lukach

This report summarizes the status of PAR related projects as of the September, 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 topics of interest:

- SA editorial staff presented an overview of SA updates at the Standard's Coordinator's meeting and also presented the Standard Template at a Lunch & Learn. Both sessions were well attended and very useful.
- SA will be hosting a Webinar on the Entity PAR process on September 25. Signups were made available electronically and via flyers at the meeting.
- Training that covers the iMeet process, policies and procedures, and word usage are planned for upcoming meetings.

Main Committee PAR Submissions approved at the May meeting*:

None

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

PC37.242	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control
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Published PAR projects since May 2019:

PC37.247	Standard for Phasor Data Concentrators for Power Systems
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RevCom/ NesCom approval or acceptance of projects since May, 2019:

PAR Number	Title	Action
PC37.99	Guide for the Protection of Shunt Capacitor Banks	New PAR
PC37.109	Guide for the Protection of Shunt Reactors	New PAR
PC37.233	Guide for Power System Protection Testing	PAR Extension
PC37.108	Guide for the Protection of Secondary Network Systems	PAR Extension
PC37.91	Guide for Protecting Power Transformers	PAR Extension
PC37.230	Guide for Protective Relay Applications to Distribution Lines	PAR Extension
PC37.110	Guide for the Application of Current Transformers Used for Protective Relaying Purposes	PAR Extension
PC37.235	Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes	PAR Extension
PC37.242	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control	PAR Extension accepted to Nescom 11/6/19
P1613	Standard for Environmental and Testing Requirements for Intelligent Electronic Devices (IEDs) Installed in Transmission and Distribution Facilities	Transferred to PSRC
PC37.1.2	Recommended Practice for Databases Used in Utility Automation Systems	Transferred to PSRC

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

PAR Number	Title	Status
PC37.242	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control	Sponsor Ballot: PreBallot
PC37.108	Guide for the Protection of Secondary Network Systems	Sponsor Ballot: Invitation
PC37.230	Guide for Protective Relay Applications to Distribution Lines	Sponsor Ballot: Comment Resolution
PC37.250	Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes	Sponsor Ballot: Comment Resolution
PC37.91	Guide for Protecting Power Transformers	Sponsor Ballot: PreBallot
PC37.110	Guide for the Application of Current Transformers Used for Protective Relaying Purposes	Sponsor Ballot: Comment Resolution
PC37.235	Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes	Sponsor Ballot: Ballot
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	Title	PAR Expiration	Status
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PC37.242	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control	12/31/2019	Sponsor Ballot: PreBallot
P1613	Standard for Environmental and Testing Requirements for Intelligent Electronic Devices (IEDs) Installed in Transmission and Distribution Facilities	12/31/2020	WG Draft Development
PC37.1.2	Recommended Practice for Databases Used in Utility Automation Systems	12/31/2020	WG Draft Development
PC37.108	Guide for the Protection of Secondary Network Systems	12/31/2020	Sponsor Ballot: Invitation
PC37.2	Standard Electrical Power System Device Function Numbers, Acronyms, and Contact Designations	12/31/2020	WG Draft Development
PC37.230	Guide for Protective Relay Applications to Distribution Lines	12/31/2020	Sponsor Ballot: Comment Resolution
PC37.249	Guide for Categorizing Security Needs for Protection and Automation Related Data Files	12/31/2020	WG Draft Development
PC37.250	Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes	12/31/2020	Sponsor Ballot: Comment Resolution
PC37.251	Standard for Common Protection and Control Settings or Configuration Data Format (COMSET)	12/31/2020	WG Draft Development
PC37.91	Guide for Protecting Power Transformers	12/31/2020	Sponsor Ballot: PreBallot
P1646	Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation	12/31/2021	WG Draft Development
PC37.101	Guide for Generator Ground Protection	12/31/2021	WG Draft Development
PC37.102	Guide for AC Generator Protection	12/31/2021	WG Draft Development
PC37.110	Guide for the Application of Current Transformers Used for Protective Relaying Purposes	12/31/2021	Sponsor Ballot: Comment Resolution
PC37.120	Protection System Redundancy for Power System Reliability	12/31/2021	WG Draft Development
PC37.233	Guide for Power System Protection Testing	12/31/2021	WG Draft Development
PC37.234	Guide for Protective Relay Applications to Power System Buses	12/31/2021	WG Draft Development
PC37.235	Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes	12/31/2021	Sponsor Ballot: Ballot
PC37.90.2	Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	12/31/2021	WG Draft Development
P2030.100.1	Monitoring and Diagnostics of IEC 61850 Generic Object Oriented Status Event (GOOSE) and Sampled Values Based Systems	12/31/2022	WG Draft Development

P2030.12	Guide for the Design of Microgrid Protection Systems	12/31/2022	WG Draft Development
PC37.104	Guide for Automatic Reclosing on AC Distribution and Transmission Lines	12/31/2022	WG Draft Development
PC37.106	Guide for Abnormal Frequency Protection for Power Generating Plants	12/31/2022	WG Draft Development
PC37.300	Guide for Centralized Protection and Control (CPC) Systems within a Substation	12/31/2022	WG Draft Development
PC37.90	Standard for Relays and Relay Systems Associated with Electric Power Apparatus	12/31/2022	WG Draft Development
PC37.92	Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers	12/31/2022	Sponsor Ballot: Comment Resolution
PC37.1.3	Recommended Practice for Human Machine Interfaces (HMIs) used with Electric Utility Automation Systems	12/31/2023	WG Draft Development
PC37.109	Guide for the Protection of Shunt Reactors	12/31/2023	WG Draft Development
PC37.252	Guide for Testing Automatic Voltage Control Systems in Regional Power Grids	12/31/2023	WG Draft Development
PC37.99	Guide for the Protection of Shunt Capacitor Banks	12/31/2023	WG Draft Development

PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:

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

Submittal dates are closed for the remainder of 2019.

All PSRCC Par-Related Projects:

PAR Number	Title	Status
1613	Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations	Complete
P1613	Standard for Environmental and Testing Requirements for Intelligent Electronic Devices (IEDs) Installed in Transmission and Distribution Facilities	WG Draft Development
1613.1	Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Transmission and Distribution Facilities	Complete
1613a	IEEE Standard Environmental and Testing Requirements for Communications Networking Devices Installed in Electric Power Substations Amendment: Adding of one definition, DC power supply requirements (5.1), and Annex E- History	Complete
1646	Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation	Complete
P1646	Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation	WG Draft Development
P2030.12	Guide for the Design of Microgrid Protection Systems	WG Draft Development
2030.1	Recommended Practice for Implementing an IEC 61850 Based Substation Communications, Protection, Monitoring and Control System	Complete

P2030.100.1	Monitoring and Diagnostics of IEC 61850 Generic Object Oriented Status Event (GOOSE) and Sampled Values Based Systems	WG Draft Development
2030.101	Guide for Designing a Time Synchronization System for Power Substations	Complete
60255-118-1	Measuring Relays and Protection Equipment - Part 118-1: Synchrophasor for Power System - Measurements	Complete
C37.1	Standard for SCADA and Automation Systems	Complete
PC37.1.2	Recommended Practice for Databases Used in Utility Automation Systems	WG Draft Development
PC37.1.3	Recommended Practice for Human Machine Interfaces (HMIs) used with Electric Utility Automation Systems	WG Draft Development
C37.2	Standard Electrical Power System Device Function Numbers, Acronyms and Contact Designations	Complete
PC37.2	Standard Electrical Power System Device Function Numbers, Acronyms, and Contact Designations	WG Draft Development
C37.90	Standard for Relays and Relay Systems Associated with Electric Power Apparatus	Complete
PC37.90	Standard for Relays and Relay Systems Associated with Electric Power Apparatus	WG Draft Development
C37.90.1	Standard Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus	Complete
C37.90.2	Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	Complete
PC37.90.2	Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	WG Draft Development
C37.90.3	Standard for Electrostatic Discharge Tests for Protective Relays	Complete
C37.91	Guide for Protecting Power Transformers	Complete
PC37.91	Guide for Protecting Power Transformers	Sponsor Ballot: PreBallot
C37.92	Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers	Complete
PC37.92	Standard for Analog Inputs to Protective Relays From Electronic Voltage and Current Transducers	Sponsor Ballot: Comment Resolution
C37.95	Guide for Protective Relaying of Utility-Consumer Interconnections	Complete
C37.96	Guide for AC Motor Protection	Complete
C37.98	Standard for Seismic Qualification Testing of Protective Relays and Auxiliaries for Nuclear Facilities	Complete
C37.99	Guide for the Protection of Shunt Capacitor Banks	Complete
PC37.99	Guide for the Protection of Shunt Capacitor Banks	WG Draft Development
C37.101	Guide for Generator Ground Protection	Complete

PC37.101	Guide for Generator Ground Protection	WG Draft Development
C37.101-2006/Cor 1	Guide for Generator Ground Protection - Corrigendum 1: Annex A.2 Phasor Analysis (Informative)	Complete
C37.102	Guide for AC Generator Protection	Complete
PC37.102	Guide for AC Generator Protection	WG Draft Development
C37.103	Guide for Differential and Polarizing Relay Circuit Testing	Complete
C37.104	Guide for Automatic Reclosing of Circuit Breakers for AC Distribution and Transmission Lines	Complete
PC37.104	Guide for Automatic Reclosing on AC Distribution and Transmission Lines	WG Draft Development
C37.105	Standard for Qualifying Class 1E Protective Relays and Auxiliaries for Nuclear Power Generating Stations	Complete
C37.106	Guide for Abnormal Frequency Protection for Power Generating Plants	Complete
PC37.106	Guide for Abnormal Frequency Protection for Power Generating Plants	WG Draft Development
C37.108	Guide for the Protection of Network Transformers	Complete
PC37.108	Guide for the Protection of Secondary Network Systems	Sponsor Ballot: Invitation
C37.109	Guide for the Protection of Shunt Reactors	Complete
PC37.109	Guide for the Protection of Shunt Reactors	WG Draft Development
C37.110	Guide for the Application of Current Transformers used for Protective Relaying Purpose	Complete
PC37.110	Guide for the Application of Current Transformers Used for Protective Relaying Purposes	Sponsor Ballot: Comment Resolution
C37.110-2007/Cor 1	IEEE Guide for the Application of Current Transformers Used for Protective Relaying Purposes - Corrigendum 1: Corrections to Equation 18 and Equation 19	Complete
C37.111	Standard for Common Format for Transient Data Exchange (COMTRADE) for Power Systems	Complete
C37.112	Standard Inverse-Time Characteristic Equations for Overcurrent Relays	Complete
C37.113	Guide for Protective Relay Applications to Transmission Lines	Complete
C37.114	Guide for Determining Fault Location on AC Transmission and Distribution Lines	Complete
C37.116	Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks	Complete
C37.117	Guide for the Application of Protective Relays Used for Abnormal Frequency Load Shedding and Restoration	Complete
C37.119	Guide for Breaker Failure Protection of Power Circuit Breakers	Complete
PC37.120	Protection System Redundancy for Power System Reliability	WG Draft Development
C37.230	Guide for Protective Relay Applications to Distribution Lines	Complete

PC37.230	Guide for Protective Relay Applications to Distribution Lines	Sponsor Ballot: Comment Resolution
C37.231	Recommended Practice for Microprocessor-based Protection Equipment Firmware Control	Complete
C37.232	Standard for Common Format for Naming Time Sequence Data Files (COMNAME)	Complete
C37.233	Guide For Power System Protection Testing	Complete
PC37.233	Guide for Power System Protection Testing	WG Draft Developmen t
C37.234	Guide for Protective Relay Applications to Power System Buses	Complete
PC37.234	Guide for Protective Relay Applications to Power System Buses	WG Draft Developmen t
C37.235	Guide for the Application of Rogowski Coils used for Protective Relaying Purposes	Complete
PC37.235	Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes	Sponsor Ballot: Ballot
C37.237	Standard Requirements for Time Tags Created by Intelligent Electronic Devices - COMTAG(TM)	Complete
C37.239	Standard for Common Format for Event Data Exchange (COMFEDE) for Power Systems	Complete
C37.241	Guide for Application of Optical Instrument Transformers for Protective Relaying	Complete
C37.242	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMU) for Power System Protection and Control	Complete
PC37.242	Guide for Synchronization, Calibration, Testing, and Installation of Phasor Measurement Units (PMUs) for Power System Protection and Control	Sponsor Ballot: PreBallot
C37.243	Guide for Application of Digital Line Current Differential Relays Using Digital Communication	Complete
C37.245	Guide for the Application of Protective Relaying for Phase Shifting Transformers	Complete
C37.246	Guide for Protection Systems of Transmission to Generation Interconnections	Complete
C37.247	Standard for Phasor Data Concentrators for Power Systems	Complete
C37.248	Guide for Common Format for Naming Intelligent Electronic Devices (COMDEV)	Complete
PC37.249	Guide for Categorizing Security Needs for Protection and Automation Related Data Files	WG Draft Developmen t
PC37.250	Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes	Sponsor Ballot: Comment Resolution
PC37.251	Standard for Common Protection and Control Settings or Configuration Data Format (COMSET)	WG Draft Developmen t
PC37.252	Guide for Testing Automatic Voltage Control Systems in Regional Power Grids	WG Draft Developmen t

PC37.300	Guide for Centralized Protection and Control (CPC) Systems within a Substation	WG Draft Development
C57.13.1	Guide for Field Testing of Relaying Current Transformers	Complete
C57.13.3	Guide for Grounding of Instrument Transformer Secondary Circuits and Cases	Complete

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 September 16, 2019 in Denver, CO with 9 members. The May 2019 meeting minutes were discussed and approved.

The following items were discussed during this meeting:

Note: Names of nominees are kept confidential until the award is publicly announced.

1. IEEE PSRC & PES & Working Group Recognition Awards
 - a. IEEE PSRC (Technical Committee Level) Outstanding Standard or Guide Award
 - b. IEEE PES (Society Level) Outstanding Standard or Guide Award
 - c. IEEE PSRC (Technical Committee Level) Outstanding Technical Report
 - d. IEEE PES (Society Level) Outstanding Technical Report
 - e. IEEE PSRC (Technical Committee Level) Prize Paper Award.
 - f. IEEE PES (Society Level) Prize Paper Award.
2. IEEE PSRC & PES Prize Paper Award
 - a. PSRC (Technical Committee Level)
 - b. PES (Society Level)

For a Prize Paper Award nomination at the society level, the paper has to have been published in a transaction journal. An announcement will be made during the MCM to request nominations for this award
3. IEEE PSRC & PES Young Professional Award
4. IEEE PES Distinguished Service Award
5. IEEE PSRC Career Service Award
6. The working group continues its work to identify potential PSRC candidates to nominate for IEEE PES Individual Award nominations. We are currently working with candidates to complete nominations for the following awards:
 - a. IEEE PES Leadership in Power Award
 - b. IEEE PES Robert Noberini Distinguished Contributions to Engineering Professionalism Award
 - c. IEEE PES Lifetime Achievement Award
 - d. IEEE Nikola Tesla Award
 - e. IEEE PES Douglas M Staszkesky Distribution Automation Award
 - f. IEEE Charles Proteus Steinmetz
 - g. IEEE SA Standards Medallion
7. The following awards were announced or issued during the PSRC Main Committee Meeting on Thursday September 19, 2019
 - a. 2019 IEEE PES WG Outstanding Technical Report (Announcement Only)
 - i. The PES-TR68 Impact of Inverter Based Generation on Bulk Power System Dynamics and Short-Circuit Performance technical report was awarded the 2019 PES WG award for Outstanding Report. This report was a collaboration between the IEEE/PSRC and NERC
 - ii. PSRC Contribution by CTF34

1. **Kevin Jones (Chair)**
 2. **Gary Kobet (Vice Chair)**
- b. Completed WG Recognitions
- i. I11 – C37.241-2017 IEEE Guide for Application of Optical Instrument Transformers for Protective Relaying
 - **Farnoosh Rahmatian - Chair**
 - **Bruce Pickett – Vice Chair**
 - ii. I23 - C57.13.1-2017 - IEEE Guide for Field Testing of Relaying Current Transformers
 - **Bruce Magruder – Chair**
 - **Will Knappek – Vice Chair**
 - iii. I24 - Use of Hall Effect Sensors for Protection and Monitoring Applications
 - **Jim Niemira – Chair**
 - **Jeff Long – Vice Chair**
 - iv. I25 - Commissioning Testing of Protection Systems
 - **Rafael Garcia – Chair**
 - **Kevin Donahoe – Vice Chair**
 - v. I27 - Investigation of Protective Relay Self-Monitoring Capabilities
 - **Roy Moxley – Chair**
 - **Cathy Dalton – Vice Chair**
- PSRC – Main Committee New Members – Class of 2019

Martin Best	Will Knappek
Matt Black	Manish Patel
Joerg Blumschein	Phil Tatro
Oscar Bolado	Jun Versoza
Rick Gamble	Christopher Walker
Allen Goldstein	Don Ware
Michael Higginson	Cathy Dalton

- c. PSRC – Honorary Committee Members

Charlie Henville	Miriam Sanders
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- d. PSRC Service Awards

- i. Bronze Service Awards for 15 Years of Service to the PSRC
 1. **Sam Sambasiban**
 2. **Jim Niemira**
 3. **Hugo Monterrubio**
 4. **Walter McCannon**
 5. **Steven Kunsman**
 6. **Sungsoo Kim**
 7. **Juan M. Gers**
- ii. Silver Service Awards for 25 Years of Service to the PSRC
 1. **Charlie Sufana**
 2. **Ken Fodero**
 3. **Patrick Carroll**
 4. **Bill Dickerson**

B. B3: Membership Working Group

Chair: Mal Swanson

Attendance during the Denver meeting was 272, which is a record attendance mark for us.

24 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

Assignment:

- Promote IEEE PES PSRCC activities globally.
- Facilitate global outreach using tools such as webinars, tutorials, trade publications, and other similar methods.
- Strengthen PSRCC awareness by preparing technical articles as may be required for the promotion of technical committee working group activities about the art of relaying, and the work of the PSRCC.

PACWorld Update: Cathy Dalton submitted information to include in PSRC update for the next issue of PACWorld, based on information discussed at our September 2019 meeting in Denver, CO, and additional updates from subcommittee chairs. The subcommittee chairs were asked to send a brief summary of their activities for inclusion in this article. Also included was technical presentation information that was presented at the Main Committee meeting. One item was a summary of Michael Higginson's presentation from Working group C30. This WG has completed its report on microgrid protection systems, which is published on the PES technical resource center as PES-TR71. This report describes microgrid protection challenges, such as variable fault current levels, bidirectional fault current flow, ability to isolate and resynchronize to the grid, and adapting to topology and generation changes. The report also identifies unique considerations for protection studies, protection schemes, communications, and equipment used in microgrid protection. It includes some microgrid protection approaches, including appendices with example case studies. A guide for the design of microgrid protection systems (P2030.12) is now being developed in working group C38.

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. Cathy also continues to work with IEEE contact, Shana Pepin, as needed.

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 “PC37.242, Guide to the Synchronization, Calibration, Installation and Testing of PMUs for Power System Protection and Control”, and transmit this information to the IEEE SA. The motion was seconded by F. Friend. There was no discussion. The motion was voted on by the main committee members and the motion carried.

B. Presentations:

Presentation, C30 Microgrid Protection Systems, M. Higginson

Presentation, Inservice Protection operations at TVA G. Kobet

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 September 18, 2019 in Denver, CO. The participants introduced themselves, a quorum was achieved (39 of 57 members and 25 guests). The May 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.
- For WGs working on PAR documents, the new rules are that vice chair and secretary, (as well as chair) need to be IEEE SA members.
- IEEE SA will have a webinar 9/25 on the Entity process of Standards development.
- 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, September 20.

C-19 WG PC37.247, “Standard for Phasor Data Concentrators (PDC) for Power Systems” has just been published by the IEEE SA, The WG has now been disbanded.

C-21 Working group has first balloted their C37.250 “Guide for Engineering, Implementation and Management of System Integrity Protection Schemes.” Quorum was achieved with 68 approval, 1 disapproval, 2 abstentions and 17 comments. The WG is developing responses to the comments.

C-35 Working Group has presented their confernece summary paper from C37.246 Guide for Protective Systems of Transmission-to-Generation Interconnections at two Protection conferences and is scheduled to present at two more. C-35 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. C-38 Guide for the Design of Microgrid Protection Systems was added.

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. P2800 will be meeting in Salt Lake City, UT Sept 25-26.

This is Gene Henneberg's last meeting as Chair of the C subcommittee.

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

Fred Friend is the incoming Chair of the C subcommittee and Michael Higginson will be the new Vice Chair, effective in January 2020.

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. IEEE SA published the standard the week of September 9-13. The WG has now been disbanded.

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 C-21 met on Wednesday, September 18, 2019 in Denver, CO in single session chaired by Yi Hu and Gene Henneberg with 10 voting members, 0 non-voting members, and 2 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 achieved and the May 2019 minutes were approved. The PAR has been extended with the new completion date of December 2020.

The draft Guide approved by the WG was subsequently reviewed by IEEE SA editors following the May meeting. The editor's comments were incorporated into Guide version that was posted for balloting between August 12 and September 15, 2019. We had a ballot body of 91, with actual 71 votes (quorum achieved). The results were 68 approval, 2 abstentions, and 1 disapproval. The standard was approved by the ballot body.

The majority of the WG meeting reviewed the 17 comments received and outlined appropriate responses. Yi and Gene will develop the specific comment responses documented in the comments spreadsheet and provide a "tracked changes" version of the Guide to the WG for their review. WG members will be requested to return their review within two weeks of when the revised document is sent out.

During the IEEE editorial review, the editor suggested minor wording changes to the proposed SIPS definition. The draft was balloted without these proposed changes, but the proposed changes were discussed by the WG. The changes were partially rejected and partially accepted. Tony Seegers will bring these changes to the Terminology WG and provide any feedback to Yi and Gene. The final definition version will be part of the "tracked changes" version to be sent to WG members.

Following any feedback from the WG member's review, the new draft will be provided to IEEE SA for posting for re-circulation balloting.

Meeting minutes by Gene Henneberg and Yi Hu 09/18/2019.

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 2 guests. A quorum not achieved, but minutes of the last meeting were approved via email.

Introductions

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

Presentations created by Jeff Dagle and Farnoosh Rahmatian, showing the expanding scope of NASPI to include Measurement and Application of Sampled Values on electrical power system was shown.

A discussion on Goodness of Fit was held. A suggestion for NASPI to investigate estimation of point-on-wave data without high-speed sampling was made by Mark Adamiak. Mark also discussed the possible validation of synchrophasor measurements using process bus data.

Vahid suggested that NASPI work on the value proposition of sampled values.

Ken Martin reported that PSRC H11 was disbanding (after 25 years and 5 published standards). A new task force is being created in PSRC Subcommittee C to study standardizing the requirements of distribution PMUs, the impact of sampled values on synchrophasor estimates and the requirements of Frequency and ROCOF measurements.

Adjourn

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

The meeting started with introductions, and then the May 2019 minutes were approved.

First the status of the report was discussed. After the May meeting, the report was revised to address comments received during the May meeting. The appendix with the PSCAD black-box inverter models was also updated by Athula.

The sections of the report were reviewed during the meeting. It was requested the CAPE model section to be updated to include the tabular input model, recently implemented based on the WG recommendation. A clarification was requested for the Type III WTG results in the appendix, whether crowbar was activated.

With respect to manufacturer-data, Ratan Das, GE has informed that the data for GE Type III WTG has been prepared but approval from upper management is pending for sharing those.

It was also mentioned that the panel session “Modeling of Converter Interfaced Renewable Sources for Short Circuit Studies” sponsored by PSRC that took place at the 2019 IEEE PES General Meeting in Atlanta was successful with more than 100 attendees. The slides will be shared with the WG roster.

With respect to next steps, once GE data are received, Sukumar and Evangelos will update the report and send it to the WG members for approval, before C subcommittee balloting.

There were total 19 attendees in the meeting, 4 members and 15 guests.

C-25: Protection of Wind Electric Plants

Chair: Martin Best

Vice Chair: Keith Houser

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

Working Group C25 met in Denver, CO in a single session on Tuesday September 17, 2019 with 10 members and 10 guests. After introductions, the agenda and minutes of the May 2019 meeting were reviewed.

The current draft of the report is 6.1.

- Mohammad Zadeh reported on additional fault collector feeder fault simulations that he performed under various conditions. His results verified that to verify that actual collector feeder faults would always appear in the first quadrant of an impedance plot.
- There followed a general discussion on the effect of Type 3 WTGs on the transmission system voltage when supplying or absorbing VARS at low power output.
- At this point, the working group members generally agree that their work is nearing completion.
- Martin Best will contact the original author(s) of each section to verify that the correct bibliography references are made in each section, and Frank Gotte will provide instructions on how to restore the reference table in the report.
- A revised report will be sent to the working group members for balloting, after which a final report will be prepared for submission to the C Subcommittee for review.

Minutes Submitted by:

Martin Best

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, Sept 17, 2019 with 14 members, 14 Guests, and 1 new member. There were 3 Remote attendees consisting of 1 member and 2 non-voting members. The chair acknowledged that due to consistent lack of quorum at in-person meetings, that the chair's discretion had been used to convert voting members to non-voting members, if they had attended fewer than 3 of the last 4 meetings.

The patent slides were presented with no exceptions noted.

The minutes from the May meeting in Cincinnati were reviewed and moved for approval. Jun Verzosa moved for approval, with Tony Seegers seconding the motion. The motion carried unanimously.

Note was made of the PAR Extension approved, new milestones will be: Feb 2021 final submitted to RevCom, Nov 2021 completion.

Don Ware discussed the value of load checks during commissioning. There was a fair discussion regarding need for diagram in document showing load check test set up. Jeff Brown has accepted the task of harmonizing the diagrams with the body of the document/previous comments on said diagrams.

Gene Henneberg presented the re-write of SIPS section in 4.1 in response to previously commented sections. Suggested reducing the section on SIPS in 4.1 which is being addressed in another document and is covered in another section in this document. Modification was approved. Gene also presented expansion of Section 7 "SIPS test requirements". Modification was approved. Gene presented edit to Section 4.7.4 regarding out-of-step testing. Addressed state simulation testing of OOS and when that will or will not work. WGs C29 and D29 are working on OOS test methods – need to check with these groups to see if they have testing material worth incorporating. Modification approved with a few changes.

Zach Zaitz presented analysis of section 5.4.4 and Annex B which both address line current differential testing. Scott Cooper volunteered to add a line current differential testing overview to section 5.4.4. Discussed moving section 5.4 to a subsection of 5.3 – will be revisited in a future meeting.

Don Ware presented analysis of transformer differential protection testing re-write vs original document content. Technical content is pretty much the same, fixed some typos. Added some content to sudden pressure relay text. Talked about some newer voting schemes and whether to include information on testing each scheme or some general guidelines. Don Ware will clean up and add some details.

New Business: Action items:

- Need to fix header for date
- Need to address meaning of winding compensation in transformer differential section testing
- Jun Verzosa will review zero sequence removal testing section in transformer testing
- Briefly discussed the need for a small overview section on phasor data concentrators, microgrids, and/or DERs
- Discussion will continue with web meetings

The draft version of the Guide C37.233 is ver. 2.35 as of Sept 18, 2019.

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 8 members and 3 guests. A quorum was in attendance.

Introductions

Patent Slides (no response)

Approval of previous meeting minutes via email after last meeting

Chairs Remarks

Draft has unanimous committee approval to send to sponsor ballot. Chair requested that C committee chairman request Main committee to vote to send to sponsor ballot. Balloting pool signup closes 19 Sep. Draft was sent to mandatory editorial review. PAR extension was applied for and is on NESCOM agenda.

Minutes

Chris Huntley discussed an issue where 1588 boundary clocks will not pass on leap second information if they are in holdover at the time of a leap second. Bill Dickerson recommended that a new H subcommittee Task Force be formed to study adding a new TLV to C37.238.

Adjourn

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

Chair: Kevin Jones (beginning January 2020)
kevin.jones@xcelenergy.com

Vice Chair: Mike Kockott
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.

OVERVIEW:

ATTENDANCE

22 Total with 8 Members and 14 Guests.

GENERAL ITEMS:

WG C29 met in single session on September 17, 2019, in Denver, CO with 8 members and 14 guests. Mike Kockott participated as WG Chair due to Kevin Jones not being able to take on the Chair responsibilities until January, 2020. Kevin participated as Vice Chair. After introductions, minutes from the May, 2019 meeting in Cincinnati were reviewed and approved.

Next, Mike led a discussion on the latest document and writing assignments. The following assignments were made:

- Gene Henneberg will send C29 membership the final J5 document by September 30th.
- Kevin Jones will send updated copies of the D29 documents by September 30th.
- Mike Benitez will send Kevin and Mike his previously written content by September 30th.
- Mike Benitez volunteered to complete the Section 2 and Section 3 summaries by October 15th.
- Rob Fowler, Jun Verzosa and Nestor Casilla will review Mike Benitez's summaries and additional content by November 30th.
- Reviewed comments will be provided to Kevin Jones by December 15th. Kevin will forward the document to C29 membership by December 20th so it can be reviewed and ready for comment by the January, 2020 meeting.

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

Assignment: Development of a guide for protection system redundancy

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, September 17, 2019, in a single session with 12 voting members, 7 non-voting members, and 6 guests attending.

The quorum was met so the WG voted to approve May 7 PSRC, May 30, June 13, June 27, July 11, July 25, August 8, August 29, and September 4, 2019, webex meeting minutes. Motion: Robin Byun, 2nd: Roger Whittaker.

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.

Outstanding action items:

1. **Solveig Ward and Joerg Blumschein** will review the new material incorporated in sub-clause 5.9 *Timing system redundancy*. Status: completed, to be removed.
2. **Roy Moxley and Solveig Ward** are to add control application section to clause 6 if affecting protection. Status: no longer relevant, will be removed.
3. **Mark Schroeder and Jim O'Brien** will write sub-clause 6.6 *Capacitor bank protection*. Status: received from Mark. Jim, Nathan Gulczynski, and Don Ware will review, due December 15, 2019.
4. **Eric Udren (with help of Solveig Ward)** will work on 5.2.3 *Non-conventional instrument transformers*, 5.X *Merging units*, and the revisions of 5.8 *Local area network redundancy*. Status: outstanding; was due September 15, 2019. Solveig to check 5.8 – should be complete.
5. **Jay Anderson** will revise Figure 9 in sub-clause 5.6.4.2 *Voting schemes*. Status: Jay submitted text revision that is to be incorporated and reviewed. Jay will submit figure revision. To be incorporated and reviewed.
6. **Solveig Ward** will review sub-clause 5.7.2 *Redundancy in multiplexed digital communication systems*. Status: completed, to be incorporated.
7. **Solveig Ward** will contribute new material on MPLS communications as part of her review of sub-clause 5.7.2 *Redundancy in multiplexed digital communication systems*. Status: pending; due September 15, 2019.
8. **Tony Bell** will redraw Figure 12 *Basic PLC system* in Visio. Status: pending; due September 15, 2019.
9. **Solveig Ward** will provide a reference to Eric Udren's PSCCC report to be included in Bibliography for 5.9. Status: completed, to be removed.
10. **Solveig Ward** will review 5.9.5 *Ethernet LANs and IEC 61850* and 5.9.6 *Channel availability conditioning*. Status: new; due September 30, 2019.
11. **Roger Whittaker** will review 6.8 *Protection function redundancy*. Status: completed, will be removed when incorporated.

The WG reassigned the figure managing responsibilities to **Robin Byun and Roger Whittaker**. We need to ask IEEE-SA for the preferred figure format (Visio, AutoCAD, or TIF).

The WG decided to use “protection engineer” as related to referencing the guide users: designers vs. protection engineers (example in 4.5 *Redundancy simplicity considerations*).

The WG discussed whether breaker failure function can be referred to as redundant. It is a primary protection for a breaker but a backup protection for a fault in the system. It can be duplicated in System A and System B primary protection but is not redundant because it operates only if System A or System B relay operates. We will further address this issue while reviewing Roger Whittaker’s comments for sub-clause 6.8 Protection function redundancy.

There was an issue of whether a reaction to multiple failure like the proposed remedies for avoiding simultaneous failures of breaker trip coils #1 and #2 as presented in 5.5 *Breaker trip coil redundancy* should be discussed in the guide. It appeared relevant and was left for now in the guide.

Alex Apostolov inquired at the May Subcommittee C meeting whether the guide would address self-powered relays. These relays are power from the CT circuits and are used in industrial applications. The WG felt there was no relation to redundancy and decided not to add this topic at this time.

The WG will continue bi-weekly webex meetings to review and edit the guide. A more convenient day of the week was chosen to be Mondays. A series of meeting will be set up accordingly.

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

Secretary Mike Higginson

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

1. The working met on 18 September, 2019 with 26 guests and 19 members.
2. After resolving communication issue between projector and laptop, Chair missed out on receiving working group’s approval of the last (May) meeting minutes. Email approval will be now be requested.
3. The following new contributions to the report were reviewed and discussed.
 - Section 4.8 – Application of Single Phase Tripping and Reclose (new section)
The write-up states that an IBR may not be to able supply negative sequence current during single phase open condition. It was agreed to modify this write-up to state that to follow-up with the IBR supplier whether or not IBR is able to stay on-line during single phase open condition without causing power quality concerns.
 - Section 5.2 – Synchronous Condenser Application (new section)
The write was reviewed and no new changes were suggested.
 - Section 4.1.4 – Example 4 Type IV Wind Turbine Generator (existing section)
A new simulation scenario (Scenario 3) will added in this section to illustrate impact of the new German Grid code related to negative sequence current injection. The new simulation will include minimum and maximum recommended slopes ($k=2$ and $k=6$) of the negative sequence current injection characteristic. The working group member, Evangelos Farantatos, agreed to provide simulation results along with the figure by 30th September 2019.

4. The new working group member, Frank Gotte, will assist with formatting of the report.
5. Chair will incorporate new simulation results and produce Draft 6.
6. Draft 6 will be sent out to the working group members around 15th October, 2019 to provide ballot vote (Approved, Approved with Comments or Disapproved with Comments) by 15 November, 2019.

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.

Meeting Minutes

WG C33 of the PSRC met on September 17, 2019 in Denver, CO. There were five members and nine guests attending. Specific requests from WG-P2004 chapter 4, 5, and 6 leads regarding protection testing requirements and procedures for Control and Power Hardware In-The Loop Testing were reviewed and writing assignments were made.

Agenda reviewed by Dean

Introductions.

Patent slides.

P2004 presentation from Panos and Ali:

Ch 5: P2004 Requested help with protection related topics, Transformer, generator, wind turbine, solar farm etc. and review existing content in chapter 5.

Ch 6 P2004 Requested help with three sections in particular

6.2.4.1 Digital relay testing

6.2.4.2 Power electronic converter controller testing

6.2.4.3 DMS/EMS testing.

Any suggestions for these chapters, additional sections etc. are welcome.

For Ch 6: Looking for a write up on different ways of doing testing, low level amplifiers, low level interface, IEC 61850. This may overlap with section 7.2.5 in chapter 7.

General Comments:

- We should link the protection specific parts of chapter 5 to the corresponding IEEE protection standard and coordinate with those committees to get comments prior to balloting.
- We should consider a section for requirements for different types of tests. This may fall under a different section 5.4.2.1? Requirements for different types of tests.
 - Regression testing on new firmware

- Factory acceptance testing
- Acceptancy/type test of a new relay product
- Investigation of miss operation
- Should we consider a separate section for control requirements of the software interface?

Writing Assignments:

Chapter 5 writing assignments:

Transformer protection: Findley draft/Emeka to review

Gustavo: to review Ch. 5 section on line protection and provide comments

Chapter 6: Anthony Johnson will look to provide a write-up for

6.2.4.2 Power electronic converter controller testing

6.2.4.3 DMS/EMS testing

Chapter 7: Findley to comment/add his write up to existing

Dean will contact P2004 Chair to request that all C33 members have access to the IMeet Central P2004 work space.

Attendance:

17 Attendees: 5 members, 2 new members, 9 Guests

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

36 Total with 8 members and 28 Guests.

GENERAL ITEMS

WG CTF34 met in single session on September 17, 2019 in Denver CO with 8 members and 28 guests. Introductions were made. The minutes from the May 2019 meeting in Cincinnati were reviewed and approved.

The 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 sent to C subcommittee ballot in October, expect completion by end of 2019.
- C25 Protection of Wind Electric Plants - Martin Best: Report nearing completion, expected finish by end of 2020.
- C32 Impact of Inverter Based Resources on Utility Transmission System Protection - Mukesh Nagpal: Recommendation on negative sequence from German grid code but without simulation results. It was stressed to C32 that the primary deliverable expected is the working group is planning to include a recommendation on negative sequence current injection from IBR during system fault conditions, based on the German grid code. Evangelos Farantatos is performing the simulation and hopes to finish by the end of September. The report will then be forwarded to the C subcommittee for balloting. Mukesh also mentioned the document will provide a recommendation to discourage the use of single pole-tripping on systems with high IBR penetration.
- D29 Tutorial on Setting Impedance-Based Power Swing Blocking and Out-of-Step Tripping Functions on Transmission Lines - Kevin Jones: Working on an inverter-based wind generation PSSE model. Some simulation

results have been obtained, but some are questionable. Kevin will be looking for guidance on getting better results. Hoping for valid results by January 2020 meeting. Expectation is that simulation results in faster swing rates with higher IBR penetration requiring adjustment in blinders, timers, etc. Model includes 500 MW of wind generation in a 2000 MW power system model. Both PSSE and PSCAD models are being developed for the test system.

- D38 Impact of High SIR on Distance Relaying - Christopher Walker: Working group has drafted a preliminary outline and will incorporate examples of high SIR due to IBR. Working group looking for IBR experts to assist with the report.
- 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. Three presentations will be made in tomorrow’s D41 meeting, two from P2800 subgroups, and one on actual field results from a utility partner involving a Type III wind turbine. Kevin Jones offered data from a 478MW wind farm event response to a single-line-to-ground fault on the connected 230kV system.
- J18 Investigate the effect sub-synchronous oscillations due to inverter based resources (IBR) on rotating machinery protection and control- Ritwik Chowdury: At PES GM meeting in August, some material was gathered in a session on subsynchronous oscillations, including control/torsional/etc. interactions. 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 - Rich Bauer: IRPTF close to publishing paper on impacted standards, with recommendations. Rich will provide a link to the document.
- P2800/P2800.1 - Rich Bauer: Leadership holding weekly teleconferences, aggressive completion targets, Jens Boehmer chairing P2800. Face-to-face meeting of P2800 in Salt Lake City next week. Additional discussion on 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). Rich stressed again this is the key issue with higher IBR penetration. Mike Jennings suggested IEEE-PES/NERC establish a liaison with those responsible for German grid codes. Rich indicated that has been attempted but so far efforts have been unsuccessful. It was mentioned that Germany is ahead of CIGRE as well. The Chair mentioned the NERC/IEEE-PES Task Force was awarded the 2019 IEEE PES Working Group Recognition Award by the IEEE Power & Energy Society for the production of the TR-68 document “Impact of Inverter Based Generation on Bulk Power System Dynamics and Short-Circuit Performance”. The award was presented at the PES GM in Atlanta on August 6, 2019. All TF members received a certificate of appreciation. Mukesh Nagpal raised the suggestion of the installation of synchronous condensers. Kevin Jones mentioned that within the Competitive Renewable Energy Zone (CREZ) in Texas where there is a high percentage of wind generation (up to 70% penetration), many synchronous condensers have been installed to provide short circuit strength. Pratap Mysore mentioned there are several papers available discussing coordination of synchronous condensers with IBR controllers. Ritwik Chowdury mentioned gathering field events for systems with high IBR penetration. Evangelos stated this is within the D41 working group scope, and offered that a database with web access will be developed. A report may also be developed in the future based on the number of records received. Kevin Jones requested that along with the event records, valid models (at least representative models) to go along with the events would be useful. Rich Bauer offered that the Renewable Energy Modeling Task Force in WECC is an excellent resource for the best models. Rich also mentioned that EMT modeling will likely be a necessity. Kevin Jones asked Mike Jensen about the EPIC report on Synthetic Inertia from Battery Storage. Mike examined this from fault current perspective and noted such technology did dampen oscillations following fault current clearing. Fault current contribution did increase but it was because the inverter size was doubled. Islanding and frequency stability was also examined. Rich Bauer mentioned a related paper on fast frequency response will be issued soon (within two weeks). Rich Bauer also mentioned a FERC-requisitioned paper by ORNL developed by John Undrill.

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 September of 2019. The WG has now presented the paper at two conferences and is scheduled to present at two more conferences. The WG has completed its assignment and was disbanded.

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 at 5pm in the Gold Coin room. There were 9 voting members, 0 non-voting members, and 12 guests present.

The group reviewed the 3.0 version of the paper and made minor edits. The document will be reviewed once more as a whole for punctuation and grammar. It will then be sent to the working group for a vote. The intent is to have the working group vote completed prior to the January meeting.

Roy Moxley is officially retiring and will no longer be attending the PSRC and thus can no longer chair the C36 working group. A request is made to approve Ben Kazimier as the chair and Steve Klecker as the Secretary / Vice Chair.

Writing Assignments:

Taylor Raffield agreed to review the total document once more for grammar and punctuation prior to the chair sending the report out to the working group.

Alex Apostolov:

Create 2 versions of conference presentations, one for 15 and another for 30 minutes long.
Create a 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 3.1

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.

September 18, 2019 Meeting Minutes

Denver, CO

Officer Presiding: Mani Venkata

Minutes Prepared By: Michael Higginson

This meeting was an in-person face-to-face meeting, in a double session. There were 59 attendees, with 22 voting members, 6 non-voting members, and 31 non-members. The working group met quorum.

The working group began with introductions, followed by reviewing our assignment. The patent slides were reviewed and no concerns or comments were raised.

Minutes from the July meeting were reviewed. Brian Boysen motioned to approve the minutes, and Ward Bower seconded the motion. The working group unanimously voted to approve the minutes.

The working group reviewed the agenda for this meeting. The working group unanimously voted to approve the agenda.

The working group reviewed progress on the draft guide. Updates and discussion were as follows:

- Section 4: update provided by Ward Bower
 - Proposed definition: "A group of distributed energy resources (DERs) and interconnected loads co-located within clearly defined, but flexible electrical boundaries, and that acts as a single controllable entity with respect to an interoperable, local or larger area electric power system (EPS). A microgrid can electrically connect and disconnect from an EPS to enable it to operate in either an interoperable or islanded mode."
 - There was a comment from Fred Friend that second sentence is an explanation and not a definition.
 - Definitions are available on the IEEE dictionary here:
 - <https://ieeexplore.ieee.org/browse/standards/dictionary?activeStatus=true&queryText=microgrid>
 - <https://ieeexplore.ieee.org/browse/standards/dictionary?activeStatus=true&queryText=interoperability>

Past standards use DOE 2011 version.

- Jim Reilly suggested we stick with DOE 2011 version of definition for consistency with 2030.7 and other standards. We can state in the body of the text that this may also be applicable to standalone systems.
 - The group discussed and voted to proceed with this approach. 16 votes in favor, 1 vote opposed.
- Section 5: update provided by Rob Fowler
 - Discussion on "mixed" mode
 - The team felt that "transition" may be a better word than "mixed".
 - Sakis Meliopoulos sent the following comments via email:
 - The "mixed mode" as defined in the present document, appears to be redundant. Specifically, modern microgrids are designed to operate in "grid-connected mode" and in "islanded mode" because of the simple fact: they are interconnected to the power grid through a single connection which can experience a fault which will lead to disconnection and islanding of the microgrid.
 - Recently we have seen the development of microgrids that are connected to the power grid via asynchronous interconnection, back to back inverters, solid state transformer, etc. For this reason, Meliopoulos proposed to include another mode: "asynchronous mode".
 - Action Item: Working group leaders should get a copy of 2030.7 for the team to do work on this section.
- Section 6: update provided by Mike Bloder
 - Mike Bloder proposed changing the title of section 6.2 from "Stability" to "Generation / Load Balance"
 - The working group discussed, and Mani asked that the group revisit and discuss further.
 - Working group members please review and provide feedback.
 - 6.1 seemed to be redundant with section 5. The working group discussed and decided it was not redundant because 6.1 should discuss operation modes with respect to protection systems.
- Section 7: update provided by Matt Reno
 - Title needs to be changed to "Microgrid Protection Challenges"
 - Action Item: Matt will send a draft based on C30
- Section 8:
 - Ratan Das previously provided an update that this section is nearly complete and should be provided shortly.
- Section 9:
 - This section has previously been completed and there are no updates at this meeting.
 - Action Item: Working group leaders will check with Scott Manson on sub-sections that are not yet populated.
- Section 10:
 - Sukumar Brahma provided a completed section draft prior to the meeting.
 - Action Item: Working group members please review and provide feedback.
- Section 11:
 - Mani asked Jim Reilly to check with Geza Joos on the status of this section.
- Section 12:
 - Mani to check with Ravindra on sections.
- Section 13:
 - Mani asked Jim Reilly to check with Mark Siira about this section.
- Section 14:
 - Don wrote a draft of this section. It is now included in the latest draft report.

New Business:

- There is a need for a section on microgrid protection solutions.
 - There will be some overlap with section 6.7.

- There was discussion that the title of the "challenges" section may benefit from editing. We are describing microgrid protection design requirements.

Our next meeting will be planned in November 2019 via a web meeting. The working group agreed to set up a poll on dates and locations.

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 project kickoff meeting occurred 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 Working Group did not meet in Denver. The expectation is that the WG will meet in conjunction with PSRC once per year, tentatively at the upcoming January meeting in Jacksonville, FL.

CTF-40: Paper development based on Standard for Phasor Data Concentrators for Power Systems

Chair: Vasudev Gharpure

Secretary: Mital Kanabar

Output: Conference or Transactions paper

Established: September 2019

Assignment:

A new task force, CTF-40 met at the September 2019 PSRC meeting to discuss whether to develop a summary paper from the work of the WG C-19.

CTF-41: Measurement Performance Requirements for PMUs in Distribution System Applications

Chair: Ken Martin

Secretary: TBD

Preliminary Assignment:

Establish a task force to examine the measurement performance requirements for PMUs that are intended for use in distribution system applications. The output of the task force will be a summary of findings and a recommendation as to whether distribution PMU requirements should be incorporated into the existing synchrophasor performance standard, established as a separate standard, or if they are adequately covered by the existing standard.

Synchrophasor standard 60255-118-1, which covers synchrophasor measurement performance for PMUs, was just completed in 2018. It establishes performance requirements for PMUs without designation or restriction for the use of the PMU. Most of the uses established to date are focused on transmission systems, so there is an assumption that the standard is for PMUs designed for those applications. A number of recent papers and reports have focused on the use of PMUs in distribution applications and have indicated that measurement capabilities are needed that are different than those for transmission systems. These indicated differences need to be examined to determine if new requirements and tests are needed to establish appropriate performance for PMUs for distribution systems.

This task force was created at the September meeting in Denver, so has not yet met.

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, September 18, 2019 with 33 members and 38 guests present.

Following introductions, Ted Warren was added to the subcommittee. Then a count of SC membership was made, and it was determined a quorum was present (33 out of 44 members present).

Minutes from the May 2019 meeting in Cincinnati were approved after motion made by Russ Patterson and seconded by Fred Friend.

The Chair reviewed items of interest from the Advisory Committee.

- WG Chairs – please send minutes to Chair and VC
- Send items for posting on the website to the webmaster, Rick Gamble.
- PES Webinar on September 25, 2019 on process for entity standards
- One duty of Main Committee member is to review papers when requested.
- Please send agendas two weeks prior to meeting

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 :2.6

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, September 17, 2019, 2:20 pm PDT.

There were 13 members and 15 guests in attendance. Quorum was achieved with one member voting by proxy. Attendance has been recorded in 123Signup.

The patent slides were presented. No concerns were voiced.

The Agenda was presented. Chris Walker motioned to approve, and Pat Carroll seconded the motion.

The May meeting minutes were presented. Fred Friend motioned to approve, and Chris Walker seconded the motion. The motion carried.

The WG reviewed and discussed the comments from the recirculation ballot. Comments responses were documented in the comment spreadsheet available to all members on iMeet Central.

Pat Carroll motioned to approve the comment responses and rejections. Joe Xavier seconded the motion. The motion carried.

Don Lukach motioned to send the guide for a second recirculation ballot. Ratan Das seconded the motion. The motion carried.

D29: Tutorial for Setting Impedance-Based Power Swing Relaying 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 6 members and 22 guests.

GENERAL ITEMS:

- 1) Kevin Jones gave a presentation showing the effect of IBR’s on power swings in the IEEE PSRC D29 test system. A 500 MW Type IV wind farm was added using the 2nd generation PSSE wind turbine and controller models. The results of the effects of IBR on power swings are still preliminary due to issues with PSSE load flow solutions not converging for more severe disturbances. Kevin will continue to work with PSSE experts on solutions to this issue.
- 2) The working group discussed shorten the title from “Tutorial on Setting Impedance-Based Power Swing Blocking and Out-Of-Step Tripping Functions on Transmission Lines” to “Tutorial for Setting Impedance-Based Power Swing Relaying on Transmission Lines”. The working group agreed to the change.

- 3) The chair discussed writing assignments. Kevin has been working with Heather Malson on sections 3, 4 and 6. The document has been reorganized to better align with the original work in the 2005 D6 published document. Kevin will complete the reorganization and will transfer the original completed writing assignments into the new, reorganized PES template by October 31, 2019.
- 4) Kevin will add more content to the document, and will send it to D29 membership by December 15, 2019 to be ready for review and discussion at the January, 2020 meeting.

WRITING ASSIGNMENTS:
NA

At the subcommittee meeting, upon motion by Kevin Jones with a second from Jorg Blumschein the subcommittee approved the request to change the title of the working group. The new title is "Tutorial for Setting Impedance-Based Power Swing Relaying on Transmission Lines."

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 12 voting members and 23 guests. After introductions, the WG Chair reviewed the minutes from the previous meeting.

Rick Gamble delivered a presentation on the application and setting of ground distance elements on a 161 kV system. The presentation was quite useful since it was entirely protected without pilot protection, so he had to address all of the coordination between ground overcurrent and distance elements. In order to achieve the sensitivity they required, he applied ground quadrilateral elements. This system provides an excellent tutorial that will be incorporated into the document.

The WG reviewed the outline and will add some additional detail on the impact of Ct saturation on the performance of ground distance elements. Daniel Lebeau will work with the Chair for this writing assignment, which will include the impact of CT saturation on polarizing quantities used for quad elements.

The WG Chair will meet with the Vice-Chair and a few individual members in the next two weeks to finalize some sections. All of the previous and new contributions will be incorporated for posting to the WG web page by October 15.

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

CHAIR: Normann Fischer

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

D34 met in Denver on Tuesday, September 17. The Chair discussed the status of the IEC standard. The Chair will begin the process of translating the draft standard to English and distribute in the next few months. The Chair requested all those interested in reviewing to send him an email. The group will set up the group website to post the draft standard in a protected manner. After review comments have been received, the group will meet

again to discuss. This process will take a few months to complete; therefore, it is unlikely the group will meet in January.

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: May 2020

Draft: 8

Working Group D35 met on Tuesday, September 17, 2019 at 9:20am in a single session with 19 members and 20 guests.

The WG reviewed several technical comments in the document. The usefulness of the section on single pole tripping was brought into question. It was noted that the section is useful as a reference point to some other document that goes into more detail. The WG also discussed the relationship between DCUB and POTT in PLC schemes, which needs more discussion in the document. Further, there was discussion on echo logic in POTT schemes, especially in weak-infeed situations, where additional information could be useful.

Several assignments were made, some new and some old.

Draft 8 will be distributed to working group members for review.

Action Items:

- Jeff Brown - write-up on POTT/DCUB relationship when using PLC
- Brandon Janssen - follow-up on Section 3.5 with new document reference
- Ted Warren - send write-up of echo considerations for later use in Section 4.2
- Jeff Brown and Nuwan Perera - harmonize Section 4.4 with D37
- Rick Gamble and Brandon Lewey - clean up Section 4.8
- Brandon Armstrong - clean up Section 4.9 for better flow (repetitive paragraphs)
- Rick Gamble - re-write summary of Section 4.10 for ranking clarity based on communication scheme
- Nathan Gulczynski - re-write 4.11 for flow (hybrid line info added, too much detail)

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 22 attendees (8 members plus 14 guests). Few writing and review assignments were received. Secretary has converted the report into the new IEEE PES format. WG reviewed the list of writing / review assignment and the overall content of the draft report.

The list of assignments is updated as follows.

Nuwan Perera

- Provide draft for the Section 7.2 on Faulted Phase Selection
- Provide draft for the Section 7.5 on Staged Fault Testing
- Provide draft for Section 7.1.2

Roy Moxley

- Provide draft on Section 3.4.4. on Delayed Current Zero Impact

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 in 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

- Provide review comments for Section 4
- Provide draft on Section 1 (work with Nuwan)

Adi Mulawarman

- Provide review comments for Section 3

Aaron Findley

- Provide draft on Sec 7.1.5
- Provide review comments for Section 5

Kanchan Dase

- Provide review comments for Section 5

Hardesh Khatri

- Provide draft for Sec 7.1.3
- Provide draft for Sec 7.1.4

Three guests showed the interest to become WG members.

Secretary to send draft 1.01 to all WG member/guests.

With no further business, the meeting was adjourned.

D38: Impact of High SIR on Line 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 on Wednesday, September 18, 2019, with 41 attendees. 14 Members and 27 Guests.

Chris opened the meeting by reading the assignment, then started introductions. The attendance sheet and agenda were passed around.

We then reviewed the writing assignments that we had so far.

Don Lukach summarized his section "What is SIR". Don took the sections from the Transmission Line Guide for this report. Don believes that section needs shortened/summarized and possibly re-written based on the working groups findings. Don Lukach, Steve Klecker and Pratap Mysore will work on that section for the next meeting.

Steve Klecker summarized what he sent on CT saturation. Steve's summary was basically, CT saturation is not an issue with High SIR. Chris was going to review what he got but may have missed Steve's submission.

Pratap summarized VT accuracy and is still working on his assignment. He has requested and received data from both Trench and GE CCVT manufacturers. He also plans to request data on wound type VT for consistency and for the working group's information.

Craig Holt has stepped down from the working group for the time being. Karl Zimmerman will work with Hardesh Khatri on providing a relay accuracy section. Chris will provide Karl and Hardesh what we have received from Craig to date.

Brandon Lewey walked through his section and similar to Don provided a lot of information from the transmission line guide. Brandon is planning on going back through this section to parse it down based on the working group information.

Ted Warren has sent is information to Bruce Mackie for review. Bruce and Ted will provide their section prior to the next working group meeting.

We discussed IBR and High SIR. We had a lot of discussion on the relevancy of this topic and discussed system topologies as a whole that have an impact on SIR. We plan to have a section based on overall system topologies and discuss IBR as part of that section. Steve Klecker and Alla Deronja are both members of working group C32 which is focused on Protection Challenges with IBR interconnections on transmission. The working group will harmonize or reference C32 as needed in the future as the system topology section evolves.

We have requested that writing assignments be completed by December 1st.

We are currently on draft 0.

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 : 0.5

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 Tuesday, September 17, 2019 at 9:20 a.m. in a single session with 22 members and 12 guests. No Quorum. After introductions, the minutes from May 2019 were reviewed.

Continuing the discussion on Adaptive Reclosing from the May meeting, Patel discussed that all of the existing content in the Adaptive Reclosing section was either covered in other sections or could be easily move to other existing related sections. There were no objections to this approach as long as all of the existing content is retained.

Continuing discussion from May meeting on including a section(s) related to manual reclosing, it was decided that this is out of scope.

There was some thought that some of the items that had been previously discussed as possible being “adaptive reclosing” (canceling reclosing for high magnitude faults, etc.) should still be included in the guide. These items could be included in the existing “special circumstances” section.

There was some discussion about dead time (arc-deionization) for instantaneous reclose attempts. The existing document includes an equation, which is also referenced in Blackburn:

$$T_{\text{cycles}} = 10.5 + (kV_{L-L} / 34.5)$$

The times obtained using this equation differ from table values listed in the ABB Transmission and Distribution Reference Book. Explore rewriting the section to include the table and the equation above.

We will be setting up Webinars/conference calls after the January meeting to begin reviewing/accepting comments that have been received from review assignments. It was discussed whether this should be done in separate teams (transmission and distribution) or the whole document under the same team. It is preferred that one team handle the whole document.

Assignments:

- Armstrong and Garver, review auto-sectionalizing section.
- Chase Lockhart and Armstrong to review Annex B
- Boysen to review Annex C.

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 13 members and 11 guests. A motion to approve the May 2019 minutes was made by Gary Stoedter with a 2nd by Dom Fontana. There was a unanimous vote to approve the minutes. A couple items were added to the agenda. A motion to approve the agenda was then made by Alla Deronja with a 2nd by Meyer Kao. There was a unanimous vote to approve the agenda.

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

- Load encroachment and loadability
- Loss of potential considerations
- Ground directional polarization

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

Other topics and ideas were discussed as follows.

- Does the line guide have information regarding the arming of power swing blocking blinders and load?
- Could guidance be expanded in the line guide regarding the setting of phase zone 3 elements on 3-terminal lines and the effect on loadability.
- Could LOP be added more to the reliability section?
- For LOP, consider the case if line relays use bus PT's and there is a bus outage.
- Should the information and references found regarding polarization be added to the D3 WG polarization report or added to the line guide? If added to the report, then the line guide could refer more to the D3 report.
- IEC definitions for DTT, POTT, and PUTT were provided. The line guide should be reviewed to see if definitions for these terms are already present.
- The topics of adaptive relay and adaptive relaying along with their definitions should be reviewed in the line guide to determine if these topics/definitions should be revised.

Information that has been gathered by the D40 WG will be provided to the new task force referred to below.

A motion was approved at the D Subcommittee meeting to disband the D40 WG. A new task force, DTF42, was approved to meet for the first time in January 2020 with the following assignment:

- Investigate the need to revise IEEE Std C37.113-2015, IEEE Guide for Protective Relay Applications to Transmission Lines.

The January 2020 meeting for the DTF42 task force will require a single session, computer projector, and a room for 40 attendees. Please avoid KTF27.

At the subcommittee meeting, upon motion by Don Lukach and second from Dominick Fontana the subcommittee approved the formation of DTF42 to review the need to revise C37.113. Jeff Barsch will chair the task force with Don Lukach as the Vice-chair.

Then a motion was made by Jeff Barsch with a second from Don Lukach to disband working group D40. The subcommittee approved this motion.

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 vice-chair described the scope of the WG. There were three presentations during the meeting:

1. Presentation - Manish Patel, Southern Company. "IEEE P2800 – Ride Through Performance Requirements (SG8) & Modeling Data, Measurement Data for Performance Monitoring & Validation Subgroup (SG10)"
2. Presentation - Kamal Garg, SEL & Jason Espinosa, Seminole Electric. "IEEE P2800 - IBR Protection Subgroup (SG9)"
3. Presentation - Evangelos Farantatos, EPRI (On behalf of Ilia Voloh) "Field Case Relay Operation Type III Wind Farm"

Mike Jensen, PG&E provided fault records from an event in January 2019 with contribution from solar PV. Additional model data were requested based on the data collection form the WG has come up with.

There were total 30 attendees in the meeting, 7 members and 23 guests.

For the next meeting in January 2020, we need a room with capacity of 30, and a computer projector. Please avoid conflict with WG C24, C32, B10, CTF34 in that order.

After the meeting, the working group proposed to change the name and assignment of the working group. This change was approved by the subcommittee chair and the chair of the PSRC. The new name and assignment of the working group are as follows.

Name: Engagement with industry activities related to line protection due to increasing penetration of inverter-based sources

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

Coordination Reports

T&D Committee / Distribution Subcommittee

The next T&D Committee / Distribution Subcommittee meeting will occur during the IEEE PES JTCM in Jacksonville, FL, 13-16 January 2020.

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 published.

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 soon.

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 by PES to update the PSRC report “Effect of Distribution Automation on Protective Relaying.” They would like for the report to be placed in the new format and refreshed if needed. Task Force DTF 43 will be created to review the request. Bruce Mackie will chair the task force.

The chair then discussed the statuses of the existing guides that the subcommittee handles. Upon a motion by Brian Boysen and second by Rick Gamble the subcommittee approved the formation of task force DTF44 to review the need to update C37.114, IEEE Guide for Determining Fault Location on AC Transmission and Distribution Lines. The subcommittee is looking for a chair for this task force.

Line Protection operations of interest

Alla Deronja made a presentation regarding a cross country fault event.

General Discussion

The chair announced this was his final meeting as Chair. For the next meeting, Bruce Mackie will be the Chair and Meyer Kao will be the Vice-chair.

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 September 18, 2019 in Denver, CO with 26 members and 44 guests present comprising a quorum. Minutes of May 2019 SC H meeting were approved unanimously (Bill Dickerson moved, Marc Benou seconded)

Announcements:

1. Announcements from AdCom
 - a. New Members starting September 2019
 - i. Matthew Black, Mital Kanabar and Dean Ouellette
 - b. New items from Awards and Recognition Meeting
 - i. iMeet and Central Desktop training is expected
 - ii. WG Chairs to verify WG info on PSRC site
 - iii. Vice Chairs and Secretaries have to be IEEE-SA Members
 - iv. Members responsibility to review PES papers
 - c. New items from May 2018 Adcom Meeting
 - i. Once work is completed WG Chairs to act to Awards.
 - c. New items from Standards Coordination Meeting
 - i. WG Chairs with PAR required to attend
 - ii. Presentations on topics of interest to be scheduled
 - iii. September 25, 2019 a Webinar on Entity Standards
 - d. New items from SC and reminders carried from prior meetings.
 - i. On meeting cancellations, coordinate with SC Officers
 - ii. SC Members are required to Vote on Reports
 - iii. 123Signup status => mostly done !
 - iv. WG presentations to be reviewed by SC Officers
 - v. Standard format for SC H vote mailings (Subject line):
PSRC VOTE REQUIRED SC H [WG HXX] (2014-1) by May 31, 2014

WG business:

H11 disbanded. Bill Dickerson made motion to disband, Seconded Allen Goldstein. H-subcommittee voted to approve disbandment.

H41 requested members from utilities to participate.

H45 Ratan Das requested that WiFi reliability be checked.

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. (Marc Adamiak) Contingent on H35 being completed.

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. Contingent on H22 being finished.

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:

Ken Martin proposed setting up a TF to establish a task force to examine the measurement performance requirements for PMUs that are intended for use in distribution system applications. The output of the task force will be a summary of findings and a recommendation as to whether distribution PMU requirements should be incorporated into the existing synchrophasor performance standard, established as a separate standard, or if they are adequately covered by the existing standard.

Allen Goldstein suggested that a TF may belong in I SC. Galina Antonova suggested that with H11 disbanded that there maybe room for TF. Gene Heneberg suggested talking with Fred Friend to see if it fit in C subcommittee. Bill Dickerson moved that the subcommittee approve the formation of a TF to investigate requirements for distribution PMUs subject to coordination with C subcommittee. Ken Martin seconded.

Bill Dikerson motioned to adjourn. Charlie Sufana 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 8 members and 9 guests present for the Sept 17, 2019 meeting.

Quorum was not met so the minutes from the last meeting will be circulated for approval. The new patent slides were also presented with no objections voiced.

The Chair began with a review of the report's status draft 10.1. Comment resolution was the topic of the meeting to finalize the report. 37 comments were resolved. The meeting finished with Draft 10.12 and it will need to be updated more.

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 Sept 17, 2019, 9:20 – 10:30 am.

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

The standard was given final approval by the IEC on September 10 and by the IEEE standards board on September 27. The IEC and IEEE both published the standard on December 17. Members of the WG wrote a summary paper for the standard. It was presented at the Texas A&M relay conference in March and a revision the PAC World conference in Raleigh, NC in August. Other versions of the paper were also presented at the CIGRE meeting in Tromso, Norway in June and the ISGT meeting in Chendu, China in May. With these 4 presentations, we have reached a wide and diversified audience.

The WG received a request to consider performance requirements for distribution PMUs. The chair gave a short presentation covering applications and performance requirements that have been proposed. In short, measurement performance requirements have been proposed but there is little evidence either based on proposed applications or documented distribution system characteristics that support them. More investigation is needed to determine what these requirements are and how they might relate to the standard just published. The WG supported forming a task force to do this investigation.

The WG discussed the future of the H11 as to whether it should repurpose to field questions and consider standard changes. After some consideration, the group decided to request to the subcommittee to disband. The question was raised whether an official WG vote is needed to request disbanding, and Galina offered to find an answer to that question. (Ans-the Subcommittee Chair may grant that that request without formal WG vote).

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 2020

Draft: 8.10

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 18 members and guests in attendance. Quorum was established. The minutes from the last meeting were approved.

Craig Preuss provided a major contribution by developing a structure for the proposed Guide and provided the group with an integrated submission (draft 8.10) that included a technical merge of concepts from various submissions with extensive work in the Definitions section. Craig then led a review of the draft with the group.

The main discussions centered on where to include the developed file categorization information. The information is currently included in an Annex but a number of members argued that they should be moved to the body of the text. After the discussions the group voted to move the information to sections 6 and 7.

Craig and Tony Johnson agreed to revise the document accordingly, and Amir Makki agreed to submit the definitions section for review by the I2 working group. The next draft will be posted to I-Meet Central. The attending members agreed to review and comment on the next draft by December.

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 first few slides of the presentation detail a vote that was taken last meeting and modifications that have been made in conference calls between meetings. These include things such as data object instances can contain data attribute instances.

An example of the ICD file was shown.

The next few slides in the presentation detail future work that this working group will undertake, this includes things such as mapping between our model data types and the ones in 61850.

The chair ends the presentation saying that if all the future work detailed on the previous slide is completed writing the standard should be completed relatively quickly.

A question was asked if we intend to include logic, the answer from the chair is that for this go we will leave logic out of the ICD file. Although there is a CIM extension (UML model) that includes logic.

A question was asked if you can define custom logic thru 61850, the answer from the chair is yes. For non-61850 relays this may not be possible.

A question was raised about using 61131. The chair doesn't believe that this is necessary.

Right now, there is no way to add a base64 binary object into 61850. Is this something that we should include in this standard? Can logic be included in a Gset in the ICD file?

IEC has copyrighted the XSD for SEL. We now need to contact IEC to see if we can edit the XSD file.

We will keep an eye on the interop in charlotte next week regarding where they are going with logic.

61850-90-11, 61131-3 this is the logic section for 61850; a draft is currently being sent to Geneva for approval.

A question was asked about the state of the CIM extension (UML Model). The chair says that a few more changes are needed but he believes that it is close to completion.

Should we include the CIM model (UML model) as an Annex in the standard? A member believes that we can just add the UML model to the standard. There is no consensus on this topic, the chair is open to both solutions.

Members express the need to add a base64 binary object to the ICD file.

A member asks why we would put base64 into the ICD file, the answer is there are relay settings that cannot be expressed as a value. EPRI has needs to include all settings in the device which includes things that can only be represented in base64.

A member raised the issue that some binaries such as firmware don't change and including them may lead to problems.

A discussion was made on whether we should include any cyber security attributes in the ICD file.

Action Items:

Look at changes that may be made to logic in 61850, Herb has said that he can update the working group on this in a few weeks.

Deal with copyright issue with IEC for the XSD for SEL.

Make a rev change to the standard (do some writing on the standard).

In January we will submit a PAR extension just to be on the safe side.

Add base64 as a base data type, need to work to make sure it does not mess with the display (human readability) of the file.

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

Dean Ouellette provided a report on WG activity. He reported that several drafts are being prepared to be balloted. Recent ballots included 7-2 and 7-4. Recent drafts were released for NSD documents. Dean also to provide link from IEC regarding public NSD documents. Next WG10 meeting is week after IOP also in Charlotte.

Jeff Shiles mentioned the planned presentation for the January meeting regarding SCE experience.

Adrian Zvarych - Skill set guidance documents required for working on the 61850 based systems.

Will Knappek – suggested that a skill set needs to be documented. Group agreed that task force should be set up possibly in I subcommittee.

Aaron Martin to ask Dustin Tessier to survey utilities about internal 61850 utility training programs, including design engineers, technicians, commissioning engineers and any other groups involved.

Darren DeRonde inquired about storing logic in 61850 configuration file. H27 working group is discussing capturing logic in configuration files in coordination with WG10.

Dean Ouellette presented the 61850 proposed IOP testbed to the group, including a one-line and protection scheme.

Aaron Martin to request Herb Falk present IOP results to the group in January or May.

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.

No meeting. No report. Webex will be scheduled in 3 weeks.

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 6 members and 7 guests in attendance.

The working group reviewed the latest draft which had been updated to address comments received during past circulation. That draft was also reorganized to make it flow better. References were added along with a list of acronyms. Some of language had been softened as this is not a standard.

The group accepted all the changes with one minor clarification. However, the group had received input from TVA that we didn't have time to address. The group will need one more meeting to address this input so we can then submit it to the subcommittee for review.

We did not have a quorum in the current approval vote. The revised draft will be resubmitted for acceptance when completed.

H35: XML Translation for COMTRADE

Chair: M. Adamiak

Vice Chair: Z. Makki

Secretary: M. Capuzzo

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: T. Laughner

Vice Chair:

Output: Guide

Established:

Expected completion date: December 2020

Draft: 1.6

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.

Working group met with 3 Members and 3 Guests in attendance. Tony Seegers is a new member as I2 (Terminology) liaison. After introductions, IP Policy call was made, no issues were raised.

Before this meeting WG Chair, Jim Bougie, not in attendance, informed SC H Chair of his resignation. SC H Chair, Galina Antonova hosted this meeting. She informed the group that Theo Laughner has accepted a WG H40 Chair position. Theo could not attend this meeting due to a time conflict.

Tony Johnson covered history of the current document. Output, Scope and Purpose were discussed next. It was suggested to change output to Guide from Recommended practice. PAR details were reviewed. It was noted that the original PAR has P2680 number, while C37.1.2 has been used for this work. This has to be corrected. A few changes in the Scope were proposed, such as removing life cycle and cost information. A new Purpose clause was proposed as follows: "The purpose of this guide is to enhance the understanding between protection and automation engineers and information technology specialist in the area of database applications. This will be facilitated by application examples." All changes were captured in Draft 1.6 during the meeting.

With new WG leadership, next steps would be to confirm WG Membership, revise PAR, and focus on completing the document. For the document content it was suggested to include general data base characteristics, and STIG.

H41: Revision of IEEE 1646 Communication Delivery Time Performance Requirements

Chair: D. Holstein

Vice Chair: T.W. Cease

Output: Standard

Completion Date: 2021

Draft: D2

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 Wednesday, with 5 members and 1 guest in attendance. A quorum was present. This was the seventh official meeting. Attendees introduced themselves and affiliation.

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

The call for patents was presented – no response.

The agenda was reviewed and approved without change.

Past minutes were reviewed and approved.

Those attending focused on the following topics:

Went over the action item list. Closed 2 out of 3 open items.

Latency was agreed upon as shown on slide and will be incorporated in the next revision.

Dennis will put the definition of latency in the next draft.

Mark will provide a use case for inclusion in an annex.

Dennis to post proposed title change and other change to the PAR.

Dennis will convert the document to the new IEEE template for Draft 3.

Dennis will survey members to use monthly, 1-hour virtual meetings.

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: 1.0

Introduction – 9 members, 12 guests

Chair presented IEEE standard related slides

Previous meeting minutes reviewed. Group did not have quorum. Minutes to be voted on via email.

Chair queried group about receiving iMeet site access 3 members said they received notices.

Jose Ruiz summarized his contribution on Simulation indication and Test indication.

Aaron summarized contribution from Qiaoyin Yang about process buss and station bus.

Section 4.2.1.1 was added to include a sample of scheme with simulation and test mode. Rich Hunt agreed to write the sample.

Craig Preuss volunteered to write a section 6.2.1 on SNMP.

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 September 18, 2019 with 34 participants (31 in person and 3 remotely, with 19 members and 15 guests).

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

Minutes of the May face-to-face and August (web) meetings were approved via email – they are available in the iMeetCentral.

We had an interesting presentation on “New Approaches for Centralized Substation Protection and Control” by Dr. A.P. (Sakis) Meliopoulos of Georgia Tech. The presentation generated lot of interest among participants and we spend rest of the meeting (about 20 minutes) with Q&A. The presentation is already posted in iMeetCentral and is also enclosed for the benefits of participants.

Other items in the agenda could not be taken up as we ran out of allocated time.

It is requested to arrange reliable wi-fi connection at the meeting to facilitate remote participation – another option could be to have reliable cellphone connection so that hotspot can be used.

A web meeting will be held either on Oct 30 or on Oct 31 for one hour at 11:00 am EST to follow up progress on assignments. Members are requested to select their preferred date.

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 9/17/19 at 15:00 MDT. There were 27 in-person attendees: 9 members, 18 Guests; as well as 4 remote attendees: 3 members, 1 guest. The Agenda was approved with Jay Anderson making the motion to approve and Michael Doak seconding the motion. No Executive session took place.

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

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 start coming up with the sections of this recommended practice was revisited. The sections that were previously discussed were reviewed, and other sections were added in turn: Control & Viewing and Security. A note was

made to try to break apart the scope into tangible sections prior to the next meeting in January for a well-defined outline.

Several existing definitions for HMI were reviewed from existing standards in the IEEE and IEC. The working group seemed to be most amenable to the C37.2 definition with some harmonization with the IEC definition. IEC's definition makes mention of the Hardware considerations within HMI design.

Hardware consideration was discussed with exception noted that there are a multitude of Hardware options for an HMI. The emphasis of the Recommended Practice is as pertains to the "screens" and not so much as relates to the Hardware. There will be an ancillary mentioning of the Hardware aspects, but it will not be a focus of the Recommended Practice.

Further discussion made it apparent that some context to the definition is inherent to define the scope of the screens, e.g., a control center's HMI screen will look and function much differently than the individual iED in a substation's HMI screen.

The chair suggested that perhaps a tiered approach to HMI (Control Center, Substation, iED) would be an appreciated structure to the Recommended Practice. Discussing each in turn and articulating the differences and the inherent factors there-in.

Jay Anderson made a motion to adjourn and was seconded by Craig Preuss. The motion was approved and the meeting adjourned at approximately 14:10 MDT.

H47: Impacts of IEC 61850 sampled values, GOOSE and PTP time synchronization on protection and control applications using process bus

Chair: M. Kanabar

Vice Chair: A. Riccardo

Secretary: D. Ouelette

Output: Report

Completion Date:

Draft: N/A

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.

H47 met on Tuesday afternoon with 7 members and 16 guests. We reviewed the approved title and assignment, as well as worked on in-scope and out-of-the-scope for this report. We felt that adding sequence-of-events to the out-of-scope was necessary for clarification.

We reviewed the outline of the proposed report and started to accept volunteers for writing assignments.

We have volunteers for section 1 and section 2.1. The group felt that section 2.2, 2.3, 2.4 on abnormal behavior require some more clarification before proceeding with writing assignments.

The group felt that section 3 needed some clarification from manufacturers about the characteristics of the behavior of the IEDs relative to 2.2, 2.3, and 2.4 before this section can be completed. Dan Ransom from GE will provide contribution on behalf of GE.

The remaining sections will follow after the above sections have been written.

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 fourth meeting as a task force in Denver. We had a much smaller group of attendees, down to 8 from ~25 in earlier meetings. Overall it seemed that many other WGs were noting lower attendance at the Denver meeting.

Discussions continued from where we left off in our earlier meetings. Our assignment from the last meeting, to develop an iMeet sharespace, has been completed, though we expect to add many more documents to it, and to develop some structure as we get to where a 'flatfile' approach is no longer practical.

Three new assignments were made:

Allen Goldstein will present our work at the upcoming NASPI meeting as a part of his C23 report. NASPI, along with ICAP, has been one of the driving forces to find a way to provide a centralized and accessible repository for many reports and documents developed over the years.

Bill Dickerson and Jason Allnut will work on developing a 'Knowledge Framework,' the purpose of which is to create a structure that organizes the information in an approachable manner.

Ken Martin and Allen Goldstein will work on developing a list of questions synchronized measurement newcomers are likely to have; for instance: "What is a synchrophasor?" and "What sort of problems can synchrophasors help solve?"

We would like to continue as a task force until if and when we have a specific work product that we have identified, such as a report, that would justify changing to a working group.

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

The chair provided background information about the potential need for a WG and received additional input from the group. The potential scope was discussed extensively and there was a consensus that:

There is a need for material that could provide a level of confidence to relay engineers when they face the need to transition to packet-based communications for the protective relay pilot channels.

WG H32 is still revising their report and is expected to cover the "tutorial" needed.

The title and potential scope of a WG based on HTF49 would be determined after H32 has been reviewed by the group.

Discussion of the scope indicated that it would be beneficial to have knowledge of any issues, concerns and lessons learned in utilities that have deployed this technology for pilot protection and teleprotection. The group could also address organizational aspects for IT/OT – system protection interfacing in regards to traffic path engineering, maintenance and notifications, monitoring, alarms, etc.

As any scope was not yet defined, the group decided to have a task force meeting in January to further define a clear objective and potential scope.

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

WG met on September 17 at 3:40 PM with 7 members and 2 guests.

Amendment of Project scope was discussed, including a proposal to include a reference to traceable time sources. Scope was amended to include the dual branding of 61850-9-3.

As amended: Presently there are IEEE and IEC standards around (accurate) time distribution systems (for example, IEEE 1588 and associated Profiles, IEEE/IEC 61850-9-3, etc.). The intent of this Report is to document requirements for Time Sources (Clocks) used in Protection and Control Systems.

Allen Goldstein began a discussion of the concept of a Clock in common parlance, and pointed out that systems like GPS, GNSS, GLONASS, etc. are not clocks per se but are time distribution mechanisms, with the reference time sources being in fixed locations around the world. This led to further discussion of time standards (UTC, TAI, the implications of Leap Seconds, etc.). What we tend to refer to as “Clocks” in P&C systems are more generally receivers (potentially wired, for example connected to Telcom Profile systems, and Wireless, i.e., satellite signal receivers) with re-broadcast and some free-running (holdover) capabilities.

This type of Clock will be the major topic of this Report, with additional references (potentially in an Annex) concerning the reference systems.

Allen will try to provide some background material on traceability and different reference clocks systems.

It was also proposed that the Report have a section including Definitions, Acronyms, and Abbreviations

WG began review of Cigré working group, B5/D2.67: Time in Communication Networks, Protection and Control Applications – Time Sources and Distribution Methods. Reviewed scope document from Cigré.

Chris Huntley had agreed to act as liaison reporter to Cigré; we reviewed Notes that Chris provided, including a Précis of current content of Cigré JWG B5/D2.67 draft.

There was additional discussion on related issues, including clock response to loss of the reference signal (i.e., entering and exiting holdover); Nicholas Kraemer provided cross-references to IEC 61869-9.

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
2. Determine a Quorum (38 voting members total in I SC) 24 members in attendance; quorum is met.
3. Approval of Minutes of the May 2019 meeting
 - a. Motion entered by: Meisinger
 - b. Motion seconded by: Pond
 - i. Approved
4. Coordination & Advisory Committee Meetings Items of Interest
 - a. Subcommittee Members' status and incoming Officers for January 2020
 - b. Attendees information
 - i. New record – 275 attendees, 24 newcomers
 - c. *Future Meetings:*
 - i. *January 12 – 16, 2020 – JTCM – Jacksonville FL*
 - ii. *May 4 – 7, 2020 – Nashville TN*
 - iii. *September 21-24, 2020 – Reno NV*
 - iv. *January 10 – 14, 2021 – JTCM – New Orleans LA*
 - d. Policies and Procedures for: Power System Relaying and Control Committee Working Group sent to Subcommittee members 31-December 2018 by email for review
 - i. Three officers: Chair, Vice-Chair, Secretary
 - ii. **All WG Officers must be members of SA!!!**
 - e. **Working Group sign-in sheets – new 123SignUp procedure!!!**
 - i. Michael Thompson sent 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/>
 - iii. Slides are provided along with final meeting agenda
 - 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 future Main Committee meetings – please contact Jim Niemira.
5. Administrative Items
 - a. From IEEE-SA: WG/TF Agendas and Minutes: **“The 14-calendar-day rule” – the Standards Association requirement in O&P**
 - b. Procedure for PARs:
 - 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)
- iii. Includes creation of a new PAR
- iv. Includes approval to proceed to IEEE-SA for creation of a balloting body or to proceed to sponsor ballot
- v. **Includes changes to a PAR title, scope and/or purpose**
- vi. 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.
- vii. 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.**
- viii. Motion to approve the new or modified PAR is done at the Main Committee meeting
- ix. PSRCC is the Sponsor
- x. myProject™ Volunteer User Guide – good stuff
https://mentor.ieee.org/etools_documentation/dcn/11/etools_documentation-11-0014-MYPR-myproject-user-guide.pdf
- c. 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.
- d. Make sure that on the Meeting Room Request (MRR) form for the **January 2020** meeting that you include “do not conflict with I50, D87, ...”
- e. As Chair or Vice-Chair of WG or TF, please contact Brian Mugalian and Jim Niemira **if you cannot attend your session.**
- f. 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.
- g. 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.
- h. 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!
- i. Email WG or TF Minutes to Jim Niemira at: Jim.Niemira@sandc.com
- j. **iMeet Central** (formerly Central Desktop) is to be used for IEEE Guide/Recommended Practice/Standard documents with a PAR
- k. 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>
- l. 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.
- m. 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

6. Working Group Reports; complete minutes for each WG follow below.

WG/TF #	Name	Chair	Report by
I2	Terminology Review	Mal Swanson	Mal Swanson
I4	International Standards Development	Eric Udren	Eric Udren
I26	Review and Expand Transaction Paper on Mathematical Models of Current, Voltage, and Coupling Capacitive Voltage Transformers	Mike Meisinger	Amir Makki
I29	Revision of C37.110 Guide for the Application of Current Transformers for Protective Relaying Purposes	Joseph Valenzuela VC Michael Higginson	Michael Higginson
I30	Revision of C37.235 Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes	Robert Frye	Robert Frye
I31	P1613 – Standard for Environmental and Testing Requirements for Devices with Communications Functions in Electric Transmission and Distribution Facilities	Brian Mugalian VC: Craig Preuss	Brian Mugalian
I32	A Survey of Protective System Test Practices	Andre Uribe VC: Will Knappek	Will Knappek
I33	Review of Relay Testing Terms	Scott Cooper	Scott Cooper
I35	PC37.2 – Standard for Electrical Power System Device Function Numbers, Acronyms, and Contact Designations	Mike Dood	Mike Dood
I36	Revision of C37.90.2 – Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers	Jeff Pond	Jeff Pond
I37	Revision of C37.90 – Standard for Relays and Relay Systems Associated with Electric Power Apparatus	Oscar Bolado VC: Marilyn Ramirez	Marilyn Ramirez
I38	Revision of C37.92 – Standard for Analog Inputs to Protective Relays from Electronic Voltage and Current Transducers	Robert Frye	Robert Frye
ITF40	Revision of IEEE C37.90.1 – Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus	Roger Whittaker	Roger Whittaker

I41	Revision of IEEE C37.90.3 – IEEE Standard Electrostatic Discharge Tests for Protective Relays	Steve Turner	Steve Turner
ITF43	Investigate response to USA executive order regarding EMP protection	Robert Frye	Robert Frye

I2: Terminology Review Working Group

Chair: M. Swanson

Vice Chair: F. Friend

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

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

September Meeting

Denver, CO

The I2 working group, chaired by Mal Swanson, met on Wednesday, September 18, 2019 with 7 members (including one new member, Masihuddin Mohammed) and 2 guests.

Quorum was achieved and minutes from the May meeting in Cincinnati were reviewed and approved (Roger Whittaker motioned, Tony Seegers 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.

Next meeting will be during the January 2020 JTCM in Jacksonville, FL.

Respectfully submitted,

Fred Friend, Secretary/ VC

Members present:	
Malcolm Swanson	M J Swanson Associates
Fredric Friend	American Electric Power
Matthew Black	Sargent & Lundy
Masihuddin Mohammed	Amped I
Claire Patti	Portland General Electric
Tony Seegers	Ameren
Roger Whittaker	none
Guests present:	
Daniella Martinez	IEEE
Malia Zaman	IEEE

I4: INTERNATIONAL STANDARDS DEVELOPMENT WORKING GROUP

Chair: Eric A. Udren

Vice Chair: Normann Fischer

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

Established: 1990

Expected completion date: Meetings are continuing

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

The WG met on September 17, 2019 with 6 members and 2 guests to review IEC TC 95 standards activities. There were no comments on the May 2019 minutes; not a quorum to vote them. Principal circulated documents and discussion points were as follows:

- 95/418/CD – IEC 60255-26 Edition 4, EMC requirements – This committee draft is a rollback from a former CDV (voting draft) due to technical changes required – the biggest being the addition of an annex giving advice and requirements on how to set protection functions during listed tests. The test report must document how the functions were set so that the record will show if recommended criteria were followed (e.g. setting a tripping function close enough to pickup considering measurement error to expose vulnerability). The US will comment this week on clarity for testing of non-relay protection communications devices, and other comments from experts.
- 95/418/CD - 60255-1 Ed.2, *Common requirements* – the prior CDV was rolled back to CD due to technical changes and received US comments submitted September 13. There is now advice for setting and energizing relays under test as in 60255-26 above. The US requested that products with communications ports for process input data are able to be compliant with either IEC 61850 or with non-IEC/proprietary communications services and protocols.
- WG2 (was AHWG 3) - Use cases of digital sampled values (e.g. from merging unit in switchyard) instead of analog inputs - PSRC HTF47 is soon to get insight on the initial draft contents of a technical report (TR) on the use cases. WG2 and HTF47 have agreed to collaborate to drive towards unified industry guidance.
- 85/681/NP - New work item proposal on 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 85 was interested in protection applications and product standards but has gotten no international support for this expansion of its scope. TC 95 has requested a JWG for a functional standard.

Murty Yalla's update on TC 95 developments from MT4 Vienna meeting March 13-15:

- 60255-187-1: *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – going to final draft international standard (FDIS) for international vote of acceptance in September.
- IEC 60255-187-2: *Functional requirements for busbar differential protection* - Still in draft review, with recent changes in CT sections inherited from 187-1.
- 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. Focus is presently on communications topics.
- 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 standard development teams MT2, 3, 4 and WG2 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.

I26: MATHEMATICAL MODELS OF INSTRUMENT TRANSFORMERS

Chair: Mike Meisinger (S&C)

Vice Chair: Steve Turner (Arizona Public Service)
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.

MINUTES FOR WORK GROUP I26

MATHEMATICAL MODELS OF INSTRUMENT TRANSFORMERS

Held on September 27, 2019 in Denver, Colorado

Writing assignments were tasked to Amir Makki and Steve Tuner for the JA algorithm, Professor Meliopoulos for merging units and Rich Hunt for optical CTs. Steve Turner will work with the PSRC officers to create a website to store data for this working group.

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.

Meeting Minutes, Denver, CO, Wednesday, Sept 18, 2019, 10:40 am – 11:50 am

I-29: Guide, C37.110 Guide for the Application of CTs for Protective Relaying Purposes

Chair: Michael Higginson acting Chair for J. Valenzuela

Vice Chair: Jeff Long acting Vice Chair for M. Higginson

The Working Group I-29 met on Wednesday, Sept 18, 2019 in Denver, CO in a single session chaired by M.

Higginson (who was acting as Chair for J. Valenzuela) with a total of 36 attendees, (6 members and 30 guests). Quorum was not met and the minutes from the last meeting could not be approved at this time.

The patent slides were reviewed and no concerns or comments were raised.

The Chair reviewed the results of the open balloting and a plan was developed for reviewing and answering all 359 balloting comments.

It was agreed that J. Valenzuela, M. Higginson and J. Long would meet in a web session to perform a cursory review of all the comments and develop a method for dividing the comments into groups. The Chair will then announce a time to the Working Group to plan and meet in an online web session to review and assign task groups to respond to the comments. Meeting agenda and dates to be determined and distributed to the Working Group later.

A general review of balloting comments ensued which developed the following questions/tasks:

- 1) Need to ask IEEE SA for guidance on balloting comments for “Guides”
- 2) Need to work with WG I2 liaison for assistance on definitions, for example:
 - a. Saturation Factor: SF vs SF’
 - b. Are “Notes” not appropriate in the Definitions section of the Guide?
- 3) Need to consult with Mike Thompson of SEL for assistance on Saturation Voltage section
- 4) Need to refer to updated C57.13 to review the calculations for saturation voltage

The meeting was adjourned.

For next meeting, we would request a single meeting session with room for 40 and a computer projector.

The following working group members were in attendance:

Name	Company / Affiliation	Membership Status
Deronja, Alla	American Transmission Company	Voting Member
Higginson, Michael (Chair)	S&C Electric Company	Voting Member
Knapek, Will	Omicron	Voting Member
Lane, John	PowerGrid Engineering	Voting Member
Long, Jeff (Vice-Chair)	Siemens Energy	Voting Member
Niemira, Jim	S&C Electric Company	Voting Member

I-30: REVISION OF GUIDE FOR THE APPLICATION OF ROGOWSKI COILS USED FOR PROTECTIVE RELAYING PURPOSES, C37.235

Chair: Robert Frye

Vice Chair: Vacant

Output: Revise C37.235

Established: 2015

Expected completion date: 2021

Output: Revised version of C37.235

I-30 met on Tuesday, September 17, 2019 with one member and eight guests. A quorum was not obtained.

The patent slides were reviewed and no concerns were expressed.

The meeting minutes from May 2019 could not be approved and will need to be approved through email.

Vice Chair Robert Frye notified the group that Mr. Kojovic had retired as Chair since the May meeting and that Mr. Frye would be assuming the role of Chairman. In addition, the new Chairman discussed the low meeting attendance and attempted to recruit new members.

The Chair provided an update on the balloting process of our document and also provided a review of balloting in general for the meeting attendees.

We are on Draft 08_final of the document.

We will need a room for 20 personnel and a computer projector for our next meeting.

This meeting should not conflict with ITF-43 due to Chair of I-30 being the chair of ITF-43.

I31: IEEE STANDARD FOR ENVIRONMENTAL AND TESTING REQUIREMENTS FOR DEVICES WITH COMMUNICATIONS FUNCTIONS USED WITH ELECTRIC POWER APPARATUS

Chair: B. Mugalian

Vice Chair: Jerry Ramie

Secretary: Craig Preuss

Output: Standard

Draft: 1.6

Established Date: 05-Feb-2016 (PAR approval date)

Completion Date: 31-Dec-2020

WG I31 met September 18, 2019 9:20-10:30 am Denver, CO USA with 12 local participants and 1 remote participant (shown below).

The working group chair called the meeting to order at approximately 9:20 am local time. A quorum was announced (9 of 18 members present).

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

A motion to approve the May 2019 meeting was made by Jerry Ramie and seconded by Mike Dood. The motion carried unanimously via voice vote.

The chair indicated that the PAR has been moved to the PSRC. There was discussion about coordinating with other groups within the PSRC. The chair mentioned that I subcommittee will be forming a subgroup of C37.90 series and 1613 for harmonization efforts. An action item is for the chair to put together a table of all five groups. Additional discussion took place regarding coordination with other committees in the

PES and even some subcommittees. The EDPG is another group. There was discussion that all five groups in the I subcommittee need to work together.

Jerry Ramie made a motion contact other committees and subcommittees with related scope to determine their level of interest in the current 1613 draft. Mike Dood seconded the motion. The motion carried unanimously via voice vote. Malia Zaman from IEEE-SA will coordinate with Erin Spiewak; Brian Mugalian will coordinate with 4 other I working groups. It was mentioned that a liaison is needed first before sending a draft.

The draft was reviewed, need to look at damp heat and non-condensing tests in draft.

Jeff Burnworth agreed to research IEC 60255 ingress and climatic areas and report back his evaluation.

The meeting was adjourned at approximately 10:10 am local time.

The attendee list is below.

Attendee List

Members	
Mike Dood	SEL
Marc Lacroix	eMcREY
Brian Mugalian	S&C
Craig Preuss	Black & Veatch
Jerry Ramie	ARC Technical Res.
Fred Friend	AEP
Claire Patti	PGE
Mark Simon (remote)	Consultant
Jay Anderson	ComEd
Guests	
Louis Garavaglia	G&W Electric
Jeff Pond	National Grid
Marilyn Ramirez	Power Grid Engineering
Jeff Burnworth	Basler Elec. Co.

I32: A SURVEY OF PROTECTIVE SYSTEM TEST PRACTICES

Chair: Andre Uribe

Vice Chair: Don Ware

Established: May 12th, 2015

Expected Completion Date: September 2018

Scope: 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, September 18, 2019, 9:20 am –10:30am, Gold Coin Room, Denver Hilton, Denver, CO, USA

- Short meeting to update member on status.
- Survey draft was approved by I-subcommittee.
- Survey now needs approval by Main Committee officers.
- Survey will then be sent to IEEE for publication and distribution.
- WG will have next meeting when results are returned and will write final report.

Meeting Adjournment at 9:30 am

Attendee List:

Full Name	Company	M/G
Angelo Tempone	Duke Energy	M
Anthony Newman	Ameren	M
Duane Buchanan, PE	Power Grid Engineering	M

Will Knapek	Omicron	M
George Moskos	Eversource	G
Sughoooh Kulee	Megger	New Guest Request Membership
Adrian Zvarych	Power Grid Engineering	New Guest
Gary Stoedter	MidAmerican Energy Co	New Guest
Jonathan Sykes	SEL	New Guest
Zach Zaitz	Xcel Energy	New Guest

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: 1.9

Assignment: Review the various definitions of relay testing terms and develop a Report with formal definitions in order to help eliminate any confusion. The Report will also be used by I2 for inclusion in the IEEE dictionary.

- a) Name of group: Working Group I33
- b) Date and location of meeting: Tuesday, September 17, 2019 In Denver, CO
- c) Officer presiding, including the name of the secretary who wrote the minutes: Scott Cooper presiding, Hugo Monterrubio recording minutes
- d) Meeting participants, including affiliation, and voting member status at the end of the meeting
 1. Scott Cooper, Omicron, Chair
 2. Hugo Monterrubio, Beckwith, Vice Chair
 3. Jack Jester, Delaware Electric, Member
 4. Eric Monson, Sargent and Lundy, Member
 5. Sughosh Kuber, Megger, Guest
 6. Will Knapek, Omicron, Member
 7. Silviu Boanta, B&V, Guest
 8. Lous Garavaglia, G&W , Guest
 9. Akram Saad, Patterson Power Engineers, Member
 10. Lue Hankins, Synchrogrid, Member
 11. Don Ware, Power Grid Engineering, Member
- e) Call to order, Chair's remarks
- f) Reminders of IEEE policies, such as Patent policy and Copyright policy: NA
- g) The fact that a Call for Patents occurred and any responses made to such Call: NA
- h) Approval of minutes of previous meeting: No Quorum
- i) Approval of agenda: Was not approved this time
- j) Technical topics
 - 1) Brief summary of discussion and conclusions
 1. Remaining definitions on the list were agreed upon
 - 2) Motions exactly as they are stated, including the names of mover and seconder and the outcome of each motion: NA
- k) Action items
 1. The group will be working on formatting results into a report
- l) Items reported out of executive session
- m) Recesses and time of final adjournment: 10:30AM
- n) Next meeting - date, time, and location: TBD, Jacksonville FL

Respectfully Submitted
Scott Cooper, I33 Chair

I35: STANDARD FOR ELECTRICAL POWER SYSTEM DEVICE FUNCTION NUMBERS, ACRONYMS AND CONTACT DESIGNATION

Chair: Mike Dood

Vice Chair: Marc Lacroix

Output:

Completion Date: End 2020

Version no: N/A

I35 met September 18, 2019 Denver, CO USA with 6 members and 2 guests.

We had quorum

The patent slides were shown to the participants.

No concerns were expressed in the meeting

The agenda was approved.

Minutes of January 15, 2019 were approved

Minutes of May 8, 2019 were approved

The members list was reviewed based on the latest meetings.

Now the group has 10 members

We discussed the status of the project. The plan is to complete the draft for ballot in the next 2 months.

We will then send it to SA for MEC and start the forming the ballot pool. We will ask I for approval to go to ballot at the JTCM.

We learned the following about conference call meetings:

- If official decision are to be taken, the meeting should be announced at least 15 days in advanced
- No such requirements for informal meeting

The latest version of the document was uploaded on iMeet Central and available to all members.

New business

- Addition of terminal server in device 16
 - The suffix will be T. Common usage will be TE. Group did not feel we need to create a drawing in Appendix B to further describe it.
- New function acronyms
 - Proposal to add:
 - TW – Travelling waves
 - TWFL – Traveling wave fault locator
 - FL – Fault Location

The group felt that the addition of TW and TWFL is specific technology and does not need to be defined in this standard. We do feel that we need an acronym for fault location. The choice is FLOC.

- We had a proposal to add PIU – Processing Interface Unit to replace merging unit with PIU – We could not find a strong use of this acronym in the industry and will stick with MU and RIO for these functions.

Next face-to-face meeting will be in January at the JTCM.

Attendees list is below.

Members	
Mike Dood	SEL
Marc Lacroix	EMCREY Canada
Eric Thibodeau	Gentec

Oscar Bolado	ZIV
Tim Farror	TRC
Ed Cenzon	SEL
Guests	

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

Chair: Jeffrey Pond

Vice Chair: Jeff Burnworth

Established: September 2017

Output: Revision of IEEE Std. C37.90.2

Expected Completion date: September 2020

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, Sept 17, 2019, at 3:40pm in a single session with 12 attendees.

After introductions, the IEEE patent slides were reviewed. No patent issues were identified.

A quorum was not met, so the minutes from the May 2019 meeting could not be approved. Approval of minutes will be requested through email.

A request was made for volunteers for the positions of Chair and Vice-Chair of the working group. Both Jeff Pond and Jeff Burnworth will no longer be routinely attending meetings after 2019. Chase Lockhart volunteered to become Vice-Chair to replace Jeff Burnworth.

The proposed title change, scope and purpose were discussed for revision, in order to coordinate with other IEEE C37.90 documents and IEEE 1613.

The chair will prepare Draft 2 of the standard, the Scope and Par for review at the January meeting.

The meeting was adjourned.

Submitted by Jeff Burnworth

I37 – REVISION OF C37.90 STANDARD FOR RELAYS, RELAY SYSTEM ASSOCIATED WITH ELECTRIC POWER APPARATUS

Chair: Oscar Bolado

Vice-Chair: Marilyn Ramirez

Output: Standard

Established Date: 2018

Expected Completion Date: December 2022

Draft: 2.0

Working Group Meeting No. 6

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

Working group C37.90 met on Tuesday, September 17th at 1:00 PM with 3 out of 9 members and 12 guests present. Quorum was not met.

The following items were discussed:

- 1.Meeting agenda was reviewed.
- 2.Minutes of the May meeting were reviewed. There was no Quorum to approve the meeting minutes.a.May minutes will be approved via e-mail.
- 3.Scope of C37.90 and 1613 were reviewed.
 - a.A meeting will be schedule to discuss the scopes of all four C37.90 documents including the latest draft of 1613 and the best way to harmonize these five documents.
 - b.After this discussion a revised PAR will be submitted.

With no additional business to discuss the meeting was adjourned.

138: 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: May 2021

Draft: N/A

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

The working group met September 18, 2019; Denver, CO, with 5 members. A quorum was achieved. No patent concerns, no copyright concerns. The meeting minutes from May 2019 meeting was approved by all 5 members, none opposed.

Lubomir and Charlie are retiring from membership. Ritwik to chair the working group from the next meeting, Eric to continue to be the vice-chair.

61689-13: Standalone merging unit analog input requirement. Rich Hunt will look and provide feedback.

Proposal: A revision for C37.92 is the path forward. Focus on applications such as RTDS, optical transformers and test sets. Revise standard to achieve compatibility with IEC standards such that rationalization. Throw away all obsolete information. Revise standard to support the applications specified.

Motion made and accepted by all 5 members for the proposal.

Mark Adamiak – Talk about a list of use cases and add a new use case for TW applications.

Revise wording from an “input” standard to an “interface” standard since both output and input devices need to talk to each other.

ITF40: REVIEW OF IEEE C37.90.1 – STANDARD FOR SURGE WITHSTAND CAPABILITY (SWC) TESTS FOR RELAYS AND RELAY SYSTEMS ASSOCIATED WITH ELECTRIC POWER APPARATUS

Chair: Roger Whittaker

Vice Chair: Todd Martin

Established: September 2018

Output: Review for revision IEEE C37.90.1

Expected Completion date: Dec 31, 2022

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, September 17th at 2:20pm in a single session with 14 attendees that included 7 voting members. A quorum was achieved.

Chair called meeting to order.

After introductions, the IEEE patent slides were reviewed. No patent concerns were identified

Minutes from the May 2019 meeting in Cincinnati, OH, were reviewed and approved. Motion to approve minutes by Brian Mugalian and seconded by Jerry Ramie.

It was discussed that PAR is being postponed until scope and purpose of C37.90, C37.90.1, C37.90.2, C37.90.3, and P1613 are rationalized to each other. Brian Mugalian is going to discuss this at the committee meeting to arrange the meetings. The goal will be to have scope and purpose work done in time to have PAR approved by January meeting. The deadline to submit PAR is December 3rd.

The need to get various IEEE and IEC standards. Roger W. is going to work to get the standards. Standards include IEEE C37.90.1, IEC 60255-26, IEC 61000-4-5, and IEC 61000-4-18

The just starting task force ITF43 concerning EMP (Electromagnetic Pulse) hardening was discussed. This working group will continue as originally planned independent of ITF43 effort.

Meeting adjourned.

Action Items:

Brian Mugalian – Arrange meetings to work on bringing scope and purpose of C37.90, C37.90.1, C37.90.2, C37.90.3, and P1613 into harmony with each other
Roger Whittaker – Contact IEEE-SA to get needed IEEE and IEC documents
Next meeting will be January, 2020 in Jacksonville, FL.

I41: 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

MINUTES FOR WORK GROUP I41 Held on September 28, 2019 in Denver, Colorado

We reviewed the PAR which is to be rewritten. Steve Turner must join the IEEE Standards Organization, iMeet, MyProject and request the Word document for this standard along with IEC 61000-4-2 and IEEE C63.16. We will create a new purpose which is to be Section 2. Jerry Ramie and Steve Turner will work together to incorporate some new material.

ITF43: INVESTIGATE RESPONSE TO USA EXECUTIVE ORDER REGARDING EMP PROTECTION

Chair: Robert Frye

Vice Chair: Not assigned

Output: TBD

Established Date: May 2019

Expected Completion Date: May 2020

Draft: NA

Assignment: Investigate need for a Working Group to develop a report or other response by the PSRC to USA Executive Order on hardening of critical infrastructure against E.M.P.

Task force ITF43 met in a single session on Tuesday September 17, 2019 with 29 attendees, 16 of which expressed a desire to become a task force member.

This was the first meeting of the task force.

Introductions were made.

The Chair reviewed IEEE-SA patent slides and IEEE copyright policy, and no patent or copyright concerns were voiced.

The Chair made a presentation titled “EMPs and Where the Protection & Control Industry is Today”.

There was some discussion regarding damage to control cables and power transformers. Present thinking is that E1/E2 may damage cables, while E3 could damage power transformers.

Focus on the control building itself, not the ground mat.

Question if Substations Committee has similar effort? Also EMC Society?

Suggestion was made to query manufacturers of secondary equipment to see if they are considering EMP protection as well.

Engineered low impedance path to ground plane to make sure voltages dissipate, not build.

Recognize skin effect - hard bends in grounding conductors - great for step/touch, but not for high frequency transients (lightning can damage foundations).

How to test whatever systems are developed for EMP hardening? C37.90 series will need to address.

Recommendation from Chair is to form a single working group to produce a single document to address:

- Provide guidance on control building hardening
- Provide guidance on ground system hardening in control buildings
- Provide guidance on control and protective cable hardening

Question was asked on survivability of electronics -- answer -- this document is to provide recommendations for 100% protection of equipment under the scope of PSRCC.

Recommendation was given that PSRCC offices should communicate to PES that PSRCC representation is required in meetings with DOE, NERC, EPRI, etc. The PSRC process, especially the IEEE-SA process that C37.90 would be under, would not be fast enough to address the issues.

Tapan Manna offered a brief presentation titled "EMP Threats on U.S. Power Grids". This presentation will be made at a future ITF43 meeting (January 2020 PSRC meeting).

No scope for a proposed working group was developed at this meeting (will be done in the future).

There was some discussion of holding conference calls to develop a scope prior to the January 2020 PSRC meeting. The point was made that development of this scope should not be limited to the attendees of this first meeting, should be open to the entire PSRC. Others stated better to start with something. The Chair stressed this would be done under PSRC rules.

7. Liaison Reports

a. Instrument Transformers– 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 their work:

Approved New Standards

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

Pending PAR Approvals

PC57.13-2016/Cor 1 Standard Requirements for Instrument Transformers

b. Transformers Committee– 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 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 800Y V 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

In development

P57.19.02 IEEE Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers

8. Old Business

- a. Creation of new Task Forces for IEEE standards expiring in 2022, and 2023
 - i. New spreadsheet from Don Lukach

9. New Business

- a. Standards governance discussion led by Mike Meisinger
 - i. Can two or more standards simultaneously apply to the same device, i.e., IEEE P1613 & C37.90?
 - ii. Is the C37.90 family of standards restricting their devices to areas of our governance?
- b. Form a Sub-Group with a minimum of the five working group officers and interested parties to harmonize title, scope, and purpose of P1613 and the PC37.90 series documents
- c. Draft of scopes and purposes to be created for the WebEx/Skype calls
- d. Will Knappek – Motion to form ITF44 task force to investigate and write a report on skill sets required by relay test technicians for setting, commissioning, and testing relay systems, given new technologies such as IEC 61850. Second by Meisinger. PASSED

- e. Leadership is needed for several WG due to impending retirements or job changes. Chase Lockhart volunteered for VC/Secretary of I-30 and I-36. Other volunteers are needed for Chair positions. Please contact Brian Mugalian or Jim Niemira if interested.

10. Motion to Adjourn Meisinger, second Monterrubio; Motion passed. See you in Jacksonville in January 2020!

Respectfully submitted,
James K. Niemira, PE
Vice-Chair, I-SC, IEEE/PES PSRC
October 22, 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 16 out of 30 members and 28 guests, reaching quorum.
May 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: 22th 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

No report – The balloting is completed

J12: Improved Generator Ground Fault Protection Schemes

Chair: Dale Finney

Vice Chair: Manish Das

Established: Jan 2013

Output: Report to subcommittee

Status: 21th Meeting

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

WG Report

The group met on September 18th, 2019 in Denver with 5 members, and 15 guests in attendance.

No issues with meeting minutes.

Subcommittee ballot sent out.

Review of subcommittee comments:

Will English's comments requiring follow up/action-

- Derrick Haas and Ritwik Chowdury to review Table 2 Example system parameter calculations.
- Wayne Hartman and Will English to revise sentence related to real/reactive vs. total current for sub-harmonic injection.
- Dale will correct reference and paragraph number for IBR protection and check on how/if we can directly quote several sentences of a paragraph.
- Dale to revise calculation and Figure 13.
- Dale to add units on equations associated with Figure 15.
- Figure 16 will be reviewed for correctness.
- Dale to add comment to refer to improved timer logic on dropout times.
- Dale to revise Figure 28 and text to remove upper and lower designations. Dale will split Figures.
- Dale will take Figure 30 and redraft it as a Table, and update Figure numbers
- Ritwik to help with editorial work above.

Remaining ballot comments will be addressed at the next meeting.

The working group will have its 20th meeting in Jan 2020,

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 one session with 9 members and 20 guests present. A quorum was not achieved.

The working group will approve minutes of the May 7, 2019 meeting by email.

Juan Gers reported on the August 8, 2019 PSDP meeting in Atlanta at the PES General Meeting. Juan provided a 10-minute presentation summarizing the paper and PSDP concurred with the content of the report.

Juan Gers provided a summary of the WebEx session on July 31 at which attendees reviewed changes to the document to address working group ballot comments.

Juan reviewed the remaining open issues on the report:

- Phil Tatro will run a transient stability simulation to supplement the discussion in Section 1.5 regarding setting the generator phase distance element, using the same generator parameters used for the static setting calculations.
- Juan Gers will work with Mike Basler to provide clarification on open items regarding excitation systems and power system stabilizers for which members requested additional clarity.
- Juan Gers will try to contact Bob Pettigrew for additional information regarding Figure 68.
- Juan Gers and Phil Tatro will redraft a paragraph in Section 8.0 regarding the potential of obtaining different relay settings results when applying IEEE guidelines compared to those stated by NERC.

The next draft of the report, addressing the remaining open issues, will be presented to the working group and discussed during a WebEx session by the end of October, with the objective of submitting the report for J Subcommittee balloting prior to the January 2020 meeting.

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: 16th Meeting

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

WG Report

The meeting was cancelled since there was only one member and one guest in attendance. The report is currently being balloted by the subcommittee.

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

Chair: Wayne Hartmann

Secretary / Vice Chair: Joseph Valenzuela

Established 2015 (1/15)

Output: Report (D2)

Status: 14th Meeting (190917)

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

Activity:

1. The Working Group (WG) met September 17th, 2019 with 16 members and 4 guests.
2. Will English performed Vice Chair duty for this meeting.
3. The WG assignment was reviewed as well as a brief history of WG activities.
4. The WG partially reviewed “Types of Oscillographic Triggering and Use for MBY Current and Torque Ratio Study”

WG Assignments:

Note for comments use “track changes” and a comment bubbles

1. Assignments:

Note: These are that same assignments as made in the May 2019 Meeting

- A. Assignment: Review Types of “Oscillography Triggering and Use for MBT Current and Torque Ratio Study”
 - a. Jason Espinosa
 - b. Mani Sankaran
 - c. Molson Parvin
- B. “MBT Field Data from MV Buses”
 - a. Dale Finney
 - b. Mani Sankaran
 - c. Prem Kumar
- C. “Modeling Results for MBT Modelling Team A”
 - a. Doug Weisz
 - b. Nate Klingerman
 - c. Ryan Carlson
- D. “Modeling Results for MBT Modelling Team B”
 - a. Jason Espinosa
 - b. Mani Sankaran
 - c. J.C. Theron

Assignments due on December 2, 2019, so Chair can create Draft 3.

Chair to issue Draft 3 before the next WG meeting.

Adjournment

WG Report

J16: PC37.101, Guide for Generator Ground Protection

Chair: Nate Klingerman

Vice Chair: Sudhir Thakur

Established: 2016

Output: Guide
Status: 8th Meeting

The group met on September 17th, 2019 in Denver with 10 members, and 7 guests in attendance.

In the absence of both the Chair and Vice-Chair, the J-SC Chair ran the meeting.

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

The J-SC Chair then reviewed outstanding writing assignments as listed in iMeetCentral:

- Steve Turner and Doug Weisz volunteered to review Section 6 Grounding Methods
- Ratan Das will review Annex A Stator ground protection for a high-resistance grounded generator.
- Dale Finney/Jason Espinosa/Sungsoo Kim have completed review of High Impedance Grounding - Traditional Neutral Overvoltage
- Legacy schemes – In progress per Kevin Barner
- Schemes on low impedance grounding – in progress per Ryan Carlson
- J-SC Chair will follow up with Vinod Yedidi on “System Provides 3I0”

The WG requests a single session with space for 25 people with a computer projector for January 2020 session. The WG also requests no conflict with other J meetings, especially J17 (C37.102).

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: 9th 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

The group met on September 18th, 2019 in Denver with 17 members, and 17 guests in attendance. Quorum was not achieved. The May minutes will be approved by email.

In the absence of the Chair, the Vice-Chair ran the meeting.

Minutes were reviewed.

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

Annex A comments were reviewed as follows:

Subclause A.2.1 Stator Ground Fault Protection: (1) At Ritwik Chowdhury's suggestion, there was a discussion on which elements to include to provide 100% ground fault protection. It was concluded that the 64S should be the one to include in the C37.102 guide and that the C37.101 could cover third harmonic schemes. (2) Dennis Tierney offered to provide actual third harmonic measurement which could be used in C37.101 sample calculation.

Subclause A.2.9 System Backup (21): Per Ritwik Chowdhury's comment, Murty Yalla and Doug Weisz will check the load encroachment of the backup distance function basic calculation shown in the Annex A subclause A.2.9.

Subclause A.2.11 Abnormal Frequency (81): (1) Per Ritwik Chowdhury's comment, Phil Tatro will review subclause 4.5.8.1 with Annex A subclause A.2.11 and review the sample calculation for frequency protection to make sure regulatory requirements and UFLS scheme coordination are adequately addressed. (2) Doug Weisz asked about supervision of the 81 functions (e.g., blocking 81O/U with machine off-line, blocking 81O/U until machine is loaded, etc). The group agreed that this is a good idea to address this. However, this should probably be added to the body for each individual element rather than the annex example.

Subclause A.2.13 Stator Thermal Overload (49): Doug Weisz reviewed this new section. There was some discussion over making sure this agrees with C50.13. A point was made about the ability to implement thermal models in microprocessor relays. Dale Finney offered to send related math models he has developed. The group agrees the background material in this subclause should be moved to the main document subclause 4.1.1, with only the sample calculation in A.2.13 (Doug Weisz will handle this).

Figures: (1) Regarding Figure A.2, Jason Espinosa and Murty Yalla pointed out we should add the resistance, time rating, and wattage for the neutral resistor, which is important for setting the 59 delay. The kVA rating for the neutral transformer should also be added. (2) The team working on Figures in the main document is not working on figures in the Annexes. They will need to be provided with the raw files so they can be edited for consistency. (3) Jason Espinosa asked about the naming for the transformers ("Auxiliary Transformer", "Unit Transformer") in Figure A.2. He will check the document for consistent nomenclature of equipment, specifically subclause 3.4.2, Figure 7. (4) In Figure A.2, the delta and wye symbols should illustrate correct phasing of HV/LV for ANSI standard transformers. (5) In Figure A.2, Jason Espinosa asked about adding the MVA rating for the Auxiliary Transformer. The group agreed this would only be necessary if the rating was needed for the sample calculation. It was noted this same sample machine is being used for C37.101 and C37.106, and C37.106 does use the Auxiliary Transformer MVA rating, so it will be added. (6) In Figure A.2, Jason Espinosa asked if the Unit Transformer high-voltage rating was the base rating of the connected system or the tapped voltage rating of the Unit Transformer itself. The group developing the sample machine will be consulted to answer this question. (7) It was noted the Unit Transformer impedance should be 7.5% on the Unit Transformer MVA base (not 0.0075pu). (8) Jason Espinosa asked about the naming for the system impedances. After some discussion, the group agreed to leave them as "Strong" and "Weak".

The WG requests a single session with space for 40 people with a computer projector for January 2020 session. The WG also requests no conflict with other J meetings, especially J16 (C37.101).

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_20110509.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

<u>Subclause</u>	<u>Description</u>	<u>WG Member</u>
<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:

<u>NERC Document</u>	<u>Assignees</u>
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 Rusicior
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 Rusicior
PRC-025-1 Generator Relay Loadability	Sudhir Thakur, Ritwik Chowdhury
PRC-026-1 Relay Performance During Stable Power Swings	Meyer Kao

NERC PRC standards:

<http://www.nerc.com/pa/stand/Pages/ReliabilityStandardsUnitedStates.aspx?jurisdiction=United%20States>

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

<u>J Publication</u>	<u>Status</u>	<u>Assignees (WG Chair/Vice Chair)</u>
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: Jared Mraz

Output: Report

Established: September 2017

Status: WG

WG REPORT

ATTENDANCE:

Total 27; Guests 12; Members 15

OVERVIEW:

Rene Midence (Vice chair) let the chair know that he may not be able to attend meeting on a regular basis and therefore, cannot meet the responsibilities of a vice chair. Jared Mraz, from power engineers graciously accepted the invite to be vice chair for this working group and will be vice chair for this working group going forward.

The chair has been collecting papers that discuss SSCI and SSTI which are available for WG to review, these will be kept in a repository in the IEEE. The location is still to be determined but WG members and guest will have access to the repository. All working group members agreed to review the papers to better understand SSCI and SSTI effects on systems and provide notes back to the working group which will be used to craft the final report for the working group. Working group members were encouraged to upload any additional papers they are aware of related to SSCI and SSTI.

The working group discussed the scope of the J18 report. The scope of the report will be limited to SSCI and SSTI effects on machinery. It is not in the scope of the report to determine appropriate mitigation techniques. SSR is not in scope of the report but if SSR is a precursor to SSCI or SSTI this will be discussed.

High-level outline:

Define the problem

- Identify the impacts of these phenomena on conventional generators

- Identify the impacts of these phenomena on other system components

The Chair gave a presentation which resulted in substantial group discussion. He presented SSCI and SSTI cases that need to be understood by the WG. Damage due to SSTI is cumulative. Damping can be added to mitigate SSCI and SSTI but will need to be modified as and when the power system changes. Type 4 WTG are less prone to cause SSCI or SSTI issues but the bulk of the WTG installations in the US are Type 3 WTG. Furthermore, IBRs from various vendors behave very differently.

Low SCR ratio can result in type 3 WTG going out-of-step.

The chair presented simulations that showed the current injected by the inverter not matching frequency of the power system. Therefore the voltage and current rotate with respect to each other.

Bob Cummings from NERC expressed concerns in identify situations where SSCI and or SSTI could have a very wide impact on the system

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

Chair: Ritwik Chowdhury

Vice Chair: Jason Espinosa

Output: Guide**Draft: 3.0****Established: January 2019****Status: 3rd 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

WG REPORT

The working group met with 10 members (out of 14 total members), 4 non-voting members and 7 guests. A quorum was achieved. The meeting minutes from May 2019 meeting was approved (Jason motioned and Sungsoo seconded).

- Raju noted that we include excitation transformer in the overexcitation capability coordination. The WG decided that we will keep only one UAT transformer curve in the Annex but add some verbiage that indicates that the UAT curve in the Annex refers to all non-GSU transformers (one or more UAT, excitation transformer etc).
- Dennis Tierney indicated that 81ACC has many problems. One of them being that it accumulates during testing. The WG indicated that there are ways to reset the scheme accumulation values after testing.
 - **Zeeky** will follow up and check what he can find about accumulator over-speed schemes (using speed instead of a frequency quantity) that reside in the turbine monitoring and control system or within the AGC. in the governor control system.
 - **Zeeky, Jason and Ritwik** will also soften the wording and indicate an ALARM from this function. Also indicate the accumulation to only take place when the generator is online. We do not want false measurements in the accumulation.
 - **Zeeky and Jason** will follow up on associated abnormal frequency (excursion from rated frequency) schemes.
- The WG liked Jason's suggestion to add a hydro example in the Annex due to the differences based on the slower governor control system
- **Ritwik** will add the user defined 24 Annex C (1 page approx) and the WG will review at it in future meetings
- We will keep Figure 7 but add some scale to address the issue pointed out previously. This is due to it being referenced later on as well, not where the figure is introduced. **Ritwik, Jason and Vinod** to follow up.
- **Jason and Vinod** will add verbiage for Fig. 8 to describe the resonant coincidence of the harmonics with the natural torsional frequencies. This is likely to help clarify a comment from the previous revision of the guide.
- The verbiage that indicates damping refers to system damping. **Ritwik** will follow up on the reference provided by Vinod to clear up any confusing verbiage.
- **Doug, Jason, Steve and Manish** will continue to work on Annex A. This will also help revise Figure 6 a bit.
- **Steve, Kelvin, Daniel and Jean** will work on Annex B. Jean wasn't present during the meeting, the chair suspects he may have interest with helping which Daniel and the chair will communicate to Jean.
- Vinod has started working on the figures already. **Vinod, Dale and Derrick** to continue making progress on the figures (visio)
- Dennis Tierney brought up an issue where there is a consistent chatter in the SOE on 24 during his units coasting down to around 85%. This is much earlier than they reach turning gear. Ritwik mentioned that the 24 chattering probably makes sense given that the frequency is low, and the voltage is still near the overexcitation limits (Dennis doesn't know how close given that we only have a binary SOE, no analog data). This has only once resulted in a trip, but usually it is nuisance SOE chatter. Ritwik indicated that the 24 reset is typically not thermal in nature and is a drop-out without any delay. When manufacturers provide the

over-excitation curve, it is how long it takes to heat but nothing related to how long it takes to thermally reset. We explored the ideal of an integrating timer, similar to what is now being used for ground fault protection (except with better reset capability). Unfortunately given the lack of a reset curve, we are not certain what we can do. Ritwik will talk to the working group in the future to see if instead of a timer with a zero drop-out delay, it makes sense to have some level of reset protection for the 24 given that it is thermal in nature.

J20 Practices for Generator Synchronizing Systems

CHAIR: Jason Espinosa

VICE-CHAIR: TBD

Output: Report

Established: January 2019

Status: WG (1st meeting 20190508)

WG Report

J20 met with 10 members and 9 guests in attendance

We reviewed the Out-of-Phase Synchronization Paper written by Nate, Kelvin, Mike, Ritwik, and Dale

- Went over the (OOPS) scheme developed by Kelvin/Nate
- Discussed possibility of loss of current zero during OOPS events and the different current characteristics between a generator breaker connected on the LV side and HV side of the GSU.
- Discussed circuit breaker pole scattering when a breaker has a close event

There was some discussion on the worst-case synchronizing angle

- From an electrical perspective, the worst-case scenario is closing at 180 degrees out of phase since this will expose your equipment to the highest current magnitude
- From a mechanical perspective, the worst-case scenario is closing at 120 degrees out of phase since this will expose the turbine to the highest torque magnitude
- We are going to try to get a switchgear expert to present breaker ratings and how these angle closures may impact them

A presentation was given on real world out-of-phase synchronization events

- The entity did not have a synchrocheck relay or a way to record synchronization quality
- From the events, the entity used a methodology to back calculate the angle of closure to identify the operation was a synch failure

We discussed the usage of zero/negative slip for synchronization of a diesel generator

- It was discovered that an entity may use this philosophy based on operational requirements

JTF1 - Investigate Need for Motor Protection Tutorial

CHAIR: Kelvin Barner

VICE-CHAIR: TBD

Output: Formation of a Working Group to develop a tutorial

Established: September 2019

Status: TF (1st meeting 20190918)

Assignment: Investigate need and interest in a motor protection tutorial

Task force JTF1 met for the first time on Tuesday, September 17, 2019.

There were 18 attendees present with 12 prospective members and 6 guests.

The Chair led a discussion to define an assignment statement. The assignment statement that was agreed upon is: "Develop a practical motor protection tutorial based around C37.96. The intent is to aid the reader to develop effective relay settings."

A rough initial outline was also developed.

There was plenty of good discussion on the usefulness of a tutorial and what should be included.

The assignment statement has been submitted to the J Chair for consideration of WG formation.

For the January 2020 meeting, a single session is requested with room for 30 and a projector

Liaison Reports:

Electric Machinery Committee - M Yalla - P1110 Modeling Synchronous Generators & Computer Programs, recirculation ballot closed August 1; WG14 C50.12 Requirements for Low-Speed Generators in Hydroelectric Applications; Grid Code Task Force; other items

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

Nuclear 1E WG - Prem Kumar - Not much changed since May; will modify one standard to include open-phase as Annex, coordinating with PSRCC K11, will include that material

Old Business

C37.101/102/106 overlap -- met Monday Sept 16; groups have already committed to revising the documents; overlap recognized, need for harmonization recognized minimizing overlap; may need to consider at ballot which documents ballot first, which follow. Chair will look into this. Could also use the Generator Protection Tutorial. Three separate documents as Guides, but a single Tutorial. After the three guide revisions complete, may need to revise the tutorial

123Signup - the system works but some may need help. Chair will arrange an on-line Webex to step through basic tasks for WG/TF chairs.

Subcommittee ballots - one in SC ballot now, some coming soon (J13, J14) - SC members must read & respond.

For main committee meeting, no ballots or PAR approvals this meeting.

New Business:

Presentation by Normann Fischer, Avista Staged Fault Testing results, "Lessons Learned from Generator Destructive Testing"

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.

The K-Subcommittee met on September 18, 2019 in Denver, CO with 22 of 32 members and 11 guests in attendance. A quorum was achieved. Jeff Barsch requested a motion to approve the May 2019 subcommittee meeting minutes. Stephen Conrad made the motion, Pratap Mysore seconded. Vote was unanimous to approve.

Advisory Committee and other items of interest were discussed:

Agenda motioned to approve by Mike Thompson and seconded by Abu Bapary. The agenda was then approved by vote.

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 09-17-2019 at 10:40am in the Matchless room. There were 5 voting members, 0 non-voting members, and 9 guests.

1547.2 – Will be meeting in-person Oct 28th and 29th in Milwaukee. The registration link is: <http://www.cvent.com/d/1yqvfx>. Please note a call to action at the K and main committee meeting that the chair of 1547.2 would really appreciate greater input from the PSRC. To get involved please contact Ben Kazimier.

1547.9 –Is holding web meetings for the foreseeable future. Contact Ben Kazimier for information on participating in 1547.9.

A new PAR was approved last week for 1547.3 which has been renamed from, “IEEE Guide for Monitoring, Information Exchange, and Control of Distributed Resources Interconnected with Electric Power Systems” to: “Guide for Cybersecurity of Distributed Energy Resources Interfaces with Associated Electric Power Systems”. This will be a joint effort with the PSCC whose study group SG13 meets on Wednesday. The first in-person 1547.3 meeting is slated for Feb. of 2020, collocated with 1547.2.

A new PAR has been approved for an amendment to 1547-2018. Several ISO’s and thus utilities are having difficulty adopting the standard because of existing protection standards. This is related to the ranges specified for abnormal performance for Category III. The amendment seeks to make 1547-2018 more universally adoptable. This amendment is on a fast track and is expected to complete and be published by May of 2020. The first meeting is a web meeting scheduled for tomorrow Thursday 9-19-19 at 12PM EDT. If you have interest in participating in the 1547-2018 revision please contact Ben Kazimier.

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 3 members, 9 guests, and 0 SC officer in attendance for the September 17, 2019 meeting in Denver, CO.

The minutes from the May 7, 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 7.99 and the over the comments received from the K subcommittee. There was one negative ballot and 11 approved with comments. Charlie went over the changes he had already reviewed. Almost all of the drawings have been redrawn in Visio as several voters commented on how fuzzy many of the figures were.

The working group then went through some of the comments that had not been cleared yet. Draft 8.12 was the result. Additional changes need to be made to the draft.

Once the working group has voted on new draft 8.12 and any issues cleaned up, then the report will be sent to the K Subcommittee for their re-consideration to allow the report to be posted to the PSRC webpage.

K12 PC37.431.20 Guide for Protecting Transmission Static Var Compensators

Chair: Satish Samineni (joint with Subs I9; Subs is the main sponsor)

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.

Subs WG I9 submitted for PAR extension. PC37.431.20 is the new project ref.

PSRC Working Group K12 met on Wednesday, September 18, 2019 with 4 members and 5 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 the May 2019 meeting was reviewed. The meeting minutes will be approved after the meeting through email.

There were no additional items to add to the agenda.

The last known draft of the Guide is 20.2.

The Substation I9 submitted a new PAR on 9-17-2019 to increase the scope of the original proposed Standard 1032: Guide for Protecting Transmission Static VAR Compensators (SVCs) to

include the protection of SVCs, STATCOMs and Hybrid STATCOMS. The new Guide will be renamed as Standard PC37.431.20: Guide for Protecting Transmission Static Shunt Compensators.

Technical topics:

- 1.) Tapan Manna brought the K12 WG up to date on the status of I9's work on the draft guide.

Action items :

- 2.) The I9 WG needs to receive any additional protection comments from K12 so that they can finalize their draft document. Martin Best will get a copy of the latest draft from I9 and distribute it to the K12 WG members for final comments.
- 3.) The I9 WG encourages as many K12 members as possible to participate in the upcoming Webx meetings on 9-24-19 and 10-8-19 from 10-11 AM EST. Martin will find out how to send a link to the K12 members for these Webx meetings.

Recesses and time of final adjournment:11:30 AM, 9-18-19

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.

The meeting was called to order by the chair at 3:42PM on September 17, 2019 at the Hilton Denver City Center, Denver, CO. The working group met with 17 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. Cincinnati – May 2019 Motion Don Lukach, Second Pat Carroll. Meeting minutes were approved at this meeting motion carried by unanimous vote.

Technical topics:

- 1.) Draft 15.1 was discussed regarding comments received from IEEE SA editorial review.

IEEE SA recommended the addition of the word "help" to 'soften' the document legal absolute statements. The working group accepted or made modifications to the received comments to improve the language.

Abstract, keywords and introduction were discussed. The keyword section was modified and will be sorted alphabetically. Modifications to the introduction were made to provide a listing of notable changes in this revision of the guide.

Normative References were also discussed. The working group agreed that the majority of the list should be removed and relocated to the bibliography.

- 2.) Having no more business a motion to adjourn was made by Pat Carroll, second by Brian Boysen, motion carried.

Recesses and time of final adjournment:4:53 pm on 9/17/2019

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

Motion to disband WG by Mike Thompson. Vahid Madanni seconded.

Discussion : good report acknowledgement.

K17 met on Tuesday September 17, 2019 with 17 participants (11 guests and 6 signed members).

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

Chair indicated that the K17 final report was approved by K subcommittee leadership without additional comments. PSRC will post the final report on PSRC website after a technical report number is assigned.

Chair discussed forming a new working group to write a summary paper and a transaction paper. The attending members and guests all supported the new working group with the assignment of writing the summary paper and the transaction paper. Ten of the participants indicated they would like to become the member of the new working group.

If the new working group is approved by the K subcommittee, Qun Qiu is willing to serve as the Chair of the new working group, and Steve Klecker is willing to serve as the vice-chair.

The next steps are to have a meeting to discuss the member's assignment if the new working group is approved.

For next meeting, it is requested a single-session and a meeting room for 20 persons, with AV capabilities. The session time is requested to avoid a conflict with D29, D39, ITF43, H45, H47 and C24 WG sessions

Submitted to the K Subcommittee on September 17, 2019

Recesses and time of final adjournment: 4:40pm 9/17/19

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 WG did not meet in Denver.

PAR extension approved.

MEC completed.

Ballot Invitation started.

Plan to meet in January 2020 to review ballot comments.

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 25 voting members, 2 non-voting members, and 11 non-members.

A motion was made by Mike Thompson to approve the minutes from the May 7 PSRC meeting, June 11 webex meeting, July 10 webex meeting, and August 15 webex meeting. The motion was seconded by Brian Boysen. The minutes were unanimously approved.

Technical topics:

- 3.) Ratan Das asked the WG whether term “tie breaker” should be used for the “middle breaker” of a breaker-and-a-half scheme. A tie breaker ties two power system elements together, typically, buses. The middle or half breaker in the breaker-and-a-half scheme usually ties two lines or a line and a transformer rather than two buses and may not be considered a bus tie breaker. Therefore, there were two proposals concerning the term. One was to remove the definition for tie breaker from clause 3 Definitions since it is already exists in the IEEE Dictionary. The other was to leave the modified bus tie breaker in the Definitions clause and update the guide accordingly. The second proposal was voted for final.

- 4.) There was a comment from Abu Zahid to revise a sentence defining differential protection methods in 7.1 Differential methods as “the sum of the currents into the zone of protection”. Abu proposed to replace it with “... the currents between the incoming and outgoing terminals of the zone of protection”. Apparently, the word “into” may have been thought of as of the incoming currents vs. incoming and outgoing. The WG decided to leave this as is since it is clearly represents Kirchoff’s current law.

An issue of utilizing strong absolute wording concerning manual switching of CT secondary currents was raised and discussed. Should we remove a “strongly discouraged” reference to this practice or explain why it should not be used? The WG felt that avoiding why certain practices should be avoided in the standards may not be a good idea when users search for answers in the standards. Therefore, the WG agreed to, instead of removing the reference, expand on the reasoning of why the CT secondary current switching should not be used.

Recesses and time of final adjournment : 10:30am 09/17/2019

Next Meeting : Webex meetings are planned to be scheduled for October, November, and December.

K24 Summary paper for PC37.245, Guide for the Application of Protective Relaying for Phase Shifting Transformers

Chair: Brandon Davies

Vice Chair: Hillmon Ladner

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 September 18th at the PSRC in Denver, Colorado with – 5 members and 7 guests present.
- Quorum met with 5/8 members in the meeting.
- WG reviewed and approved the May 2019 Meeting Minutes. Motion to approve presented by Paul Elkin and seconded by Ashley Hannigan.
- WG discussed additions to the paper as agreed on the May 2019 meeting.
 - Introduction section was slightly updated to elaborate on need for PST
 - Figures were updated as agreed on the May 2019 meeting
 - SC calculation section was added
 - Protection section was edited to remove specific recommendations on pick-up settings and use general guidance instead.
 - Conclusion section was added
- A brief discussion on V/Hz protection followed. The current version of the guide does not cover this protection method for PST, but the group thought it was a good idea to discuss this during a future revision of the C37.245 guide. The paper will only include material for the guide.

- Paper needs to be complete by October 2019 to be able to approve by January 2020. We will need a Webex.
 - WG to review current draft and submit comments by October 4th. Chair will re-distribute the draft to the WG with all current comments accepted.
 - Webex will be scheduled for October 9th
 - The Paper will be submitted to K in October, with goal of approval by January 2020.
 - GA Tech Abstract end of September. January full paper.
- WG started planning for the presentation.
 - Brandon Davies shared a presentation with the WG that could be used as a starting point. The WG will review and edit as needed.

With the paper completed by January, the goal would be to focus on the presentation on the January 2020 meeting.

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 check for quorum was made. Quorum was met with 13 voting members present out of 21 total members. The patent slides were reviewed with no issue. The previous meeting minutes were reviewed. Pratap Mysore moved to approve the minutes, Steve Conrad seconded the motion.

The efficacy of Table 2 was questioned and a determination was made that no one in the WG uses that table. A suggestion was made to turn the table into a functional example, and assignments were made to that effect.

Sections 7 and 8 structures were reviewed, sparking some discussion on how that part of the document should flow. Assignments were made to review those sections.

A WG member discussed a need for the document to have some information on fault studies and system considerations. The member will provide an example write up of what that could look like.

The WG then reviewed several editorial comments. With WG approval, the Chair will resolve those comments.

The WG discussed the references section and references in the body of the document. A volunteer stepped forward to ensure those body references are correct and still valid (i.e. in which year a particular document was published).

Last, the WG discussed temperature variance caused capacitance drift. The existing document discusses those factors, but more research may be needed.

Action items :

- a. Terminology liaison to be assigned - Claire Patti

- b. 2,3 (including body references) - Tapan Manya
- c. 4.4 - Michael Bloder (review of 110% limit)
- d. 7 (including structure of 7 and 8 overall) - Eric Thibodeau, Rick Gamble
- e. 8 (formatting of tables) - Claire Patti
- f. 8.1, 8.2, 8.3 - Pratap Mysore, Satish Samineni
- g. 8.4 - Steve Klecker
- h. 8.6 - Hillman Laduer
- i. 9 - Brandon Lewey, Steve Conrad
- j. Including review of 1531 applicable sections
- k. 10 - Kent Ryan
- l. 11 - Satish Samineni
- m. 12 - Ben Malcolm
- n. 13 - Pratap Mysore
- o. Calculation examples in lieu of Table 2 - Pratap Mysore, Dean Sorensen
- p. Fault study example text - Dean Sorensen

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 – First meeting after PAR Approval.
2. Approval of minutes of the May 04, 2019 and June 27, 2019 (web) meetings via web already
3. 28 people in presence. (16 Voting members).
4. PAR approved and group already have agreed monthly webmeetings. Next webmeeting to discuss frequency.
5. Documents will be shared at Imeet Central. Some progress has been made on chapters 4 and 5.
6. Three presentations and good discussion of shunt reactor protection practices for tertiary reactors
7. Bill Cook presented on SDGE tertiary reactor standards and settings
8. Pratap Mysore presented new method for turn fault protection and lesson learned
9. Mukesh Nagpal presented on BC hydro tertiary grounded reactor past practice and lesson learned.
10. Adjourn

Recesses and time of final adjournment : 09/17/2019, 0210 pm MDT

Liaison Reports:

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T&D Committee, Capacitor Subcommittee

Pratap Mysore

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

TX Committee

Fred Friend

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

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 800Y V 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

In development

P57.19.02 IEEE Standard for the Design and Performance Requirements of Bushings Applied to Liquid Immersed Distribution Transformers

Old Business:

- WG chairs – PSRCC directory update
 - Mike Thompson will try to use new 123signup roster to push an automatic update to the directory. WG chairs do not need to do anything for the moment.

New Business:

- C37.95 – IEEE Guide for Protective Relaying of Utility-Consumer Interconnections (approved 3/27/2014)
 - Assignment to investigate the need to revise C37.95, IEEE Guide for Protective Relaying of Utility-Consumer Interconnections
 - Expire 2024
 - KTF27
 - Paul Elkin will be the chair for TF, and Jeff Barsch as Vice Chair.
 - Motion to create TF by Charlie Sufana, seconded by Randy Crellin.
 - No discussion
 - Unanimously approved.

- GMD report – WG to create Transactions paper
 - Assignment to write a transaction paper based on the technical report entitled “Geomagnetic Disturbances (GMD) Impacts on Protection Systems”.
 - Noted that WG can only have 1 output so as discussed transaction paper will be done first then summary paper by a different WG.
 - K28 new WG, chair Qun Qiu. Vice Steve Klecker.
 - Motion to create new WG by Don Lukach, seconded by Pat Carroll
 - No discussion
 - Unanimously approved.

- UPFC WG_P2745 Series
 - Jeff started with showing the scope of K Subcomm
 - PAR for P2745 is shown
 - This project is considered not in scope. Motion made by Adi Mulawarman, seconded by Dominick Fontana
 - Count of 12 agree.
 - 5 abstain.
 - 2 oppose.
 - Oppose by Charlie Sufana and Pat Carroll: discussion : SA should have given us more time to discuss

- (not discussed, moved to next meeting)
 - K3 report
 - Tertiary bus ground protection

Adjourn: motion by Ben Kazimier, second by Will English, unanimous approval.