

Minutes of Meeting

Working Group C37.010 – Application Guide for AC High-Voltage Circuit Breakers > 1000 VAC Rated on a Symmetrical Basis

Location: Signa Hilton Orlando Bonnet Creek, Orlando Florida

Date: Monday April 14th, 2022 (08:00-09:45 EDT)

Quorum: Membership Count: **23** Members Present: **23**

Agenda

Andy Keels w/ kEElectric Engineering, PLLC called the meeting to order and presented the agenda.

IEEE Copyright Policy and Call for Patents

Patent and copyright policy presented. No Patent claims identified.

Introduction of Members and Guests

Introductions and attendance gathered in-person.

43 Total in Attendance (**23** Members, **20** Guests)

Call for Volunteers

Chair requested volunteers. Luke Collette w/ Duquane Light Co. volunteered for the Vice Chair role. Jeremy Hensberger w/ Mitsubishi Electric Power Products volunteered for the Secretary role

Review of IEEE SA Acceptance of PAR Study Group

See meeting slides documenting the Scope, Purpose, Need for the Project and Proposed Additional Content.

Discussion on How to Form Task Force Groups to Divide Document for Review

Chair requested comment from guests on how to divide the document to review. Guests recommended a subject matter approach with the following Task Force categories/subcategories identified:

1. TOC review and verification
2. Interruption
 - a. Proximity of Generators
 - b. High X/R
 - c. TRVs
3. Inverter based system (renewables)
 - a. How to calculate fault currents
4. Temperature Considerations
5. Voltage (Carl Schuetz volunteered to Lead)
 - a. Dielectric Withstand
 - b. Altitude Correction Factors
 - c. Increased Operating Voltage – See Discussion below
6. Capacitor/Reactor Switching (Luke Collette volunteered to Lead)
7. Alternative Gases
8. Find outdated references to C37.06 (Vernon Toups volunteered to Lead)

9. Harmonize TLF/Fast TRV with C37.06.1 (Luke Collette volunteered to Lead)

Discussion on Increased Operating Voltage

Some users specify a circuit breaker to withstand an operating voltage of 110% nominal voltage. Concern with this requirement is that the operating voltage is much higher than the rated voltage, which is usually 105% of the nominal voltage. Not all manufacturers subject the breaker to a type test TRV that is 5% in excess of the maximum rated voltage U_r . Refer to meeting slides.

Carl Schuetz commented on the subject and stated preliminary results will be available in the Fall 2022 that provides additional utility input into this concern and data to provide more detail into how system configurations generate these overvoltage scenarios.

Dave Mitchell commented that operating voltage beyond 105% could be issues with NESC compliance

Schedule

Chair provided a schedule for completion of the PAR Study Group C37.010. Refer to meeting slides. The chair plans to schedule workgroup meetings four times per year and alternate between virtual and in-person. Next work group meetings will be a virtual meeting in July 2022 and in-person at next Switchgear Committee meeting in October 2022 in Burlington, VT.

Membership to the Study Group will be indicated by each participant on the roster and recorded in the minutes.

Adjournment

Motion: Adjourn Meeting: Neil Hutchins

2nd to the Motion: John Webb

Vote: Approved without objection/abstention

Meeting adjourned by the chair at 09:30 (EDT).

Reported by:

Jeremy Hensberger & Andy Keels

★ Request Membership C37,010

4-11-2022

llc

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JAN WEISKER	SIEMENS ENERGY			Jan Weisker
Cassey Weeks	SIEMENS Energy			Cassey Weeks
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Juan W.P.T.B.B	ABB			Juan W.P.T.B.B
Victor Kim	HICO			Victor Kim
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Thomas Andy Keels	KEE Electric Engineering	DigiGria Gray		Thomas Andy Keels
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4-11-2022

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Carl Schuetz	ATC			Carl Schuetz
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Marcus Young	Mitsubishi Elec			MSY
Joseph Usner	AEP			Joe Usner
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Leo Lopez	WKA			Leo Lopez
Don Steigerwalt	Duke Energy			Don Steigerwalt
Tom Bellerita	DTE Energy			Tom Bellerita
John Brunke	Power Engineers			Joe

C37.010 PAR Working Group

April 11th, 2022

8:00 AM – 10:15 EDT

Chair:

Andy Keels

Secretary:

HELP! We Need One!

Vice-Chair:

We could use one of these too!



Agenda

1. Chairman's call to order & remarks
 2. Introduction of attendees:
Please type your *Name, Affiliation, Location* in the chat
 3. Attendance Logging Instructions
 4. IEEE Patent and Copyright Policy (*Obligatory*)
 5. IEEE SA Accepted PAR
 6. Anticipated Schedule (*Best laid plans*)
- Adjournment

Call for Volunteers

The Chair requests volunteers to serve as Vice Chair and Secretary for the working group.

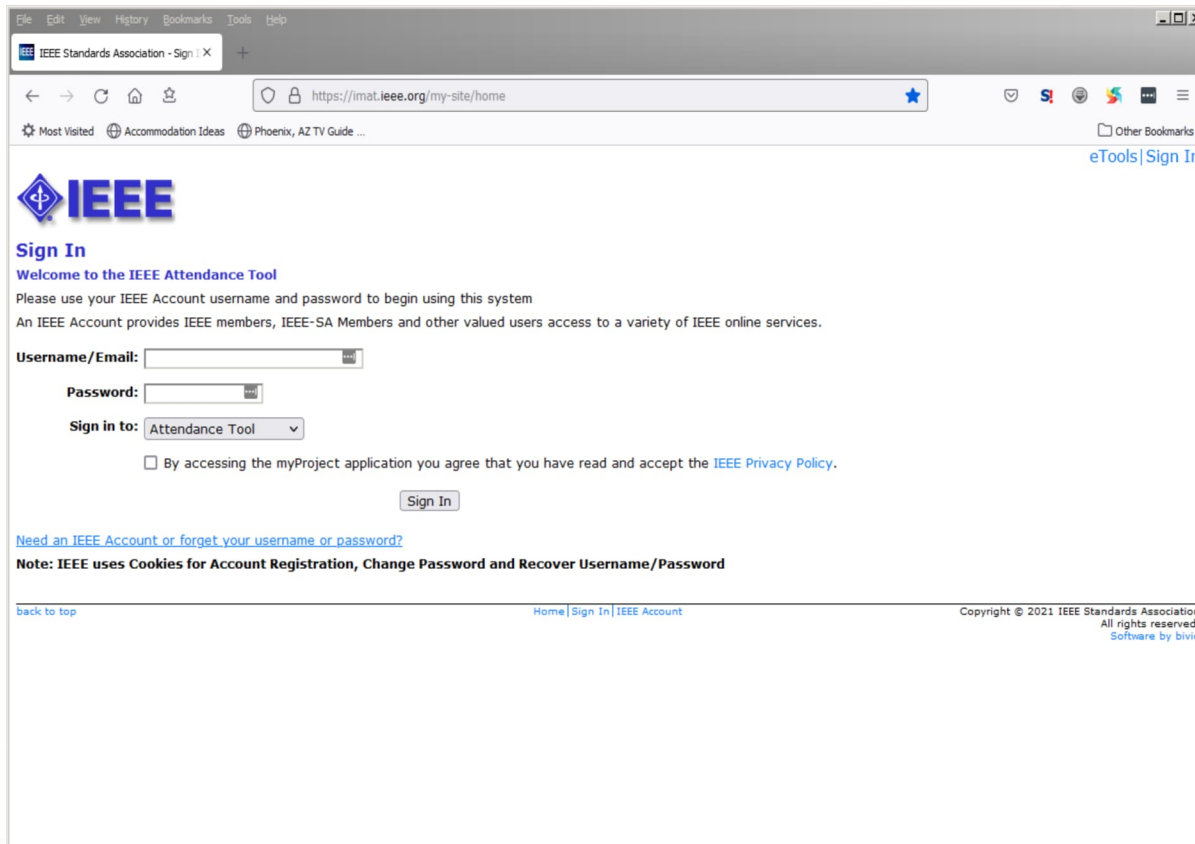


Chair: Andy Keels w/ kEElectric Engineering
Secretary: Jeremy Hensberger w/ MEPPI
Vice-Chair: Lucas Collette w/ Duquesne Light Co.

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3. Go directly to: <https://imat.ieee.org/my-site/home>



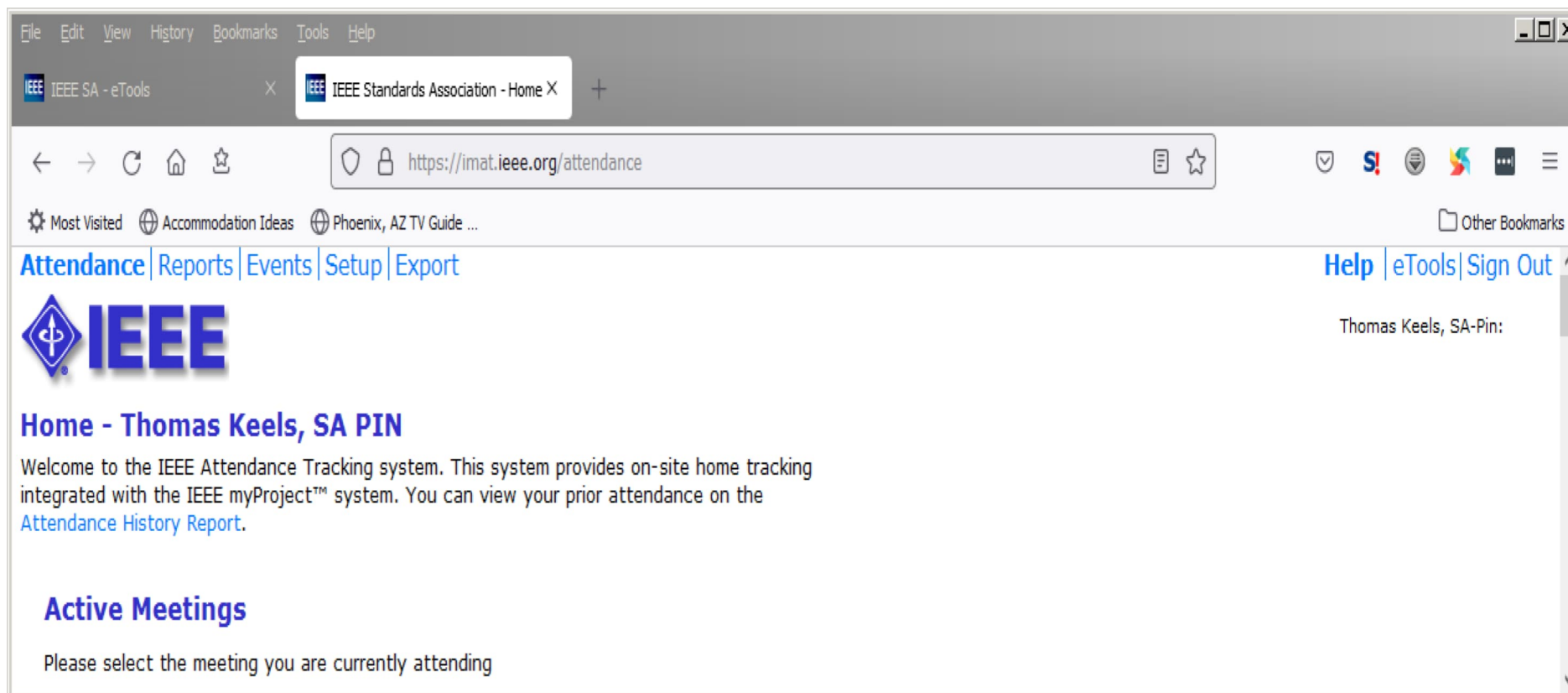
The screenshot shows a web browser window with the URL <https://imat.ieee.org/my-site/home>. The page features the IEEE logo and a "Sign In" section. The "Sign In" section includes a "Welcome to the IEEE Attendance Tool" message, a request to use IEEE Account credentials, and a "Sign in to:" dropdown menu set to "Attendance Tool". There are input fields for "Username/Email:" and "Password:". A checkbox for "By accessing the myProject application you agree that you have read and accept the IEEE Privacy Policy." is present, along with a "Sign In" button. At the bottom, there is a "Need an IEEE Account or forget your username or password?" link and a "Note: IEEE uses Cookies for Account Registration, Change Password and Recover Username/Password".

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The screenshot shows a web browser window with the URL <https://imat.ieee.org/attendance>. The page features the IEEE logo and navigation links for Attendance, Reports, Events, Setup, and Export. The user is logged in as Thomas Keels, SA-PIN. The main heading is "Home - Thomas Keels, SA PIN". Below this, a welcome message states: "Welcome to the IEEE Attendance Tracking system. This system provides on-site home tracking integrated with the IEEE myProject™ system. You can view your prior attendance on the [Attendance History Report](#)." Under the "Active Meetings" section, there is a prompt: "Please select the meeting you are currently attending".

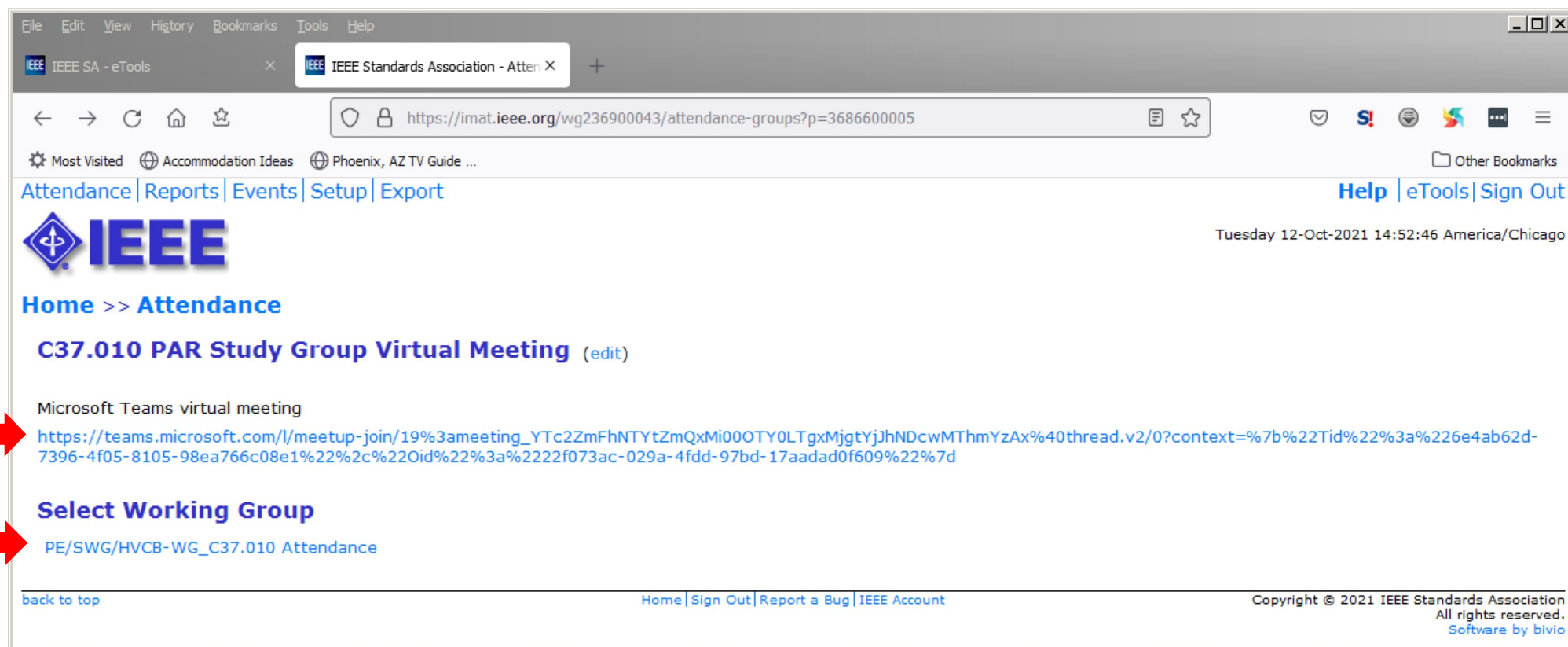
 [C37.010 PAR Study Group Virtual Meeting](#)

13-Oct-2021

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Then select the Working Group

If it is a 'virtual meeting' the WG Chair should have the link listed here

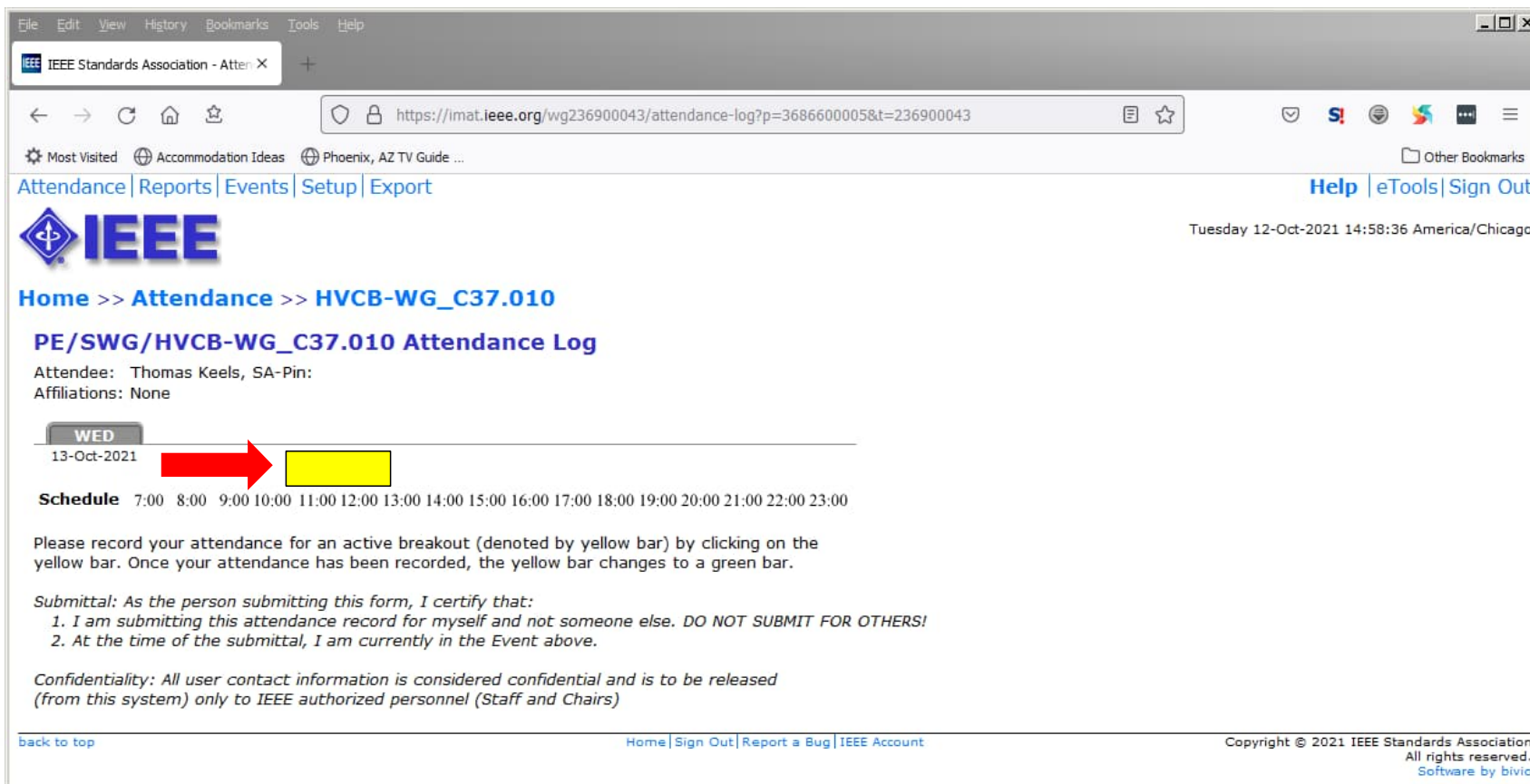


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PE/SWG/HVCB-WG_C37.010 Attendance Log

Attendee: Thomas Keels, SA-Pin:
Affiliations: None

WED
13-Oct-2021 

Schedule 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

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**Early identification of holders of potential
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- ***IEEE-SA Standards Board Operations Manual***
(<http://standards.ieee.org/develop/policies/opman/sect6.html#6.3>)

Material about the patent policy is available at
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**If you have questions, contact the IEEE-SA
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 - Permission is still needed for inclusion in the draft standard.

The group chair would like to remember the past vice-chair of C37.010

Xi ZHU

OCTOBER 9, 1964 - JULY 31, 2021



Xi ZHU, age 56, of Marietta, Georgia passed away on Saturday, July 31, 2021. Xi was born October 9, 1964.

4. IEEE SA Accepted PAR

Reason for Study Group formation

- Prepare a recommended PAR scope for presentation to the sponsor (HVCB SC)

PAR Study Group deliverables

- A report addressing the criteria for consideration and, if appropriate, a draft PAR
- The report should include a roster of participants and minutes

4. IEEE SA Accepted PAR

Switchgear Policies & procedures requires the PAR Study Group to consider:

- The potential market acceptance of the standards project, including technical feasibility
- Relationship to related standards, if known, including its distinct identity from other projects
- Viable volunteer leadership and participation
- Realistic scope and objectives

4. IEEE SA Accepted PAR

Scope and Purpose for the currently submitted PAR

- **Scope:** This application guide applies to the ac indoor and outdoor high-voltage circuit breakers rated in accordance with the methods given in IEEE Std C37.04 and IEEE Std C37.04a, listed in IEEE Std C37.06(TM), and tested in accordance with IEEE Std C37.09 and IEEE Std C37.09a.1 Circuit breakers rated and manufactured to meet other standards should be applied in accordance with application procedures adapted to their specific ratings or applications.
- **Purpose:** The purpose of this document is to provide guidance for the application of high-voltage circuit breakers which are rated in accordance with IEEE Std C37.04 and IEEE Std C37.06 and which are tested in accordance with IEEE Std C37.09 and other related standards.

4. IEEE SA Accepted PAR

Need for the project

- Several related standards have been changed since the last revision and therefore an update of this standard is needed
- IEEE C37.04a with regard to capacitor current switching
- IEEE C37.09b with regard to harmonization between IEC and ANSI TRV (2 and 4 parameter)
- IEEE C37.015 shunt reactor switching
- Guidance for asymmetrical currents with regard to different time constants need to be given
- Several examples need to be updated and checked
- References need to be updated and checked for applicability

4. IEEE SA Accepted PAR

A. Some proposed additional content

- Several related standards have been changed since the last revision and therefore an update of this standard is needed (requirements and ratings have now been incorporated into one document - C37.06 has been incorporated within C37.04.)
- Growth of inverter-based generation in some distribution and transmission grids. New methods of calculating fault currents that take into account these constant current sources need to be recognized / approved
- Circuit breaker capabilities under user-specified operating voltage of 1.10 pu
- Application of high-voltage circuit breaker for generator synchronization
 - extended period of time in open position under 2 pu voltage
 - transients associated with disconnect switch operation

C37.010 - 2016 Table of Contents

Contents

1. Overview.....	14
1.1 Scope.....	14
1.2 Purpose.....	14
2. Normative references.....	14
3. General service conditions.....	15
3.1 Usual service conditions.....	15
3.2 Unusual service conditions.....	16
3.3 Mechanical considerations for outdoor circuit breakers.....	20
4. Application considerations.....	20
4.1 General.....	20
4.2 Maximum voltage for application.....	21
4.3 Voltage range factor.....	21
4.4 Frequency.....	21
4.5 Continuous current.....	21
4.6 Rated dielectric withstand.....	34
4.7 Standard operating duty.....	35
4.8 Interrupting time.....	35
4.9 Permissible tripping delay T (determined by short-time current test duration).....	37
4.10 Reclosing time.....	38
4.11 Short-circuit current rating.....	42
4.12 Transient recovery voltage (TRV).....	54
4.13 Load current switching capability and life (repetitive operation).....	54
4.14 Capacitance current switching.....	54
4.15 Line closing (line-closing switching surge factor for circuit breakers 362 kV and above).....	55
4.16 Switching lines with series capacitors.....	61
4.17 Conditions of use with respect to the out-of-phase switching current rating.....	61
4.18 Shunt reactor current switching.....	62
4.19 Transformer current switching.....	63
4.20 Controlled switching.....	63
4.21 Transformer limited fault (TLF) duties.....	65
4.22 Mechanical endurance.....	65
4.23 Rated control voltage.....	66
4.24 Fluid operating pressure.....	66
4.25 Insulating oil for circuit breaker.....	66
4.26 Closed pressure system (gas-filled).....	66
4.27 Circuit breakers limiting factors for associated equipment.....	66
4.28 Circuit breakers equipped with resistors.....	67
4.29 Service capability.....	70
5. Short-circuit considerations.....	70
5.1 System short-circuit currents.....	70
5.2 Methods for calculating system short-circuit currents.....	73
5.3 Electrical quantities used.....	85
5.4 Selection of applicable circuit breaker ratings.....	90
Annex A (informative) Basis for E/X method corrected for ac and dc decrements in the calculation of short-circuit currents.....	92
Annex B (informative) Circuit breakers directly connected to motors.....	112

User Specified 110% Voltage Duty

Submitted by: Carl Schuetz

Description of Concern

Some users specify a CB to withstand an operating voltage of 110% nominal voltage

- The concern with this requirement is that the operating voltage is much higher than rated voltage (which is usually 105% of nominal voltage)
- Not all manufacturers subject the breaker to a type test TRV that is 5% in excess of the maximum rated voltage U_R

$$U_C = k_{pp} \times k_{af} \times \sqrt{2/3} \times U_R$$

Why this Concern is getting attention

Traditionally fault currents are calculated based on an unloaded power system and generator voltages are less than or equal to 105% of system nominal voltage

- This method is felt to be conservative and result in the highest fault current

With the advent of large generator (fossil fueled & nuclear stations) retirements voltage variations on the power system are larger than historical values

- This results in some portions of the power system that could experience voltages in excess of 105%

A Closer Look

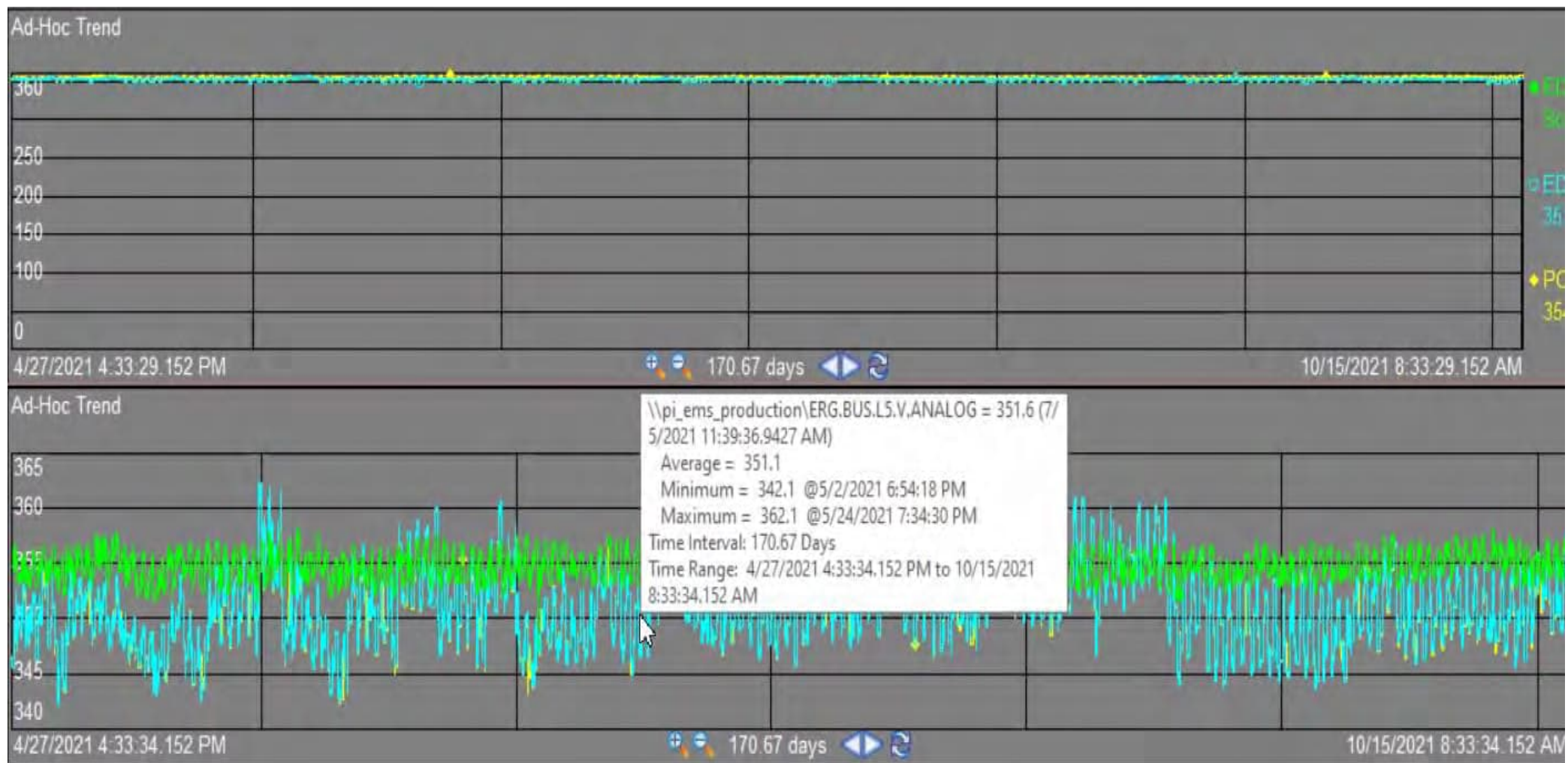
Users don't operate their entire system in excess of rated voltage

The bus voltages near a large power plant are most often kept below 105% of system nominal

- This is done to keep MPT and generator losses and associated temperature rises to pre-defined levels
- If this is true then CB used at these buses are applied within their ratings and are not a concern

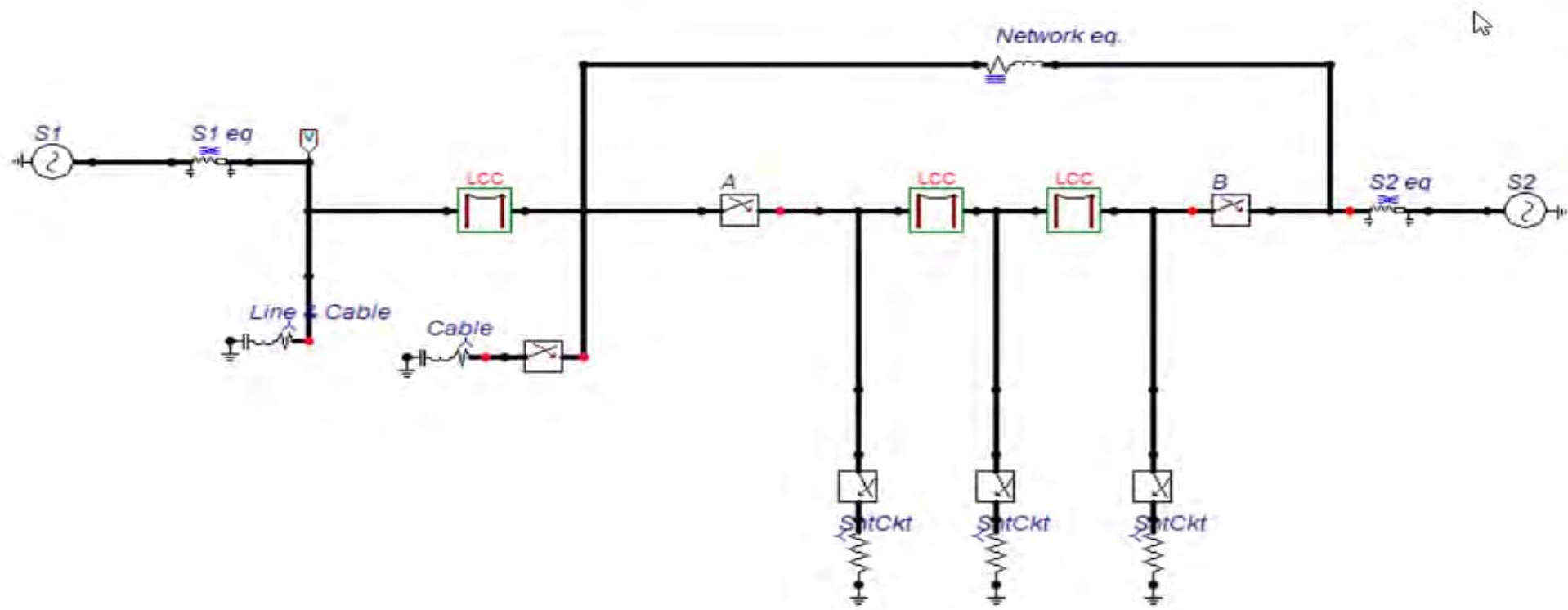
Bus Voltages at Three Gen Stations

6 month timeframe in 2019



When is System Operating Voltage Expected to Exceed U_R ?

Periods of elevated voltage are expected during light load periods or equipment/line outages in electrical areas associated with larger than normal VAR support (long overhead lines, cables, transformer no-load taps)



User Feedback and Suggested Remediation

During a fault the local capacitive elements near the faulted component will discharge their stored energy according to the circuit constants and the source side component of the TRV may be within fault clearing capability

- Feedback: Do user's have this concern at their company?
- Proposal: If so, it's suggested a task force be established to study the concern in more detail with the goal of providing users further guidance when operating their system above rated voltage

5. Anticipated Schedule

04/21/2021	PAR Study Group determined scope & purpose
10/6/2021	IEEE SA Accepted PAR Application
12/07/2021	IEEE NesCom meets to determine our fate
04/11/2022	1 st working group meeting
10/XX/2022	2 nd working group meeting
04/XX/2023	3 rd working group meeting
10/XX/2023	4 th working group meeting
04/XX/2024	5 th working group meeting; Submit draft to IEEE SA for initial ballot
10/XX/2024	1 st Comment resolution meeting
04/XX/2025	2 nd Comment resolution meeting
10/XX/2025	3 rd Comment resolution meeting; Submit completed document to RevCom

**Would someone like to
make a motion to
adjourn?**





Our Next in-person Meeting Is Scheduled to be at:

Hilton Burlington Lake Champlain, Burlington, Vermont

October 8-15, 2022