

First PAR Approved Meeting: WG PC57.133

"Guide for Evaluating Transformer Performance under Reverse Power Flow"

3:15-4:30 PM CDT | October 29, 2024

Grand Ballroom AB (Floor 4) | Hyatt Regency St. Louis at the Arch | St. Louis, MO

Chair:	Ryan Hogg	Bureau of Reclamation	rhogg@ieee.org
Vice Chair:	Bruce Webb	Knoxville Utilities Board	bruce.webb@kub.org
Secretary:	Drew Welton	Intellirent	dwelton@intellirentco.com

Attendees:

Working Group_membership was established at the meeting. Those who requested membership were granted membership. Guests are welcome to join after attending the next two out of three meetings.

Attendees: 121

Members: 89

Guests: 33

Non-Attendee Requesting Membership: 1

First Name	Last Name	Affiliation	Membership
Kayland	Adams	Prolec-GE Waukesha	Member
Gilles	Bargone	FISO	Member
Mats	Bernesjo	Hitachi Energy	Member
Daniel	Blaydon	Baltimore Gas and Electric	Member
William	Boettger	Boettger Transformer Consulting LLC	Member
Garrett	Bradshaw	Howard Industries	Member
Jeffrey	Brooks	Asplundh Engineering Services	Member
Alfredo	Carrizales	PROLEC	Member
Thomas	Dauzat	AEP-SWEPCO	Member
Nikolaus	Dillon	Dominion Energy	Member
Fernando	Duarte	EPRI	Member
Roger	Dugan	RC Dugan	Member
Eric	Elson	San Diego Gas & Electric	Member
Miguel	Garcia	Hitachi Energy	Member
Eduardo	Garcia	Siemens Energy	Member
David	Garcia-Paredes	Virginia Transformers Corp	Member
James	Gardner	Prolec-GE Waukesha	Member
Jose Antonio	Gonzalez Ceballos	Virginia/Georgia Transformers	Member
William	Griesacker	WGA	Member
Jesse	Hall	Virginia Transformer Corp.	Member
Corey	Hanson	Flex-Core	Member
U	Hernandez Decanini	Virginia Transformers Corp	Member
Saramma	Hoffman	PPL	Member
Ryan	Hogg	Bureau of Reclamation	Member
Derek	Hollrah	Burns & McDonnell	Member
Saif	Hossain	Trench Group	Member
Miljenko	Hrkac	Hitachi Energy	Member
Jose	Izquierdo	Siemens energy	Member
Nick	Jensen	Delta Star	Member
John	John	Virginia Transformer Corp	Member
Christopher	Johnson	Oncor	Member
Akash	Joshi	Kimley-Horn	Member
Thrinadha	Katapalli	Virginia Transformer Corp	Member
Anton	Koshel	Delta Star, Inc.	Member
Mark	Lachman	Doble	Member
Jihun	Lee	HD HYUNDAI ELECTRIC	Member
Junho	Lee	HD Hyundai Electric	Member
Kushal	Mahajan	Sungrow	Member
Swapnil	Marathe	Megger	Member
Daniel	Martinez	Jfe guest	Member
Katherine	Marulanda	Magnetron	Member
Brian	McCarrick	Virginia Transformer Corp	Member
Omar	Mendez	Prolec	Member
Emilio	Morales-Cruz	QUALITROL	Member
Tyler	Morgan	Duke Energy	Member
Dan	Mulkey	Mulkey Engineering Inc	Member
Ali	Naderian	EnerPars	Member
Shankar	Nambi	Bechtel Energy, Inc.	Member
Eduardo	Orozco	GE Grid Solutions	Member
Sanjay	Patel	SGB-Smit USA	Member
Vinay	Patel	Con Edison	Member
Gustavo	Prado	Siemens Energy	Member
Tim	Raymond	Inductive Reasoning	Member
Yuri	Rossini	Siemens Energy	Member
Marnie	Roussell	Entergy	Member
Paul	Salvato	Intellirent	Member
Amitabh	Sarkar	Virginia Transformer Corporation	Member
Markus	Schiessl	SGB	Member
Eric	Schleismann	Southern Company	Member
Leena	Shimpi	Mgm transformer	Member
Stephen	Shull	BBC Electrical Services Inv	Member
Igor	Simonov	Toronto Hydro	Member
James	Spaulding	City of Fort Collins Utilities	Member
Andy	Speegle	Entergy	Member
Brad	Staley	Leeward Renewable Energy	Member
Sunny	Swarna	Virginia Transformer Corp	Member
Marc	Taylor	JFE Shoji Canada	Member
Joseph	Tedesco	Hitachi Energy	Member

Ed	teNyenhuis	Hitachi Energy	Member
Mark	Tostrud	Dynamic Ratings	Member
Kannan	Veeran	Virginia/Georgia Transformer Corp	Member
Juan	Velasquez	Magnetron SAS	Member
Karsten	Viereck	Reinhausen Germany	Member
Krishnamurthy	Vijayan	Pennsylvania transformers	Member
Dharam	Vir	Prolec GE	Member
Pragnesh	Vyas	Sunbelt Solomon	Member
Savid	Walker	MGM Transformers	Member
Joe	Watson	JD Watson and Associates	Member
Bruce	Webb	Knoxville Utilities Board	Member
Drew	Welton	Intellirent	Member
Joe	White	POWER Engineers	Member
Jeffrey	Wright	Duquesne Light	Member
Fei	Yang	Hitachi Energy	Member
Tim	Young	Hitachi Energy	Member
Guang	Yuan	Hitachi Energy	Member
Michael	Zarnowski	Carte International	Member
Hongzhi	Zhang	Hitachi Energy	Member
Shibao	Zhang	PCORE Electric	Member
Waldemar	Ziomek	PTI Transformers LP	Member
Edwin	Betancourt	Siemens Energy	Guest
Naveen	Bhardwaj	Trench Group	Guest
Kevin	Biggie	Weidmann	Guest
Bhaumik	Choksi	Engineer	Guest
Rhett	Chrysler	ERMCO	Guest
Adriana	Cisco Sullberg	Salt River Project	Guest
Luiz	de Oliveira	Hitachi Energy	Guest
Paul	Dolloff	EKPC and University of Kentucky	Guest
Janko	Dzodan	Koncar D&ST	Guest
Sanford	Fong	Georgia Power	Guest
Raymond	Frazier	Ameren	Guest
Jose	Gamboa	The H-J Family of Companies	Guest
Dragana	Gasic	Koncar D&ST	Guest
Kevin	Hampton	Siemens Energy	Guest
Jean Carlos	Hernandez-Mejia	Georgia Tech NEETRAC	Guest
Kenneth	Klein	Johnson	Guest
Nihat	Kosedagi	Hitachi Energy	Guest
Angela	Leigl	Eaton	Guest
Xose	Lopez-Fernandez	Universidade de Vigo	Guest
Charles	Morgan	Eversource Energy	Guest
Fredy	Murcia	Siemens Energy	Guest
Higo	Murillo	Guest	Guest
Adnan	Rashid	Measurement Canada	Guest
Robert	Reepe	Georgia Power Co	Guest
Masoud	Sharifi	Siemens Gamesa Renewable Energy	Guest
Hemchandra	Shertukde	University of Hartford	Guest
Andrew	Steineman	Delta Star, Inc.	Guest
Michael	Thompson	SEL Engineering Services	Guest
Timothy	Tillery	Howard Industries	Guest
Reinaldo	Valentin	Duke Energy	Guest
Terry	Wong	Trench Limited	Guest
Koray	Yavuz	Noark Electric US	Guest
Jason	Snyder	First Energy Corp	Interested

Minutes:

1. Behavior, Copyright, and Patent Slides Displayed
2. PAR, Working Group's goal, and draft schedule (PAR expires 12/31/2028) - Reviewed by Ryan Hogg
3. Established Working Group membership, Established via QR Code System, Paper Roster
4. Agenda approval
 - a. Motion to approve the agenda by Joe White
 - b. Seconded by Dan Mulkey
 - c. Approved unanimously
5. R. Hogg – "Reverse Power and Base C57 Standards"
6. Presentations:
 - a. E. teNyenhuis – "Effect of Reverse Power Flow on Transformers"
 - b. D. Mulkey – "Fundamental differences between power and distribution transformers"
 - c. Slides from the presentations available on the IEEE Transformers Committee web page
 - d. Discussion regarding Ed's presentation that contained illustrations of four power quadrants that may help to define reverse power
7. Definition of "Reverse Power Flow"
 - a. Status of "...addendum to C57.12.80 for defining Reverse Power Flow"
 - b. Our WG to hold interim meetings before Denver meeting on this topic
8. Working outline
 - a. Discuss rough draft outline – Too many items? Missing items?
 - b. Plan = at a future meeting, delegate drafting to task forces
9. Discussions:
 - a. Ramsis Girgis - Discussed the impacts of day vs. night time on power flow, and the differences between step up and step-down transformers, and the effects on OLTC's, and the impacts of voltage regulation should be addressed. Advised he is presenting a paper on reverse power flow at next year's Doble Client Conference.
 - b. Ali Gorzin - Raised the question regarding 3-winding transformers, suggested a review of outside publications, such as published papers, and seek utility guidance.
 - c. Steve Shull recommended referencing a paper published in 1983 as an electric metering source – "Power Flow Direction Definitions for Metering of Bidirectional Power" by Raymond Stevens, IEEE PSIM, for presentation at the IEEE/PES 1983 Winter Meeting in New York, New York.
 - d. Eric Elsum and others were in favor of the quadrant approach would be most beneficial for defining reverse power.
 - e. David Walker stated that unexpected losses can occur during reverse power conditions

10. Old Business – none
11. New Business – none
12. Next meetings – Chair will send out a Doodle Poll to meet regarding:
 - a. Virtual:
 - i. Define “reverse power flow”
 - ii. Outline development
 - b. In person: Denver, CO in Spring 2025
13. Adjourn