IEEE Industry Applications Society
Renewable and Sustainable Energy Conversion Systems Committee – **IEEE RSECS**

Annual Meeting – Baltimore, MD

October 1, 2019

Chair – Adel Nasiri, USA

Vice Chair, TPC – Akshay Kumar Rathore, Canada

Vice Chair – Ke Ma, China

Secretary – Eduard Muljadi

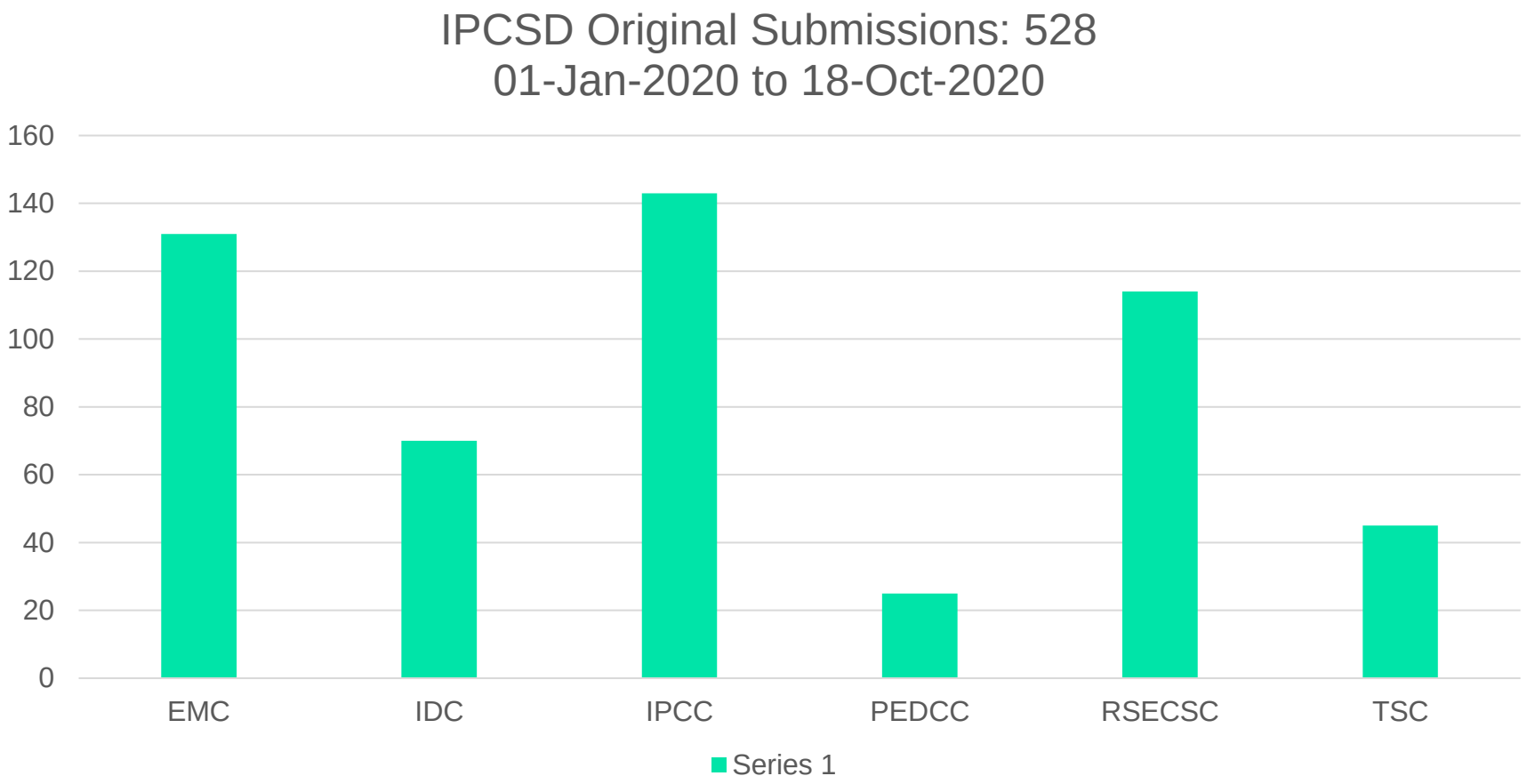
Past Chair – Yilmaz Sozer

Agenda

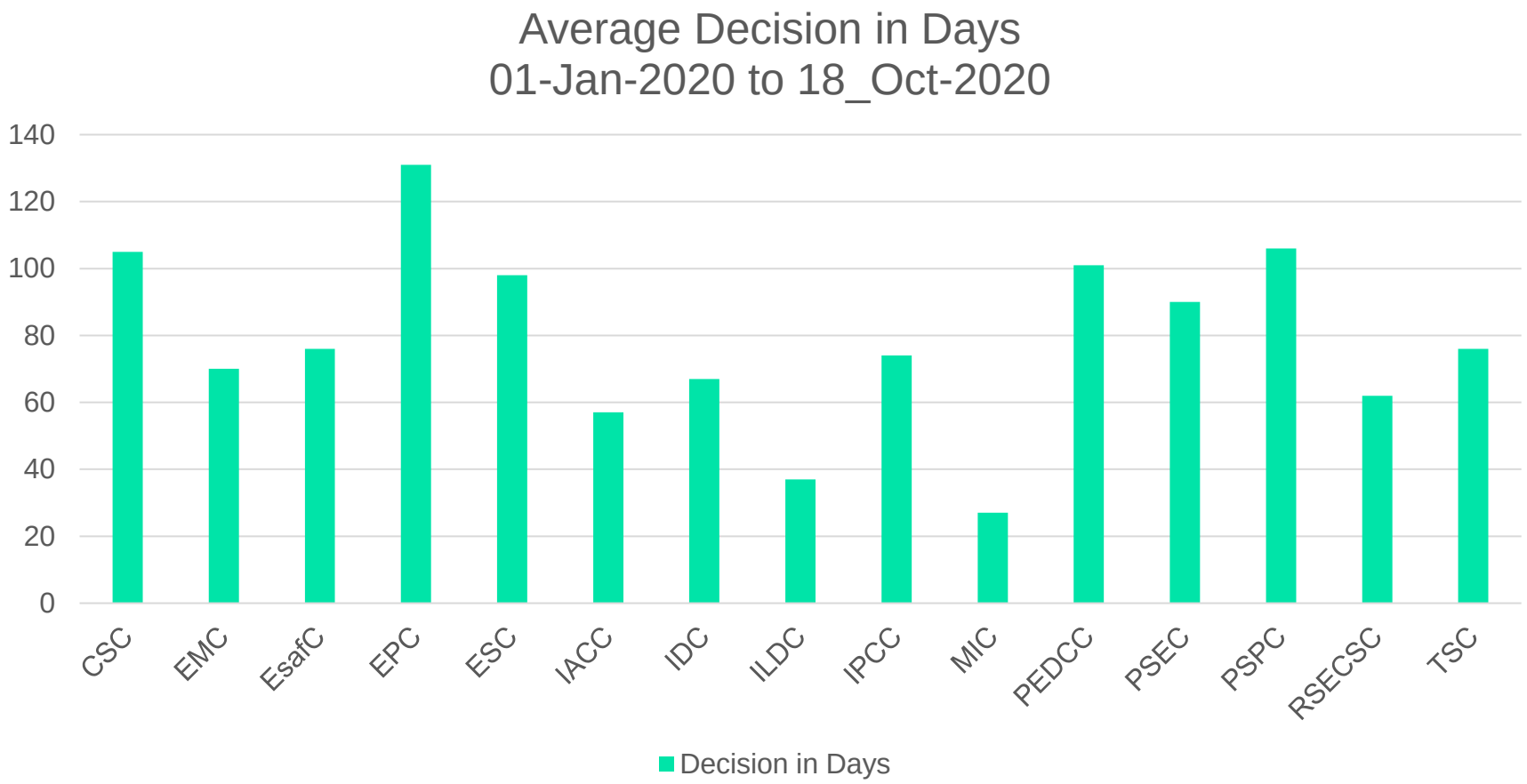
- Approval of 2019 Meeting Minutes
- TCPRC Report – Akshay Rathore
- ECCE Activities 2020 – Ke Ma
- IAS-RES Committee Co-Sponsored Conferences – Ke Ma
- RES Conference Prize Paper Awards – Ke Ma
- RES Transactions Prize Paper Awards – Akshay Rathore
- IEEE Standards Coordinating Committee 21 – Mark Siira
- Ask committee members for participation, AE, session chair, reviews
- ECCE 2021

Number of Paper Submissions by Committees

IAS Industrial Power Conversion Systems Department



Days from Original Submission to Final Decision – Past 12 Months



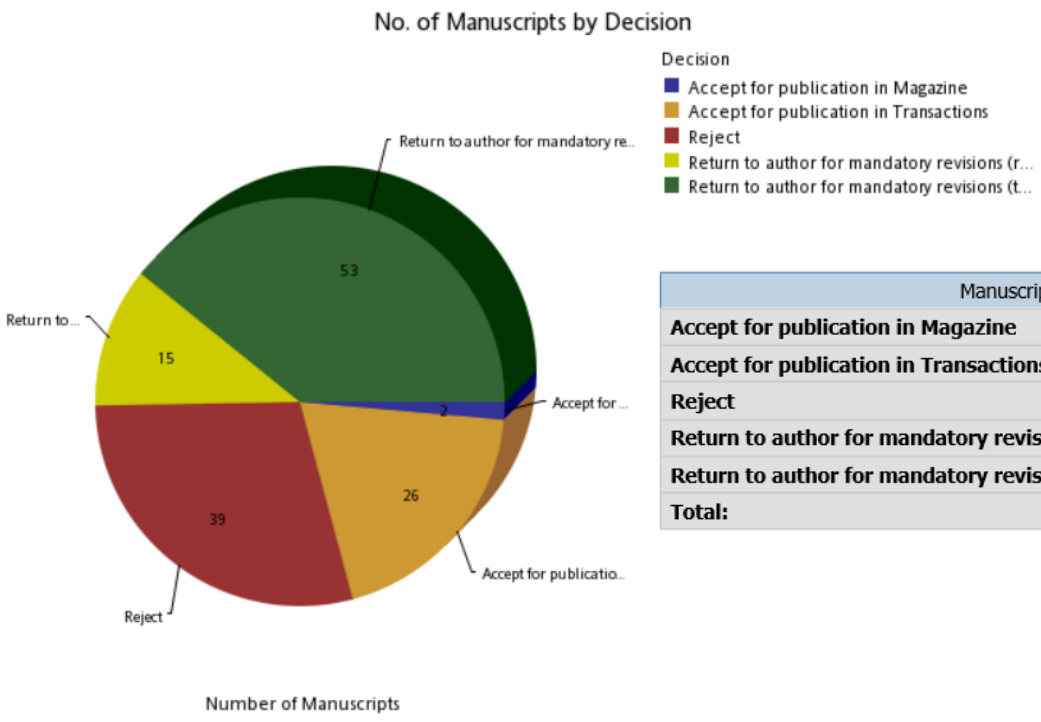
Upcoming Special Issues of IEEE Transactions on Industry Applications

- 6 regular and 2 special issues
- July/August 2020, Part II– 10 Papers Scheduled for Special Issue on Security, Reliability, Privacy, and Quality in Industrial Automation and Control
- July/August 2020 – 6 Papers Scheduled for Special Issue on Reliability in Cyber-physical Systems and their communication networks
- July/August 2020– 4 papers scheduled for Special Issue on Power Quality in Power Systems and Electrical Machines
- Sept/Oct 2020 – 32 papers scheduled for Special Issue on Advanced Approaches and Applications for Electric Vehicle Charging Demand Management

IAS Transactions and Magazine Decision Ratio

Submission to Renewable and Sustainable Energy Conversion Systems Committee

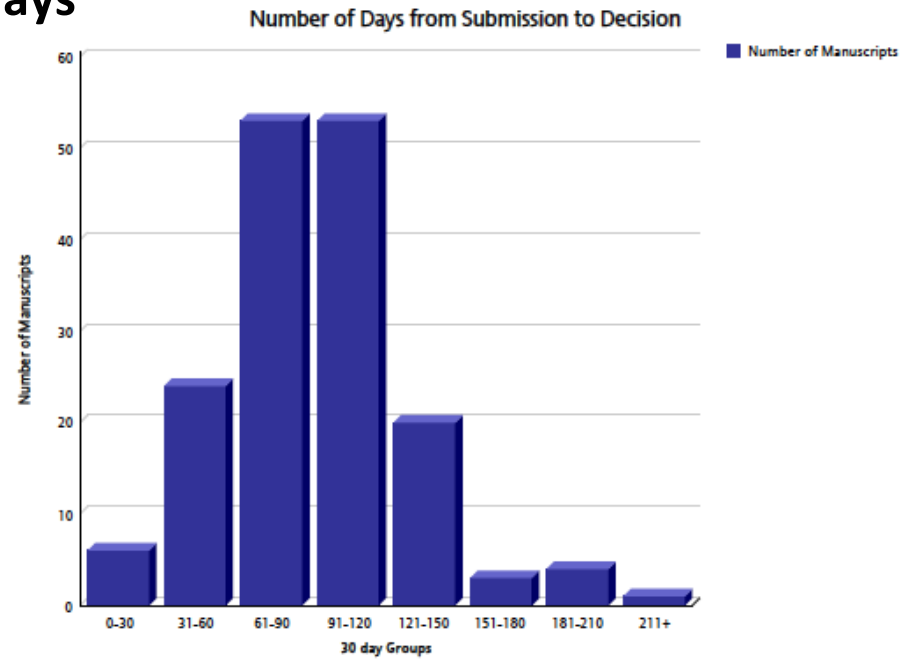
Jan 2020-20 Oct 2020



Manuscript Decision	Number of Manuscripts	Percentage of Total
Accept for publication in Magazine	**2**	**1.5%**
Accept for publication in Transactions	**26**	**19.3%**
Reject	**39**	**28.9%**
Return to author for mandatory revisions (rto address reviewer comments)	**15**	**11.1%**
Return to author for mandatory revisions (to address reviewer comments)	**53**	**39.3%**
Total:	**135**	**100.0%**

Publications Chair Report Jan 2018 – Sept 2019

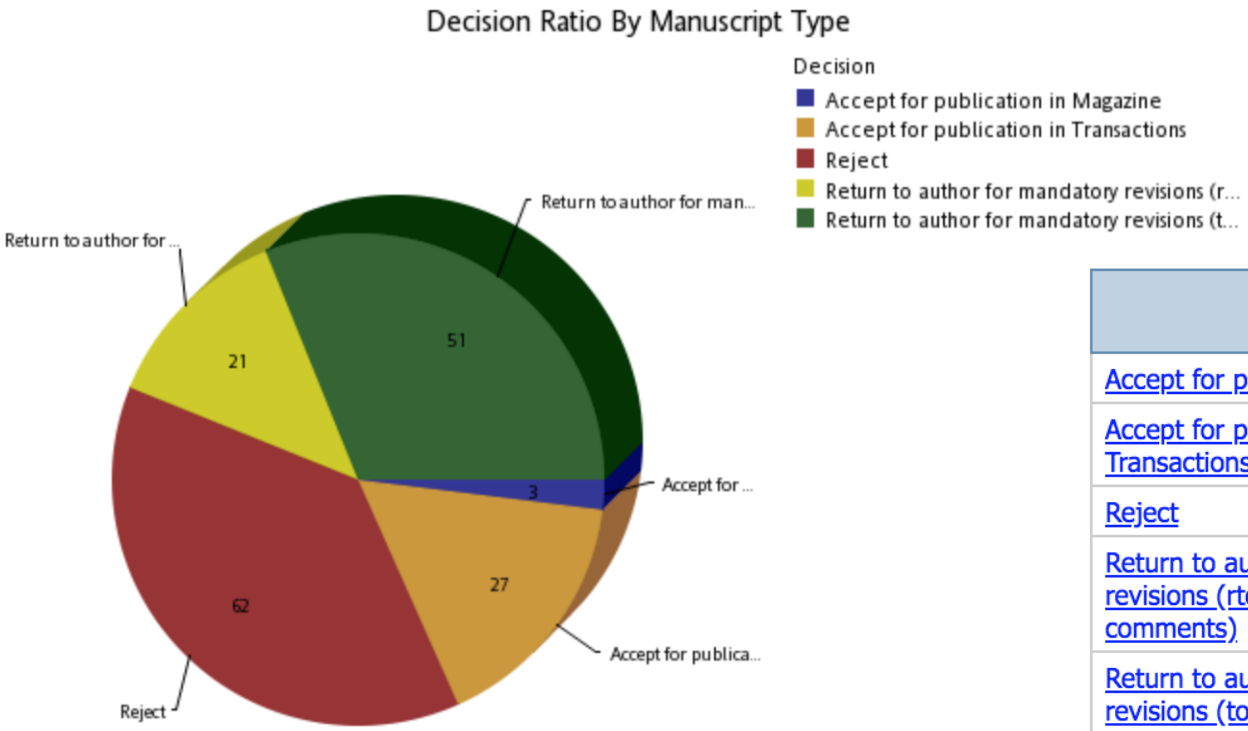
- Paper submission to Renewable and Sustainable Energy Conversion Systems Committee:
  - **Total 164 (Jan 2018-Sep 2019);**
- Acceptance Rate (Jan 2018-Sep 2019):
  - **16.5% Transactions, 2% Magazine**
- **Average First Decision Time: 104 days**



IAS Transactions and Magazine Decision Ratio

Submission to Renewable and Sustainable Energy Conversion Systems Committee

Jan 2018-Sep 2019



Decision	# Manuscripts	Percentage
Accept for publication in Magazine	3	1.83%
Accept for publication in Transactions	27	16.46%
Reject	62	37.80%
Return to author for mandatory revisions (rto address reviewer comments)	21	12.80%
Return to author for mandatory revisions (to address reviewer comments)	51	31.10%
Total:	**164**	**100.00%**

Thanks to Associate Editors

- Mohamed Badawy (USA), since 2017
- Ke Ma (China), since 2017
- Dinesh Kumar (Denmark) , since 2017
- Afshin Izadian (USA) , since 2017
- Mo Rashidi (USA), since 2019
- Saban Ozdemir (Turkey), since 2019
- Necmi Altin (Turkey), since 2019
- Ahmed Elasser (USA), since 2019
- Akanksha Singh (USA), since 2020
- Yigeng Huangfu (China), since 2020
- Vinod Khadkikar (UAE), since 2020
- Yongheng Yang (Denmark), since 2020
- Xu She (USA), since 2020

Seeking interested Associate Editors from committee in the area of **Battery and Fuel Cells**.

Submitting Papers for IAS Transactions

- The IAS RES Committee welcomes for review and possible publication in IEEE Transactions on IAS papers that have been presented within the last year at an IAS technically sponsored conference, such as ECCE, IAS Annual Meeting, APEC, ICEM, PEDES, PESGRE.

- In order to submit a paper, please email the following information to the Technical Paper Review Chair (TPC) with the following information: (1) corresponding author's first and last name; (2) corresponding author's e-mail address; (3) manuscript title; (4) conference name; (5) year of presentation; together with a PDF of your Conference paper, as it was published in the Conference proceedings.

Changes for Submission to IEEE IAS Trans. and Magazine

- Conference papers recommended for publication MUST BE REVISED before publication in IEEE Transactions on Industry Applications or IEEE Industry Applications Magazine.
- There is no hard metric on how much revision is required. Instead, authors must be comfortable that they are compliant with the long-standing rule that they are not seeking multiple publication of a paper. (Unlike other Societies, we are not requiring a specific amount of change in the revision).
- Reviewers and the Associate Editor are also expected to be comfortable that the paper offers information not included in the earlier conference version.
- The revised version MUST include a reference citation pointing to the earlier conference version.

Changes for Submission to IEEE IAS Trans. and Magazine

- The authors may consider changing the title, adding references, adding or simplifying illustrations, and adding or simplifying text in the body of the paper.
- The authors are asked to provide a BRIEF description (± 200 words) of the revisions in the cover letter field in Scholar 1.
- The policy change has been adopted and we are obligated to proceed with implementation in IAS.
- Conference papers that are approved for publication without revision will be returned to the responsible technical committees for revision.
- Exceptions to the 'presentation first' policy are only made for ‘special issues’ of IAS Transactions as authorized by the IAS Executive Board.

RESC Conference Paper Awards Committee

- Vinod Khadkikar, Khalifa University, Abu Dhabi, UAE
- David Dorrell, University of the Witwatersrand, South Africa
- Ke Ma, Shanghai Jiao Tong University, China
- Dinesh Kumar, Danfoss, Sweden
- Akanksha Singh, NREL, USA

Candidates are selected from IAS Transactions in 2020

Third Prize

«Incorporating Battery Energy Storage Systems into Multi-MW Grid Connected PV Systems»

Vandana Rallabandi ; Oluwaseun M. Akeyo; Nicholas Jewell ; Dan M. Ionel

Vo. 55, no. 1, pp 638-647.

«Ancillary Services via VSIs in Microgrids with Maximum DC-Bus Voltage Utilization»

Aswad Adib; Jacob Lamb ; Behrooz Mirafzal

Vo. 55, no. 1, pp 648-658.

Second Prize

"A 50-kW Air-Cooled SiC Inverter with 3D-Printing Enabled Power Module Packaging Structure and Genetic Algorithm Optimized Heatsinks"

Zhiqiang Wang ; Madhu Chinthavali ; Steven L. Campbell ; Tong Wu ; Burak Ozpineci

Vo. 55, no. 6. 6256-6265

First Prize

A Rotational Control in Medium-Voltage Modular Solid-State Transformer based Converter System

Dong Dong, Ravisekar Raju, Govardhan Ganireddy, Mohammed Agamy

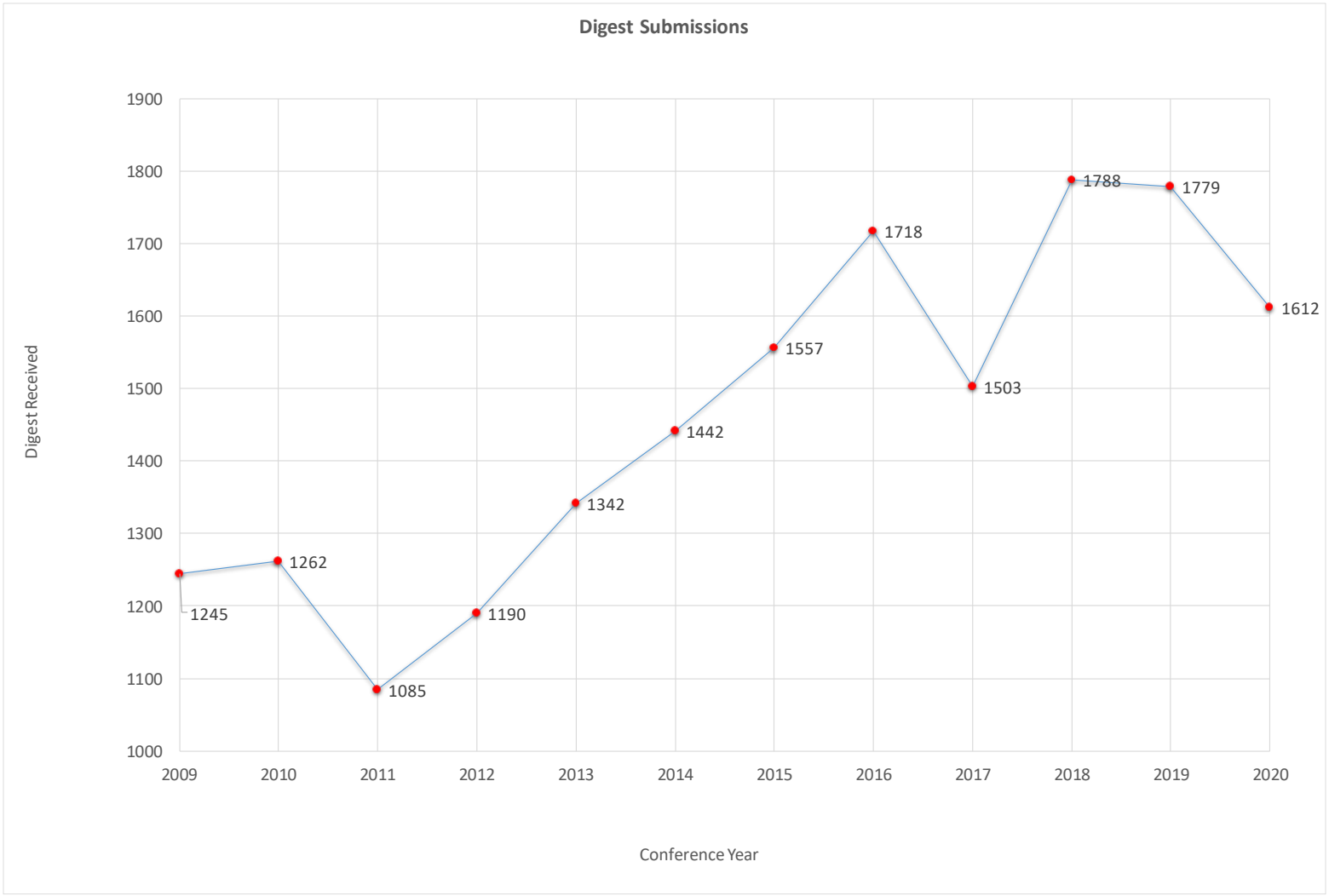
Vol. 55, no. 6, 2019, pp. 6223-6233

ECCE 2020 Technical Program

- ECCE 2020 and TPC meetings are totally virtual-based.
- 1615 digest submissions this year – 9% less compared to last year (1779) last year
- 24 Vice Chairs (VC) and 182 Topic Chairs (TC) serving for 12 Tracks to handle the digests review and sessions design.
- Number of digests handled per Topic Chair (TC) is limited to 10.
- Final program includes 959 technical papers for oral/poster sessions, 14 tutorials, and 20 presentation-only special sessions.

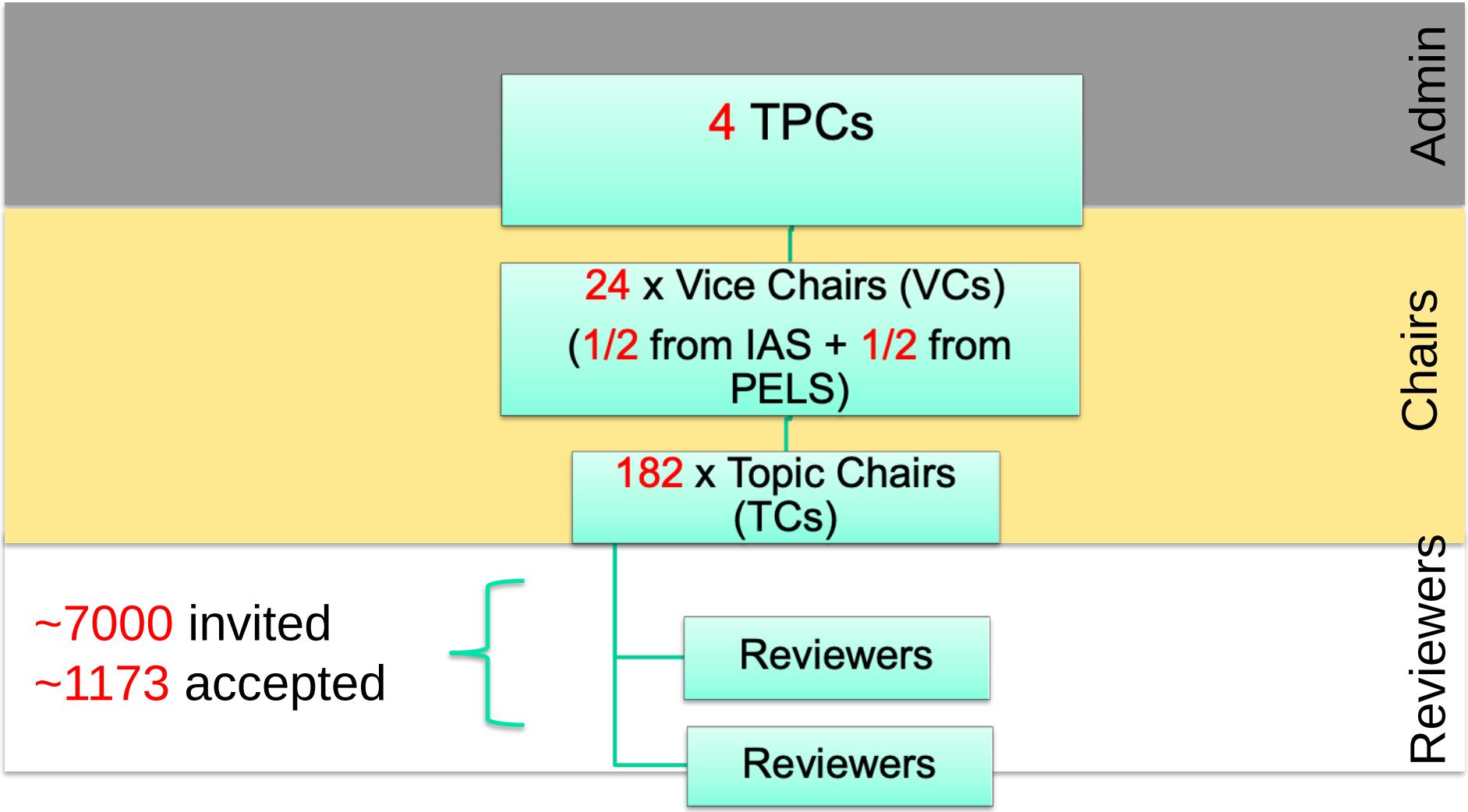
ECCE Digest Data

ECCE level



2020 ECCE Paper Review

ECCE level



24 Vice Chairs from IAS and PELS

ECCE level

Track Name	Track	Vice Chair	Vice Chair	Vice Chair
◆ Renewable and Sustainable Energy Applications	A	Ke Ma	Kaushik Basu	
◆ Smart Grid and Utility Applications	B	Adel Nasiri	Yaosuo Xue	
◆ Big Data, Machine learning, Cyber security and design automation	C	Brandon Grainger		
◆ Transportation Electrification Applications	D	Mihat Kisacikoglu	Mahesh Krishnamurthy	
◆ Power Converter Topologies	E	Yongsug Suh	Luca Solero	Gerry Moschopoulos
◆ Controls, Modelling and Optimization of Converters	F	Xiaonan Lu	Khurram Khan Afridi	Laili Wang
◆ Electrical Machines	G	Rukmi Dutta	Greg Heins	
◆ Electric Drives	H	Jul-ki Seok	Antonio J. Marques Cardoso	
◆ Power Semiconductor Devices, Passive Components, Packaging, Integration, and Materials	I	Tanya Gachovska	Francesco Iannuzzo	
◆ Energy Efficient Systems Applications and Lighting Technologies	J	Marco Dalla Costa		
◆ Emerging Technologies and Applications	K	Jin Wang	Huai Wang	
◆ Conflict of Interest	M	Jean-Luc Schanen		

ECCE 2020 Contributions –Track A

- Track A - Renewable and Sustainable Energy Technologies (IAS RESC contributions)
- IAS-RESC provided 1 Vice Chair Ke Ma to work with another Vice Chair Kaushik Basu, and 16 Topic Chairs:

Subtrack	Topic	Papers submitted	Topic Chairs
A1	Wind	19	**Paul Barendse** **Rohit Baranwal**
A2	Solar	16	**Yongheng Yang** **Alvaro Luna**
A3	Power Converter Topologies for Renewables	42	**Feng Gao** **Georgios Konstantinou** **Xiaofeng Yang** **Ayan Mallik** **Soumya Shubhra Nag**
A4	Energy Storage	24	**Hengzhao Yang** **Fei Gao** **Harish Krishnamoorthy**
A5	Hybrid Renewable Sources	9	**Ramkrishan Maheshwari**
A99	Other topics in renewable and sustainable energy	18	**Jae-Do Park** **Suryanarayana Doolla** **Santanu Kapat**

ECCE 2020 Contributions – **Track A**

- 135 papers in 6 sub-tracks received in Track A
- Originally, 76 papers were accepted (55+2 oral and 19 poster), acceptance rate 56 %
- ECCE 2020 was decided to be virtual conference after sessions were designed – withdrawn papers and changing/merging of sessions
- All technical sessions were video-based on demand, available until **16 Nov, 2020**.
- **Special thanks to our topic and session chairs!**

ECCE 2020 Contributions – Track B

- Track B - Smart Grid & Utility Applications (IAS RESC contributions)
- 200 papers in 10 sub-tracks were managed by Vice Chairs Adel Nasiri (IAS-RSECS), Yaosuo Xue and 16 Topic Chairs.
- 112 accepted, 16 withdrawn, and 72 rejected, acceptance rate 56 %.

Sub-track	Title	Submitted Papers	Topic Chairs
B01	Renewable Energy Grid Integration	50	
B02	Distributed Resources and Microgrids	42	
B03	HVDC and FACTS	18	Afshin Izadian
B04	DC Distribution and DC Microgrids	19	Dinesh Kumar

ECCE 2020 Contributions – Track B-Adel

Sub Track	Title	No. of Submitted Papers	Topic Chairs
B05	AC Distribution and AC Microgrids	11	Saban Ozdemir
B06	Electronic transformer and other grid devices	21	Behrooz Mirafzal
B07	V2G and G2V	8	Necmi Altin
B08	Stability and power quality	17	Mohammad Shadmand
B09	Smart buildings and appliances	4	Necmi Altin
B99	Other topics	10	Mehdy Khayamy

ICRERA 2020 Contributions

- International Conference on Renewable Energy Research and Applications (ICRERA) was held virtually
- IAS, PELS, IES sponsored conference hosted from Paris, France.
- Approximately 87 papers in 18 sessions.
- 7 keynote speakers, 4 tutorials, 3 industrial talks
- Adel Nasiri served on the steering and organizing committees.
- Virtual conference.

RESC Conference Paper Awards Committee

- Ke Ma
- Adel Nasiri
- Eduard Muljadi
- Yilmaz Sozer
- Hengzhao Yang
- Jae-Do Park
- Xiaofeng Yang

Candidates are selected from accepted papers in Track A and Track B of ECCE 2020

Third Prize

Yafeng Wang, Tiefu Zhao

"A Hybrid Voltage Regulator with Arcless Tap Change and Stepless Voltage Regulation Functions"

Second Prize

Yiwei Ma, Fred Wang, Leon M. Tolbert

"Virtual Synchronous Generator with Limited Current– Impact on System Transient Stability and Its Mitigation"

First Prize

Sanjay Rajendran, Soumik Sen, Liqi Zhang, Zhicheng Guo, Qingyun Huang, Alex Q. Huang

"500kVA Hybrid Solid State Transformer (HSST): Design and Implementation of the SST"

Volunteers for AEs and Session/Topic Chairs

ECCE 2021 Topic Chairs and Session Chairs

IAS Transactions Associate Editors

Email: eduard.muljadi@auburn.edu

IEEE SA
STANDARDS ASSOCIATION

IEEE 1547 – IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

RENEWABLE AND SUSTAINABLE COMMITTEE

23 October 2020

IEEE IAS

IEEE

1. Overview of IEEE 1547 Standard – Scope, Evolution

IEEE Standards Development

IEEE Societies

Standards Coordinating Committees – (SCC) 21 oversees the development of standards in the areas of Interoperability, fuel cells, photovoltaics, dispersed generation, and energy storage

SCC21 Background

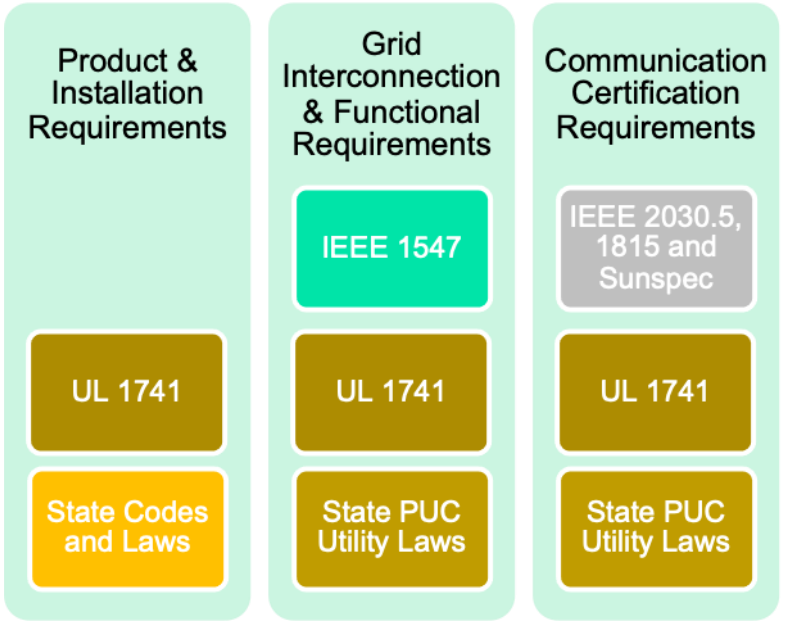
- The IEEE Standards Coordinating Committee 21 oversees the development of standards in the areas of fuel cells, photovoltaics, dispersed generation, and energy storage
  - Coordinates efforts in these fields among the various IEEE societies and other affected organizations
  - Ensure that all standards are consistent and properly reflect the views of all applicable disciplines.
  - Increasing emphasis on communications interoperability and system control
  - Reviews and approves all standards in these sponsored areas
- SCC21 has been operating since 1981
- SCC reports directly to the IEEE – SA Standards Board – Project focus:
  - Scope too broad to be encompassed in a single IEEE Society
  - IEEE Society is unable to carry out the work needed to meet an identified need
  - New or undefined initiatives related to Distributed Energy

Importance of IEEE 1547

- Energy Policy Act (2005) Cites and requires consideration of IEEE 1547 Standards and Best Practices for Interconnection; all states use or cite 1547.
- Energy Independence and Security Act (2007) IEEE cited as a standards development organization partner to NIST as Lead to coordinate framework and roadmap for Smart Grid Interoperability standards and protocols {IEEE 1547 & 2030 series being expanded};
- Federal ARRA (2009) Smart Grid & High Penetration DER projects {*use IEEE stds*}.

Distributed Energy Dramatic Changes

- Significant changes to standards, codes and regulations as a result of IEEE 1547 Interconnection Standard
- Revisions of the original standard due to:
  - High penetration of renewable sources in some markets
  - Differing performance of inverters and synchronous generators
  - Need for guidance on how to apply standards
    - No conformance assessment standards for Microgrids, energy storage or aggregation of multiple DER
- Interoperability requirements are critical and may provide for innovation



Evolution of grid support functions

IEEE Std 1547-2003

- **Shall NOT** actively regulate voltage
- **Shall** trip on abnormal voltage/frequency

IEEE Std 1547-2018

- **Shall be capable of** actively regulating voltage
- **Shall** ride through abnormal voltage/frequency
- **Shall be capable of** frequency response

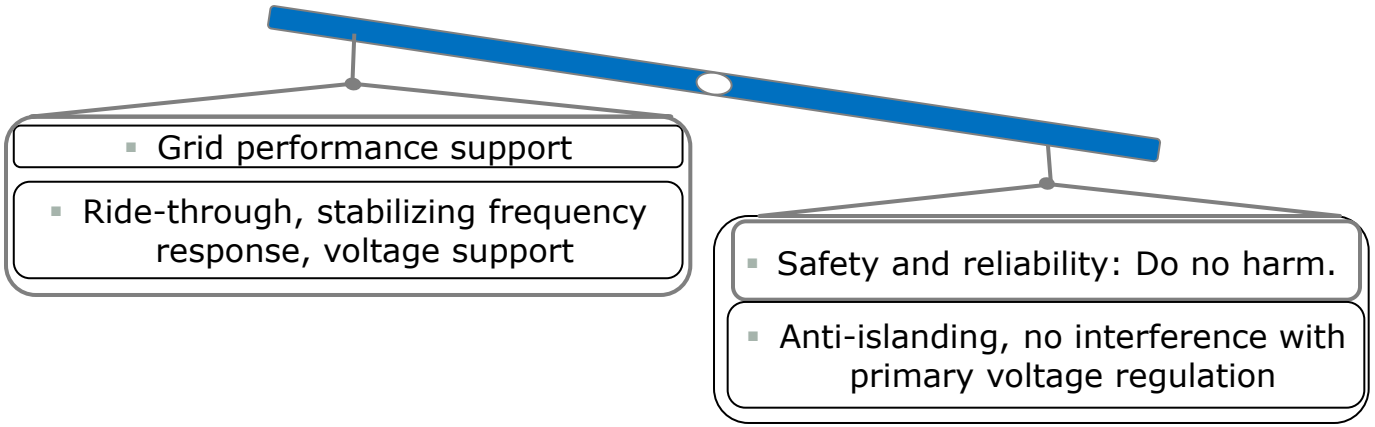
Source: NREL

Importance of IEEE 1547 - 2018

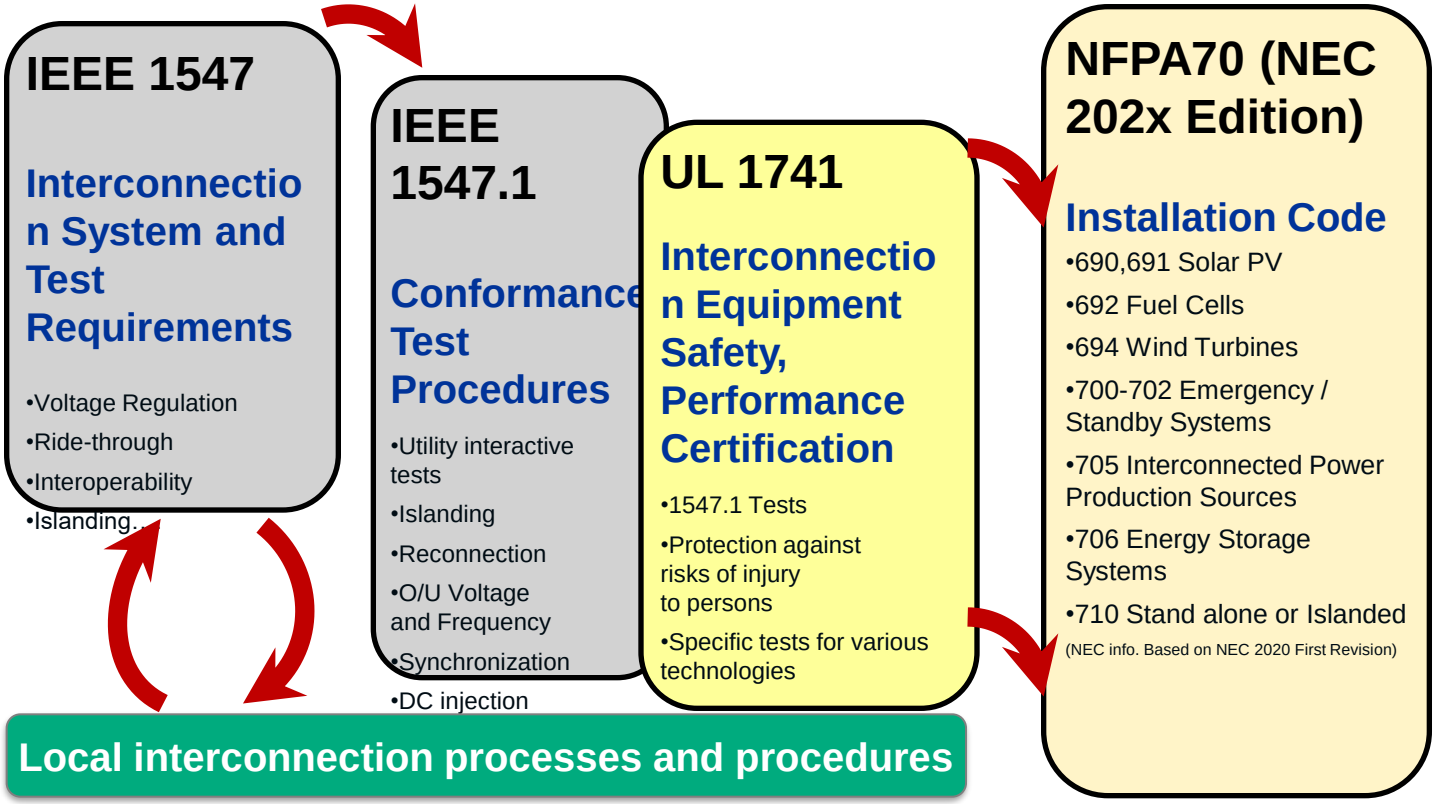
- Foundation for Transition to Interactive, Resilient Electric Power System
- Improve the resilience of the Electric Power System
- Balancing Distribution and Transmission Needs
- Maintains focus on Safety of Interconnection
- Reduced ambiguity of integration requirements
- Technology Neutral
- States are evaluating regulations based on IEEE 1547-2018 and on availability of certified equipment

Balancing Distribution Needs with BPS Considerations

- *Increasing DER penetration was a major driver for revising IEEE 1547-2003*



IEEE 1547 Interconnection Example Use in USA



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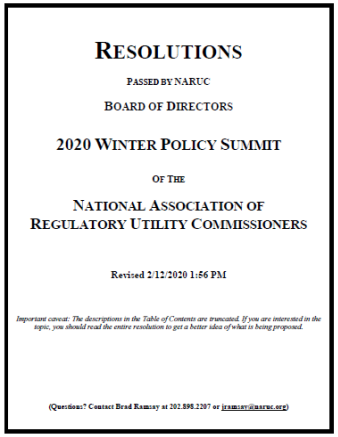
2. Regulatory Support for IEEE 1547 Implementation (NARUC Resolution)

IEEE Std 1547-2018 Adoption Snapshot

- NARUC advising all utility regulators to adopt 1547-2018 “as soon as possible”
- ISO-level adoption:
  - ISO-NE, MISO, PJM requiring utilities in their territories to adopt specific 1547 ride-through settings (timelines vary)
- State- and utility-level adoption:
  - CA, HI actively harmonizing interconnection standards with 1547-2018
  - MD, MN requiring 1547-2018 compliance by certain dates
  - AZ, IL, MA, NC, NY, in various stages of work to require 1547-2018 compliance and select settings
  - Various other states and utilities expected to begin work to adopt 1547-2018 in near future
  - Early adopters are requiring compliance by January 2022 (allowing time for certification to UL 1741 using IEEE Std 1547-2020)



RESOLUTIONS

PASSED BY NARUC

BOARD OF DIRECTORS

2020 WINTER POLICY SUMMIT

OF THE

NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS

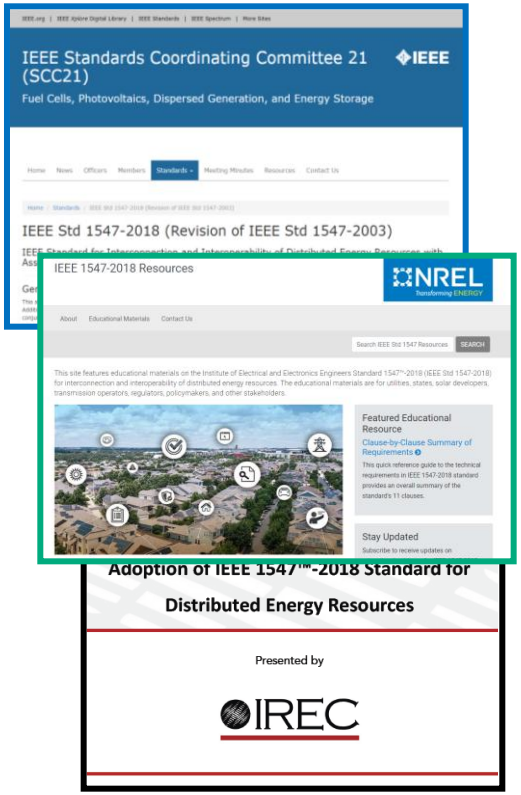
Revised 2/12/2020 1:56 PM

Important caveat: The descriptions in the Table of Contents are truncated. If you are interested in the topic, you should read the entire resolution to get a better idea of what is being proposed.

(Questions? Contact Brad Ramsey at 202.898.2207 or bramsey@naruc.org)

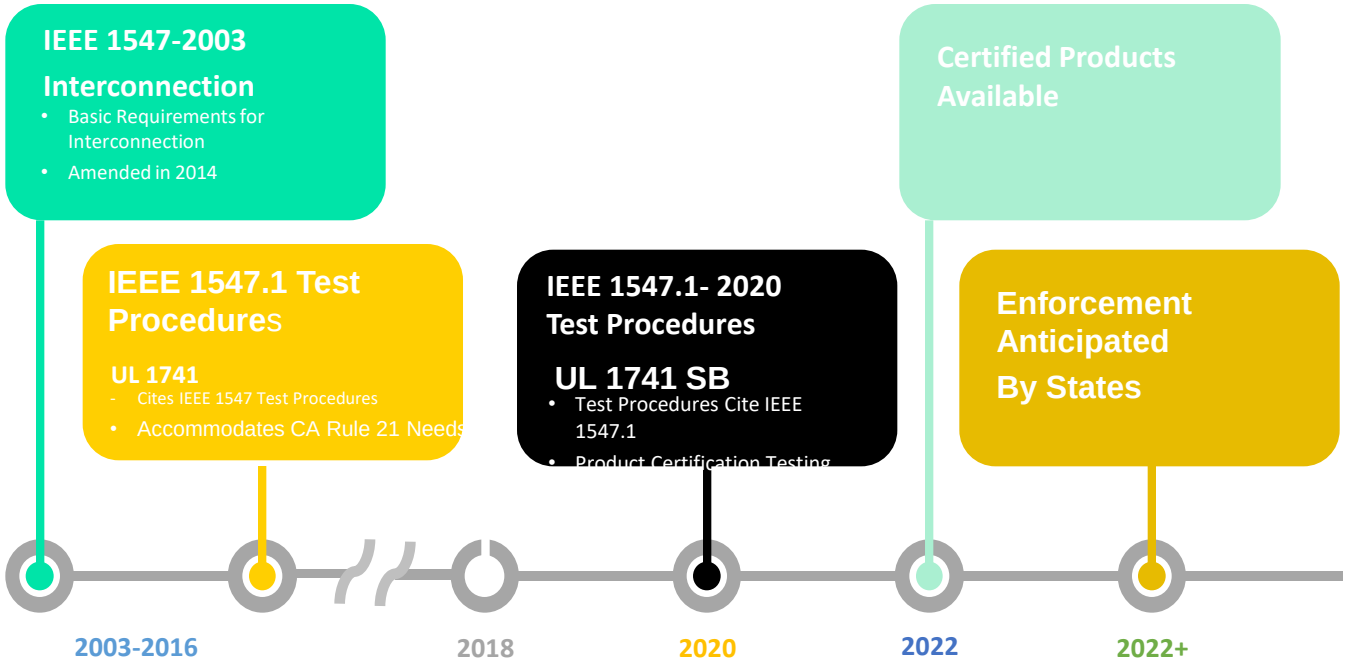
IEEE Std 1547-2018 Resources/ Outreach

- SCC 21 informational site includes resources, timeline, references
- NREL educational site provides resources for 1547-2018 adoption
- EPRI project on “navigating 1547”
  - Various documents and webinars
  - Hosting database of utility required profiles for 1547-2018 compliance:
- IREC primer on 1547-2018 adoption
- Developing webinars to present holistic review of IEEE 1547 & how it may be implemented (Texas PUC) In cooperation with ICAP
- Quarterly coordination meeting with industry stakeholders (FERC, NERC, SEPA, SEIA, etc.)



Timeline for Rollout of IEEE Std 1547-2018 Compliant DER

Standards



Regulations

CA Rule 21

NARUC Resolution on IEEE 1547

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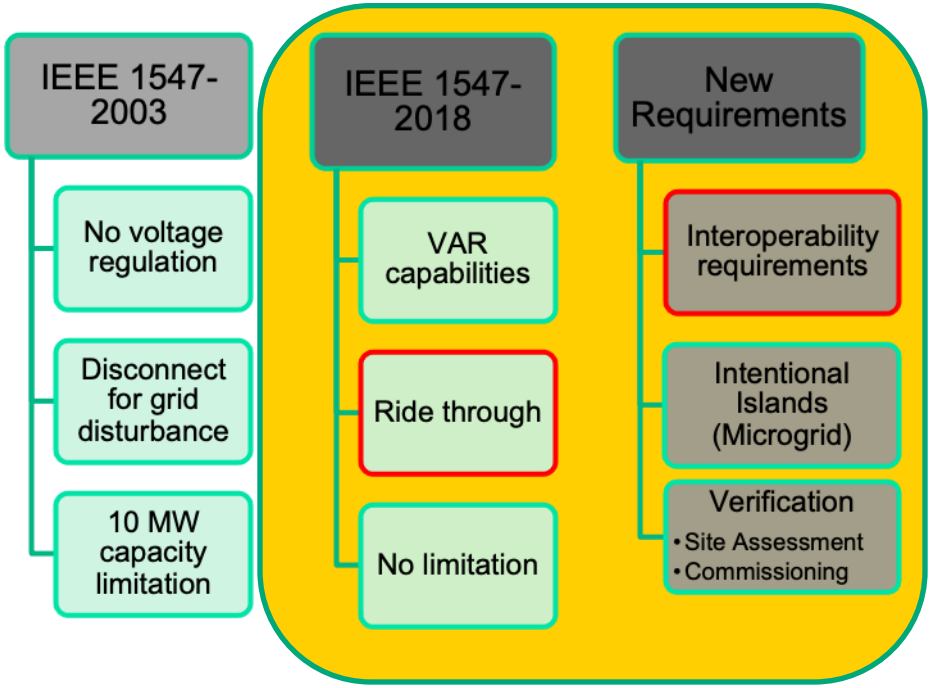
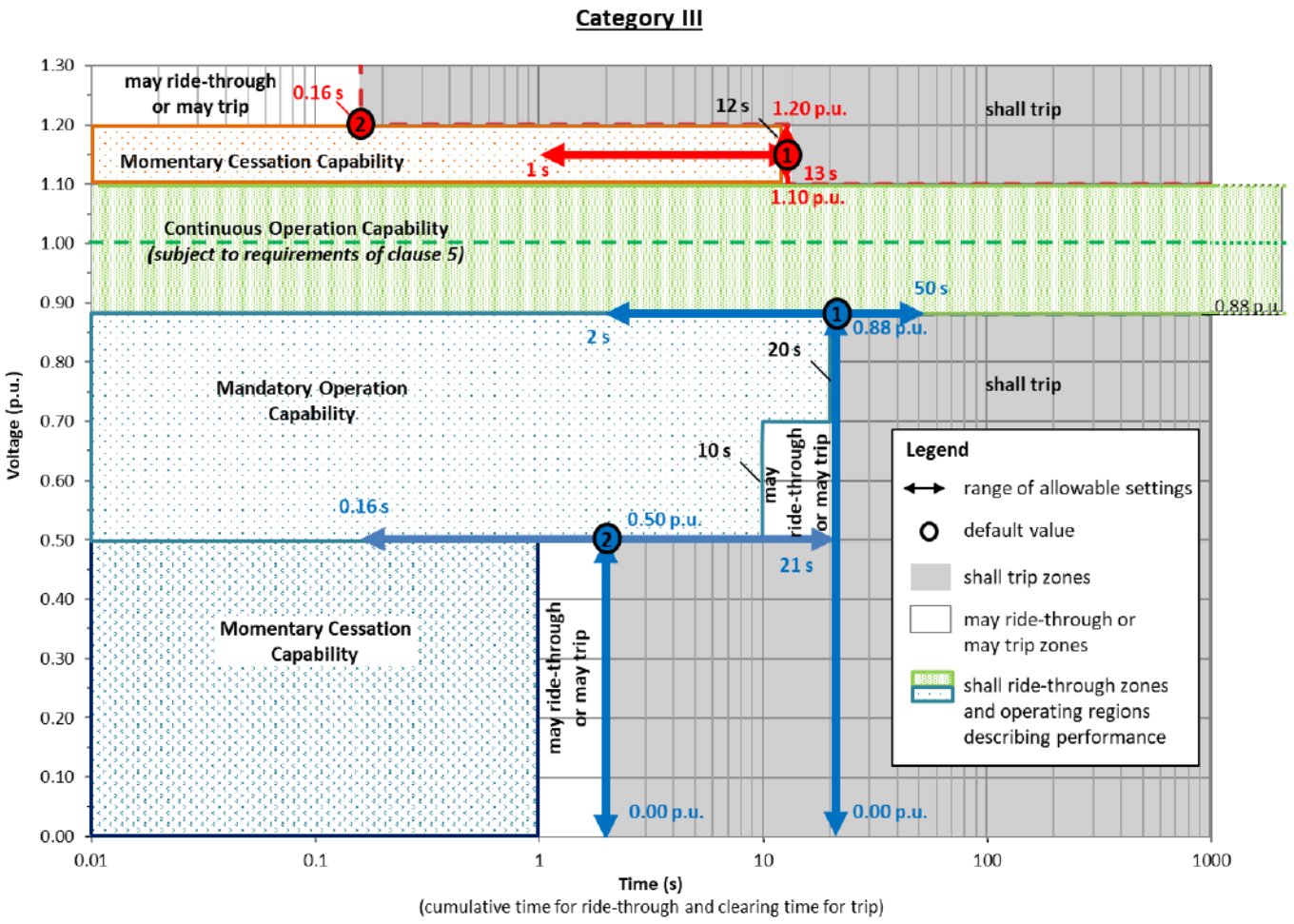
3. IEEE 1547-2018: Capabilities and New Functions)

Distributed Energy Dramatic Changes

- IEEE 1547-2018 and IEEE 1547.1 (Test Procedures) require all DER to have capability to meet technical requirements:
  - For Normal operating conditions - regulate voltage, frequency within ranges specified by ISO
  - For Abnormal conditions - “Ride-Through" disturbances
  - For Intentional Islands (that include distribution) may have extended clearing time (to 5 sec)
  - All DER will be capable of meeting Interoperability Requirements
    - DER Nameplate and Configuration
    - Monitoring Information and Management Information (settings)
    - Specifies Protocols
  - Verification Process Requirements (Allow System Type Testing)

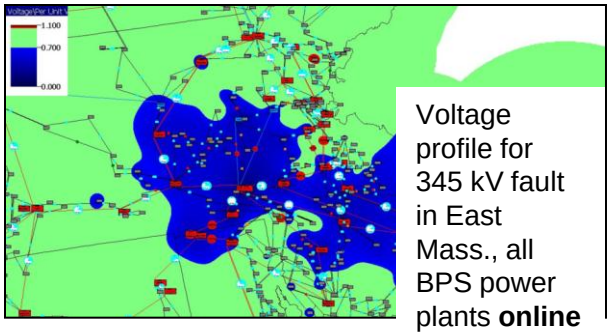


1547 Example of New Requirements for Voltage Ride Through



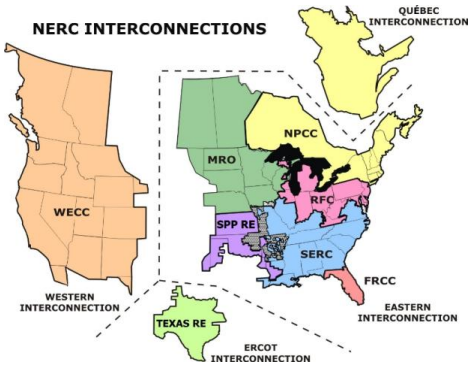
Driver for new ride-through requirements: Potential for widespread DER tripping

- System frequency is defined by balance between load and generation
- Frequency is similar across entire interconnection; all DER can trip simultaneously during disturbance
- Impact the same whether or not DER is on a high-penetration feeder



Voltage profile for 345 kV fault in East Mass., all BPS power plants **online**

Source: ISO-New England



- Transmission faults can depress distribution voltage over very large areas
- Sensitive voltage tripping (i.e., 1547-2003) can cause massive loss of DER generation
- Resulting BPS event may be greatly aggravated

Interoperability

- Communication Requirements
  - A DER shall have provisions for an interface capable of communicating (local DER communication interface) to support the information exchange requirements specified in this standard for all applicable functions that are supported in the DER.
- Information to be exchanged:
  - Nameplate Data – As-built characteristics of the DER.
  - Configuration Information – Each rating in Nameplate Data may have a configuration setting.
  - Monitoring Information – Latest value measured.
  - Management information – This information is used to update functional and mode settings for the DER.

Areas of Potential Interest for Collaboration

- Communications and Smart Grid
  - New Standard P2030 Revision
  - Cyber Security
  - Cyber Physical Systems
- Grid Forming Inverters
- Vehicle Fast Charging Infrastructure
- Safety Low Voltage Systems

Thank you

Standards Development Impacting EPS

- *Active IEEE Working Groups (Projects with Blue Font Holding Regular Meetings)*
- IEEE P1547a: Amendment to IEEE 1547-2018 (Extend Ranges in Category III)
- IEEE P1547.1: DER interconnection and interconnection test requirements
  - Ballot and recirculation approved – comment resolution
- IEEE P1547.2: Application Guide to 1547
- IEEE P1547.3: Standard Cybersecurity Requirements for Power System Automation, Protection and Control Systems
- IEEE P1547.9: Guide for Energy Storage System Interconnection
- IEEE P2030.4: Guide for Control and Automation Installations Applied to the Electric Power Infrastructure
- IEEE P2030.5: Standard for Smart Energy Profile 2.0 Application Protocol

Standards Development Impacting EPS

- IEEE P2800: Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems
- IEEE P2800.1: Guide for Test and Verification Procedures for Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems
- IEEE P2815: Guide for the Technical Specification for Smart Distribution Transformer Terminal (Entity)
- IEEE P2030.7: Standard for the Specification of Microgrid Controllers
- IEEE P2030.8: Standard for the Testing of Microgrid Controllers
- IEEE P2030.11: Guide for Distributed Energy Resource Management Systems (DERMS)
- IEEE P2030.12: Guide for protection of Microgrid Systems
- IEEE C26 C37.233: Guide for Protection System Testing
- IEEE P1661: Guide for Test and Evaluation of Lead-Acid Batteries Used in Photovoltaic (PV) Hybrid Power Systems

Note: Active Working Groups in Blue Text (Jointly Sponsored with IEEE PES ESB)

Other Activity Related to Microgrids and DERMS

- In February 2020, NARUC resolution recommends State commissions adopt IEEE 1547-2018 and align implementation of the Standard with the availability of certified equipment.
- Other Standards:
  - IEEE P2800 is adopting IEEE 1547 technical requirements to Transmission Connected DER.
  - IEEE P2030.11 Guide for Interoperability of DERMS will propose nomenclature for control and communication
  - IEEE P2030 will update the IEEE 2030 Smart Grid Interoperability Reference model to current practices and simplify application
  - Anticipate that Microgrid Systems may require comprehensive commissioning to ensure performance when connected to Grid

ECCE

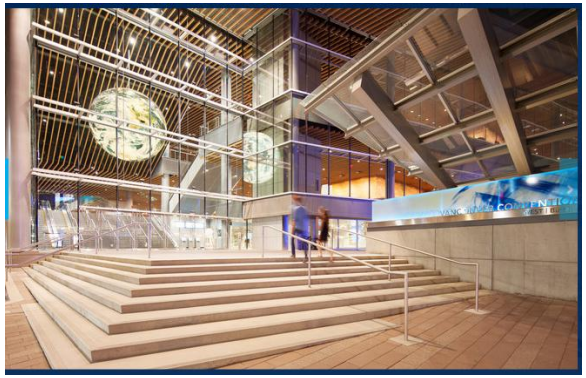
IEEE ENERGY CONVERSION CONGRESS & EXPO

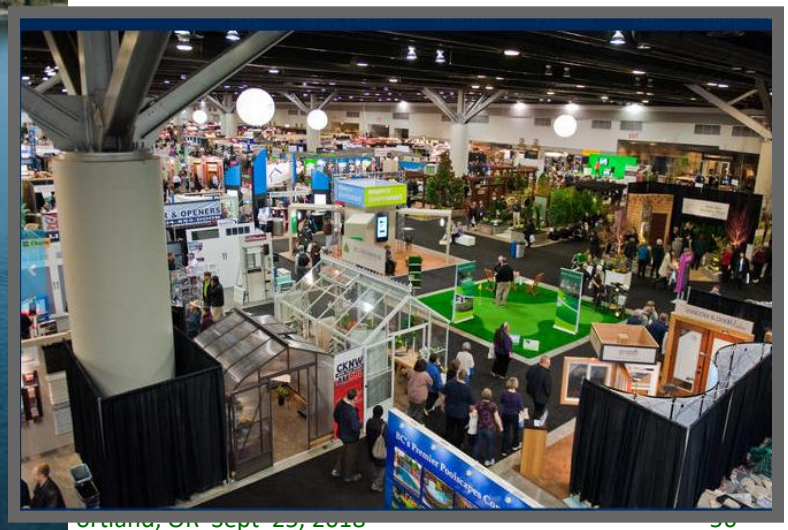
2021

Vancouver, Canada Oct. 10-14

Vancouver Convention Center - West

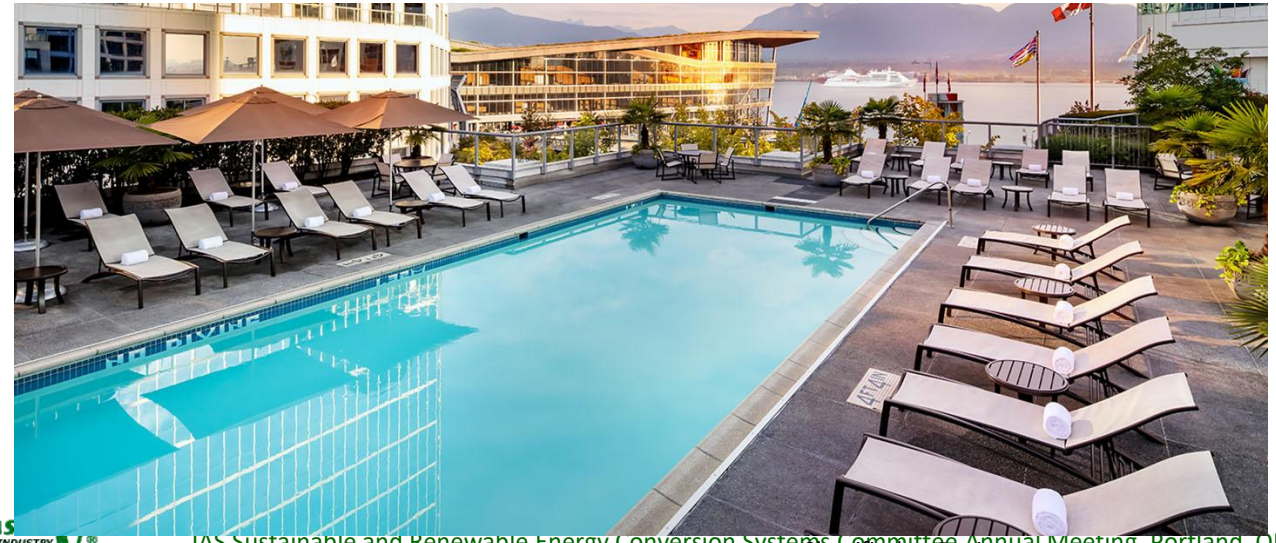
- **Sustainable building** (double LEED® Platinum certified facility), six-acre living roof
- Waterfront views from every window





Hotels

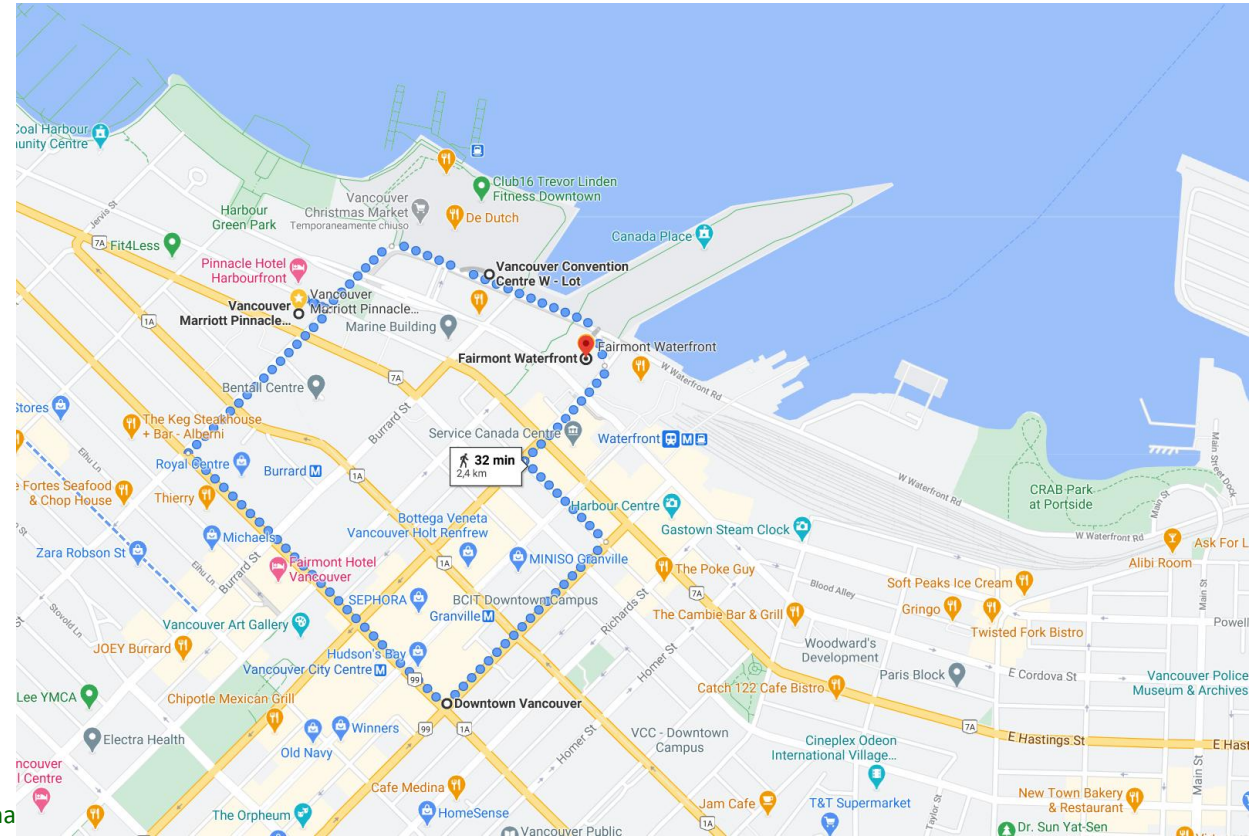
- Marriott Pi
- Fairmont W



Live Vancouver!

Click for 30 s Video

- Hotels, convention center and downtown at hand
- Vancouver Inter. Airport (YVR) 20 min. from downtown



Many Attractions in Vancouver

- Port of Vancouver (largest port in Canada)
- Cruise Ship Terminal (4th largest in the world)
- Stanley Park
- Capilano Suspension Bridge
- H.R. MacMillan Space Centre
- Aquarium
- Science World
- Grouse Mountain
- Vancouver Art Gallery
- VanDusen Botanical Garden
- and many others…

Important Dates

- Jan. 15th, 2021 - Deadline for digest submissions
- Feb 12th, 2021 – Deadline for Tutorials
- Mar 31st, 2021 – Deadline for Special Sessions
- April 2nd, 2021 – Tutorial decision notification
- May 1st, 2021 – Digest and Special Sessions decision
- Jun. 30th, 2021 - Final papers with copyright forms

For details visit our website:

http://www.ieee-ecce.org/2021/

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12 from industry,
17 from academia,
1 US gov. lab

See you in October 2021 - in Vancity!!