



IEEE SBLC 亚太地区工作组学术研讨会

暨 IEEE P2781 标准工作组启动会

IEEE SBLC Asia Pacific Working Group Symposium & Kick-off  
Meeting for IEEE Standard P2781-Guide for Load Modeling and  
Simulations for Power Systems

会  
议  
指  
南



May 25, 2018  
Guangzhou, China

# 目录

1. 中文会议通知.....	1
2. 英文会议通知.....	4
3. 参会专家名单.....	6
4. 全体工作组专家名单（中文） .....	8
5. 全体工作组专家名单（英文） .....	12
6. 会议议程（中文） .....	16
7. 会议议程（英文） .....	18
8. IEEE P2781 标准立项审批单.....	20
9. IEEE P2781 标准大纲.....	22
10. IEEE P2781 标准规约.....	26

# Contents

1. Conference Notice (Chinese).....	1
2. Conference Notice (English).....	4
3. List of Participating Experts.....	6
4. List of all WG Members (Chinese) .....	8
5. List of all WG Members (English) .....	12
6. Meeting Agenda (Chinese).....	16
7. Meeting Agenda (Chinese).....	18
8. IEEE P2781 PAR Approval File.....	20
9. IEEE P2781 outline.....	22
10. IEEE P2781 baseline.....	26

# 南方电网科学研究院有限责任公司部门文件

系统〔2018〕14号

---

## 关于召开“IEEE SBLC 亚太地区工作组 学术研讨会暨 IEEE P2781 (Load Modeling and Simulation WG) 标准工 作组启动会”的通知

各位专家：

兹定于 2018 年 05 月 24 日至 25 日在广州召开“IEEE SBLC 亚太地区工作组学术研讨会暨 IEEE P2781 (Load Modeling and Simulation WG) 标准工作组启动会”，请各位专家参加。本次会议由南方电网科学研究院承办，广东电网安全经济运行与市场化调度重点实验室（广东电网调度控制中心）及 IEEE 广州分会协办。

会议有关事宜和安排通知如下：

### 一、会议时间

2018 年 05 月 24 日至 25 日，09:00-17:00，会期2天，5月23日报到。

## 二、会议内容

05 月 24 日，参观广东电网安全经济运行与市场化调度重点实验室；

05 月 25 日，IEEE SBLC 亚太地区工作组学术研讨会及 IEEE P2781 ( Load Modeling and Simulation WG ) 标准工作组启动会。

## 三、会议地点

5 月 24 日，广州市越秀区梅花路 75 号广东电网电力调度控制中心；

5 月 25 日，广州市黄埔区科学城科翔路 11 号南网综合基地 3 号楼 215 会议室。

## 四、住宿酒店

广州日航酒店

地址：广州市天河区华观路 1961 号

## 五、会议联系人

邹 金 020-36625185 18588899225

禤培正 020-36625146 18620051011

谢平平 020-36625145 18688868751

## 六、其他事项

本次会议食宿统一安排。

已报名的参会专家名单见附件。

特此通知。



---

抄送:

---

南方电网科学研究院有限责任公司      2018年5月21日印

---

IEEE SBLC Asia Pacific Working Group Symposium & Kick-off  
Meeting for IEEE Standard P2781-Guide for Load Modeling and  
Simulations for Power Systems

Dear Experts and Professors,

IEEE SBLC Asia Pacific Working Group will have a conference on May 24-25, 2018 at Electric Power Research Institute, China Southern Power Grid (EPRI, CSG), Guangzhou, China. We will have a symposium as well as a kick-off meeting for IEEE Standard P2781-Guide for Load Modeling and Simulations for Power Systems during this conference. This conference is organized by EPRI, CSG, and co-organized by Key Laboratory of Grid Secure and Economic Operation & Market Dispatch, GPGC (Guangdong Power Grid Power Dispatching Control Center) and Guangdong IEEE Guangzhou Section. The information about this meeting is listed below.

**Date:** May 24-25, 2018, 09:00-17:00.

**Schedule:**

May 24: Visiting Key Laboratory of Grid Secure and Economic Operation & Market Dispatch, GPGC (Guangdong Power Grid Power Dispatching Control Center);

May 25: IEEE SBLC Asia Pacific WG Workshop & Kick-off Meeting for IEEE Standard P2781-Guide for Load Modeling and

Simulations for Power Systems.

**Location:**

May 24: Guangdong Power Grid Power Dispatching Control Center, No.75 Meihua Road, Yuexiu District, Guangzhou, Guangdong, China;

May 25: EPRI, CSG, No.11 Kexiang Road, Huangpu District, Guangzhou , Guangdong, China.

**Hotel:** Guangzhou Rihang Hotel

**Hotel Address:** No.1961 Huaguan Road, Tianhe District, Guangzhou, Guangdong, China.

We are looking forward to your participation.

Best regards,



Jizhong Zhu, IEEE SBLC Asia-Pacific WG Chair

EPRI, CSG

May 15, 2018



## 参会专家名单

序号	姓 名	单 位	职务/职称
1	曾勇刚	南网科研院	院长
2	Jay Giri	美国工程院	院士
3	Malia Zaman	IEEE 标准协会	Program Manager
4	赵盟	IEEE 中国	Standard Manager
5	朱继忠	南网科研院	国家千人计划专家
6	洪潮	南网科研院	高级技术专家
7	周保荣	南网科研院	高级技术专家
8	赵勇	南网科研院	高级技术专家
9	涂亮	南网科研院	高工
10	赵睿	南网科研院	高工
11	谢平平	南网科研院	工程师
12	禰培正	南网科研院	工程师
13	邹金	南网科研院	工程师
14	吴小珊	南网科研院	工程师
15	李诗旻	南网科研院	工程师
16	苏祥瑞	南网科研院	工程师
17	毛田	南网科研院	工程师
18	赵化时	南网总调	高工
19	李嘉龙	广东中调	部长/高工
20	张轩	广东中调	副部长/高工
21	孙斌	贵州中调	副主任/高工
22	袁宇波	国网江苏电科院	总工/研高
23	孙蓉	国网江苏电科院	主任/研高

24	杨毅	国网江苏电科院	副主任/高工
25	李虎成	国网江苏电科院	工程师
26	于继来	哈尔滨工业大学	教授/所长
27	郭钰锋	哈尔滨工业大学	副教授
28	王晓茹	西南交通大学	教授/校长助理
29	刘炜	西南交通大学	副教授
30	刘俊勇	四川大学	教授
31	荆朝霞	华南理工大学	教授
32	熊小伏	重庆大学	教授
33	陈谦	河海大学	教授
34	石立宝	清华大学深圳研究生院	副教授
35	富晓鹏	天津大学	讲师
36	王雪纯	武汉大学	博士生
37	李克强	山东大学	博士生
38	袁爽	西南交通大学	博士生

## IEEE SBLC 亚太地区工作组专家名单

序号	姓 名	单 位
1	朱继忠	南方电网科学研究院
2	洪 潮	南方电网科学研究院
3	周保荣	南方电网科学研究院
4	陈 政	南方电网科学研究院
5	赵 勇	南方电网科学研究院
6	谢平平	南方电网科学研究院
7	禔培正	南方电网科学研究院
8	邹 金	南方电网科学研究院
9	陈亦平	中国南方电网电力调度控制中心
10	于继来	哈尔滨工业大学
11	郭钰锋	哈尔滨工业大学
12	李卫星	哈尔滨工业大学
13	李卫东	大连理工大学
14	刘 娆	大连理工大学
15	武新宇	大连理工大学
16	韩学山	山东大学
17	杨 明	山东大学
18	王明强	山东大学
19	孙宏斌	清华大学
20	郭庆来	清华大学
21	张 宁	清华大学
22	王成山	天津大学
23	李 鹏	天津大学

24	穆云飞	天津大学
25	富晓鹏	天津大学
26	王晓茹	西南交通大学
27	刘 炜	西南交通大学
28	韩正庆	西南交通大学
29	袁宇波	国网江苏省电力公司电力科学研究院
30	孙蓉	国网江苏省电力公司电力科学研究院
31	杨 毅	国网江苏省电力公司电力科学研究院
32	李虎成	国网江苏省电力公司电力科学研究院
33	葛 亮	北京四方继保自动化股份有限公司
34	赵凤青	北京四方继保自动化股份有限公司
35	时伯年	北京四方继保自动化股份有限公司
36	刘 辉	广西大学
37	石立宝	清华大学深圳研究生院
38	赵俊华	香港中文大学（深圳）
39	黎灿兵	湖南大学
40	周斌	湖南大学
41	高云鹏	湖南大学
42	娄素华	华中科技大学
43	李正天	华中科技大学
44	陈 卫	华中科技大学
45	陈红坤	武汉大学
46	陈皓勇	华南理工大学
47	刘明波	华南理工大学
48	荆朝霞	华南理工大学
49	朱 森	上海交通大学

50	侯 玉	上海交通大学
51	熊小伏	重庆大学
52	颜 伟	重庆大学
53	周念成	重庆大学
54	任洲洋	重庆大学
55	王强钢	重庆大学
56	罗永捷	重庆大学
57	卫志农	河海大学
58	孙国强	河海大学
59	臧海祥	河海大学
60	陈谦	河海大学
61	刘俊勇	四川大学
62	刘友波	四川大学
63	刘继春	四川大学
64	向 月	四川大学
65	韩肖清	太原理工大学
66	秦文萍	太原理工大学
67	贾燕冰	太原理工大学
68	李嘉龙	广东电网电力调度控制中心
69	张 轩	广东电网电力调度控制中心
70	李 颖	广东电网电力调度控制中心
71	白 杨	广东电网电力调度控制中心
72	孟安波	广东工业大学
73	叶 林	中国农业大学
74	李乃湖	通用电气公司能源互联集团
75	李文云	云南电网有限责任公司

76	朱 涛	云南电网有限责任公司
77	孙 斌	贵州电网有限责任公司
78	张武军	中能建湖南省电力设计院有限公司
79	蒋云松	中能建湖南省电力设计院有限公司
80	孙志云	中能建湖南省电力设计院有限公司
81	Ron Hui (许树源)	香港大学
82	Xu Zhao (许昭)	香港理工大学
83	Joe Dong (董朝阳)	澳大利亚新南威尔士大学/南网科研院
84	Thongchai MEENUAL	泰国电力公司 (PEA)
85	Jong Bae Park	韩国建国大学
86	Gerald Ledwich	澳大利亚昆士兰科技大学
87	Koji Yamashita	电力工业中央研究院

## Members of IEEE SBLC Asia-Pacific Working Group

No.	Name	Company/Organization
1	Jizhong Zhu	Electric Power Research Institute, CSG
2	Chao Hong	Electric Power Research Institute, CSG
3	Baorong Zhou	Electric Power Research Institute, CSG
4	Zheng Chen	Electric Power Research Institute, CSG
5	Yong Zhao	Electric Power Research Institute, CSG
6	Pingping Xie	Electric Power Research Institute, CSG
7	Peizheng Xuan	Electric Power Research Institute, CSG
8	Jin Zou	Electric Power Research Institute, CSG
9	Yiping Chen	China Southern Grid Power Dispatching and Control Center
10	Jilai Yu	Harbin Institute of Technology
11	Yufeng Guo	Harbin Institute of Technology
12	Weixing Li	Harbin Institute of Technology
13	Weidong Li	Dalian University of Technology
14	Rao Liu	Dalian University of Technology
15	Xinyu Wu	Dalian University of Technology
16	Xueshan Han	Shandong University
17	Ming Yang	Shandong University
18	Mingqiang Wang	Shandong University
19	Hongbin Sun	Tsinghua University
20	Qinglai Guo	Tsinghua University
21	Ning Zhang	Tsinghua University
22	Chengshan Wang	Tianjin University
23	Peng Li	Tianjin University

24	Yunfei Mu	Tianjin University
25	Xiaopeng Fu	Tianjin University
26	Xiaoru Wang	Southwest Jiaotong University
27	Wei Liu	Southwest Jiaotong University
28	Zhengqing Han	Southwest Jiaotong University
29	Yubo Yuan	Jiangsu Electric Power Company Research Institute
30	Rong Sun	Jiangsu Electric Power Company Research Institute
31	Yi Yang	Jiangsu Electric Power Company Research Institute
32	Hucheng Li	Jiangsu Electric Power Company Research Institute
33	Liang Ge	Beijing Sifang Automation Co. Ltd.
34	Fengqing Zhao	Beijing Sifang Automation Co. Ltd.
35	Bonian Shi	Beijing Sifang Automation Co. Ltd.
36	Hui Liu	Guangxi University
37	Libao Shi	Graduate School at Shenzhen, Tsinghua University
38	Junhua Zhao	The Chinese University of Hongkong (Shenzhen)
39	Canbing Li	Hunan University
40	Bin Zhou	Hunan University
41	Yunpeng Gao	Hunan University
42	Suhua Lou	Huazhong University of Science and Technology
43	Zhengtian Li	Huazhong University of Science and Technology
44	Wei Chen	Huazhong University of Science and Technology
45	Hongkun Chen	Wuhan University
46	Haoyong Chen	South China University of Technology
47	Mingbo Liu	South China University of Technology
48	Zhaoxia Jing	South China University of Technology
49	Miao Zhu	Shanghai Jiaotong University



50	Yu Hou	Shanghai Jiaotong University
51	Xiaofu Xiong	Chongqing University
52	Wei Yan	Chongqing University
53	Niancheng Zhou	Chongqing University
54	Zhouyang Ren	Chongqing University
55	Qianggang Wang	Chongqing University
56	Yongjie Luo	Chongqing University
57	Zhinong Wei	Hohai University
58	Guoqiang Sun	Hohai University
59	Haixiang Zang	Hohai University
60	Qian Chen	Hohai University
61	Junyong Liu	Sichuan University
62	Youbo Liu	Sichuan University
63	Jichun Liu	Sichuan University
64	Yue Xiang	Sichuan University
65	Xiaoqing Hang	Taiyuan University of Technology
66	Wenping Qin	Taiyuan University of Technology
67	Yanbing Jia	Taiyuan University of Technology
68	Jialong Li	Guangdong Electric Power Dispatching and Control Center
69	Xuan Zhang	Guangdong Electric Power Dispatching and Control Center
70	Ying Li	Guangdong Electric Power Dispatching and Control Center
71	Yang Bai	Guangdong Electric Power Dispatching and Control Center
72	Anbo Meng	Guangdong University of Technology
73	Lin Ye	China Agricultural University
74	Naihu Li	GE Energy Connections
75	Wenyun Li	Yunnan Power Grid Co., Ltd.

76	Tao Zhu	Yunnan Power Grid Co., Ltd.
77	Bin Sun	Guizhou Power Grid Co., Ltd.
78	Wujun Zhang	Energy China, HEPDI
79	Yunsong Jiang	Energy China, HEPDI
80	Zhiyun Sun	Energy China, HEPDI
81	Ron Hui	The University of Hong Kong
82	Xu Zhao	The Hong Kong Polytechnic University
83	Joe Dong	The University of New South Wales
84	Thongchai MEENUAL	Provincial Electricity Authority (PEA)
85	Jong Bae Park	Konkuk University
86	Gerald Ledwich	Queensland University of Technology
87	Koji Yamashita	Central Research Institute of the Electrical Power Industry

# IEEE SBLC 亚太地区工作组学术会暨

## IEEE P2781 标准启动会

### 会议议程

时间: 2018 年 5 月 25 日

地点: 南方电网科学研究院

详细地址: 广东省广州市黄埔区科学城科翔路 11 号 南网科研基地 3 号楼 J3-215

会议主持: 国家千人计划专家朱继忠教授 (IEEE SBLC 亚太地区工作组主席, IEEE PES 负荷分专委会主席, IEEE P2781 标准工作组主席)

### 会议议程:

9:00 – 10:00: IEEE SBLC 亚太地区工作组研讨会

1. IEEE SBLC 亚太地区工作组主席朱继忠宣布大会开始, 并介绍部分参加会议的领导和专家。
2. 南方电网科学研究院曾勇刚院长致欢迎词。
3. 美国工程院院士 Jay Giri 作学术报告“Managing Uncertainties of the Future Power Grid”
4. IEEE SBLC 亚太地区工作组主席朱继忠介绍标准立项情况
5. IEEE 标准委员会项目经理 Malia Zaman 讲话

10:00 – 10:10: 会议中途休息 10 分钟

10:10 – 17:00: IEEE P2781 负荷建模与仿真标准启动会

(包括 12:00 – 13:00 自助午餐 和 13:00 – 13:50 午间休息)

1. 介绍参加启动会议的单位/包括参加会议的 IEEE 标准协会会员单位
2. 同意启动会议程
3. IEEE 标准委员会中国经理 Meng Zhao 介绍如何编写制定 IEEE 标准
4. IEEE 标准编写中的专利问题
5. 讨论选举 IEEE P2781 工作组共同主席/副主席和秘书
6. 同意 IEEE 标准政策
7. IEEE P2781 标准大纲讨论

8. IEEE P2781 标准工作计划

9. 需求侧负荷的快速响应系统标准立项补充报告

10. 包括铁路系统负荷的电能质量标准立项补充说明

17:40 – 18:30: 自助晚餐

# **IEEE SBLC Asia-Pacific WG Workshop & Kick-off Meeting for IEEE Standard P2781**

## **Agenda**

**Date:** May 25, 2018

**Location:** EPRI, China Southern Power Grid

**Address:** Room 215, Building 3. No.11 Kexiang Road, Huangpu District, Guangzhou, Guangdong 510663, China

**Moderator:** Jizhong Zhu, IEEE SBLC Asia-Pacific WG Chair; IEEE PES Load Subcommittee Chair; IEEE Standard P2781 WG Chair

## **Agenda:**

9:00 – 10:00: IEEE SBLC Asia-Pacific WG Workshop

1. Asia-Pacific WG Chair, Jizhong Zhu declares the Meeting Open and Introduces Distinguished Guests
2. Welcome speech by Yonggang Zeng, President of SEPRI, China Southern Power Grid
3. Presentation by Dr. Jay Giri, Member of National Academy of Engineering in U.S.: “Managing Uncertainties of the Future Power Grid”
4. IEEE SBLC Asia-Pacific WG Chair Dr. Zhu report the PARs proposed by Asia-Pacific WG
5. Presentation by IEEE SA Manager Malia Zaman

10:00 – 10:10: Break

10:10 – 17:00: Kick-off Meeting for IEEE Standard P2781

(Including 12:00 – 13:00 Lunch Buffet and 13:00 – 13:30 Break)

1. Call to Order
  - Introduction and Affiliation Declarations
  - Introduction to member entities
  - Introduction of new DRs and DRAs
2. Approval of Agenda
3. Presentation from IEEE SA

4. IEEE Patent Policy
    - Call for Patents Call for Patents
  5. Appointment of officers
  6. Approval of WG Policies and Procedures (P&P)
  7. Entity Presentations / Technical presentation or discussions.
  8. Draft of Work Plan
  9. Report update of PAR - Quick Response System for Customer-side Load
  10. Report update of PAR – Power Quality - Railway
  11. Adjourn
- 17:40 – 18:30: Dinner Buffet

# P2781

---

**Submitter Email:** [shawn.chandler@navigant.com](mailto:shawn.chandler@navigant.com)

**Type of Project:** New IEEE Standard

**PAR Request Date:** 21-Mar-2018

**PAR Approval Date:** 14-May-2018

**PAR Expiration Date:** 31-Dec-2022

**Status:** PAR for a New IEEE Standard

---

**1.1 Project Number:** P2781

**1.2 Type of Document:** Guide

**1.3 Life Cycle:** Full Use

---

**2.1 Title:** Guide for Load Modeling and Simulations for Power Systems

---

**3.1 Working Group:** Load Modeling and Simulation WG (PE/SBLC/Loads/Load Model)

**Contact Information for Working Group Chair**

**Name:** Jizhong Zhu

**Email Address:** [jizhong.zhu@ieee.org](mailto:jizhong.zhu@ieee.org)

**Phone:** Office

**Contact Information for Working Group Vice-Chair**

None

---

**3.2 Sponsoring Society and Committee:** IEEE Power and Energy Society/Smart Buildings, Loads and Customer Systems (PE/SBLC)

**Contact Information for Sponsor Chair**

**Name:** Shawn Chandler

**Email Address:** [shawn.chandler@navigant.com](mailto:shawn.chandler@navigant.com)

**Phone:** 5039270793

**Contact Information for Standards Representative**

None

---

**4.1 Type of Ballot:** Entity

**4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot:** 05/2019

**4.3 Projected Completion Date for Submittal to RevCom**

**Note:** Usual minimum time between initial sponsor ballot and submission to Revcom is 6 months.: 05/2020

---

**5.1 Approximate number of entities expected to be actively involved in the development of this project:** 5

**5.2 Scope:** The scope of this guide is the definition of load models for various conventional and emerging elements in the generation, transmission, distribution and customer sectors at all voltage levels. This includes guidance for developing load models, identifying load model parameters, and utilizing measurement data for load model development at various voltage levels. It also includes modelling practices for emerging elements such as power electronics connected elements, electrical vehicles and charging stations, better utilization of Information and Communication Technology (ICT) infrastructures in load model development, and dynamics associated with customer involvement.

**5.3 Is the completion of this standard dependent upon the completion of another standard:** No

**5.4 Purpose:** Load modeling and simulation have been an established area with continuous development through research and engineering practices. Although there are different references and reports, there are emerging interests from the industry on standard practices with various load models and simulations to accommodate the rapidly evolving power industry incorporating both conventional and new inverter connected renewable elements. Development in power electronics, smart grid technologies, demand side control and increasing renewable energy uptake have made load modeling an increasingly challenging essential element for system operations and planning to ensure system security while maintain economic efficiency and emission reduction objectives. The rapid deployment of IoT technologies and considered by industry initiative brings new opportunities and challenges for load modeling; together with big data analysis and artificial intelligence methods, data obtained through the IoT sensors enable detailed modeling of loads behind the meters without customer survey. A guide for standard approaches within this domain will lead to new load modeling approaches beyond the conventional measurement based or component based ones which will advance acceptance and interoperability.

**5.5 Need for the Project:** Load modeling and simulation are essential parts of the overall power system modeling and simulations for static as well as dynamic stability assessment. Steady state and dynamic load models have been used in system operations and planning over the decades. Classic load models such as induction motors, ZIP models and exponential models generally cover most of the properties of load

components in a power system. However, with the development of IoT technologies, smart grid, demand side management, energy storage and distributed generations, more and more active elements have been introduced to the system loads, as such, load models for both generic load modeling and load models including new power electronics based loads, active distribution networks with distributed generation with energy storage have emerged as new challenges for load modeling. IEEE and CIGRE have done some highly valuable work on load models over the past few years which provide very useful guidance to industrial practices on load modeling based mostly on the conventional load models. There is an urgent need for an overall guidance to cover load modeling and simulations to include those emerging elements.

**5.6 Stakeholders for the Standard:** The universality of this standard relates not only to the technical aspects, but also to the adoption of this standard as being pertinent across a number of industries and institutions, e.g., power utilities, power grid, energy supply companies and other interested entities.

---

#### **Intellectual Property**

**6.1.a. Is the Sponsor aware of any copyright permissions needed for this project?:** No

**6.1.b. Is the Sponsor aware of possible registration activity related to this project?:** No

---

**7.1 Are there other standards or projects with a similar scope?:** No

#### **7.2 Joint Development**

**Is it the intent to develop this document jointly with another organization?:** No

---

**8.1 Additional Explanatory Notes:** After reviewing the related documents, there is no IEEE standard related to our proposal. Only one IEC Standard involves the load model, but it focuses on wind turbines, that is, IEC 61400-2 Wind turbines Part 2: Small wind turbines (Simple Load Model).

In addition, there are some researches and IEEE standards that further mention the load, but they do not focus on load model. For example, IEEE Std C62.72-2016 is about an IEEE Guide for the Application of Surge-Protective Devices, IEEE 2030-2011 is a Guide addressing Smart Grid Interoperability, and IEEE 241-1990 is a Guide focusing on Commercial Buildings only. They are listed as below for reference.

1)IEEE Std C62.72-2016 IEEE Guide for the Application of Surge-Protective Devices for Use on the Load Side of Service Equipment in Low-Voltage (1000V or Less, 50HZ or 60HZ) AC Power Circuits.

2)IEEE 2030-2011 - IEEE Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS), End-Use Applications, and Loads

3)IEEE 241-1990, IEEE recommended practice for electric power systems in Commercial Buildings

4)NIST in dynamic load model, (a technical reference document), published in December 2016

5)P3002.2/D6 IEEE Draft Recommended Practice for Conducting Load-Flow Studies of Industrial and Commercial Power Systems (IEEE Task Force on Load Representation for Dynamic Performance)

6)CIGRE WG C4.605 Modeling and Aggregation of Loads in Flexible Power Networks.



## **IEEE P2781 Standard Working Group**

### **IEEE P2781 Standard**

#### **Title: Guide for Load Modeling and Simulations for Power Systems**

#### **I. Review the existing standards related to the proposed title.**

After reviewing the related documents, there is no IEEE standard related to our proposal. Only one IEC Standard involves the load model, but it focuses on wind turbines, that is, IEC 61400-2 Wind turbines Part 2: Small wind turbines (Simple Load Model).

In addition, there are some researches and IEEE standards that further mention the load, but they do not focus on load model. For example, IEEE Std C62.72-2016 is about an IEEE Guide for the Application of Surge-Protective Devices, IEEE 2030-2011 is a Guide addressing Smart Grid Interoperability, and IEEE 241-1990 is a Guide focusing on Commercial Buildings only. They are listed as below for reference.

“IEC 61400-2 Wind turbines –Part 2: Small wind turbines (Simple Load Model)”.

In addition, there are two research working groups related to it. They are:

- 1) IEEE Std C62.72-2016 IEEE Guide for the Application of Surge-Protective Devices for Use on the Load Side of Service Equipment in Low-Voltage (1000V or Less, 50HZ or 60HZ) AC Power Circuits.
- 2) IEEE 2030-2011 - IEEE Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS), End-Use Applications, and Loads.
- 3) IEEE 241-1990, IEEE recommended practice for electric power systems in Commercial Buildings.
- 4) NIST in dynamic load model, (a technical reference document), published in December 2016.
- 5) P3002.2/D6 IEEE Draft Recommended Practice for Conducting Load-Flow Studies of Industrial and Commercial Power Systems (IEEE Task Force on Load Representation for Dynamic Performance).
- 6) CIGRE WG C4.605 Modeling and Aggregation of Loads in Flexible Power Networks.

#### **II. Scopes and Purpose of the proposed standard**

##### **(Load Model and Simulation (Standard/Guide))**

##### **Purpose:**

Load modeling and simulation have been an established area with continuous development through research and engineering practices. Although there are different references and reports, there are

## **IEEE P2781 Standard Working Group**

emerging interests from the industry on standard practices with various load models and simulations to accommodate the rapidly evolving power industry incorporating both conventional and new inverter connected renewable elements. Development in power electronics, smart grid technologies, demand side control and increasing renewable energy uptake have made load modeling an increasingly challenging essential element for system operations and planning to ensure system security while maintain economic efficiency and emission reduction objectives. The rapid deployment of IoT technologies and considered by industry initiative brings new opportunities and challenges for load modeling; together with big data analysis and artificial intelligence methods, data obtained through the IoT sensors enable detailed modeling of loads behind the meters without customer survey. A guide for standard approaches within this domain will lead to new load modeling approaches beyond the conventional measurement based or component based ones which will advance acceptance and interoperability.

### **Scopes:**

The scope of this guide is the definition of load models for various conventional and emerging elements in the generation, transmission, distribution and customer sectors at all voltage levels. This includes guidance for developing load models, identifying load model parameters, and utilizing measurement data for load model development at various voltage levels. It also includes modeling practices for emerging elements such as power electronics connected elements, electrical vehicles and charging stations, better utilization of Information and Communication Technology (ICT) infrastructures in load model development, and dynamics associated with customer involvement.

### **Key Aspects for P2781**

- measurement based load modeling standard practice procedure and criteria
- component based load modelling standard practice procedure and criteria
- new approach for load modelling with smart grid measurement data
  - - e.g. nonintrusive load modelling at distribution level, standard practice and criteria;
  - power quality measurement data for load modelling at distribution level;
  - tap change induced dynamic response for load modeling at distribution level, etc
- modelling of distributed generation off distribution substations, standard practice
- simulation standards for steady state analysis with load models
- simulation standards for dynamic analysis with load models
- new load modelling considerations for discussion
  - how to model the intermittency of distributed generation and storage

## **IEEE P2781 Standard Working Group**

- their impact on load modelling; and
- Needs for consideration of their impacts on system simulations, both dynamic and steady state

## **III. Draft Table of Contents for P2781**

### **EXECUTIVE SUMMARY (1-2 pages)**

#### **CHAPTER 1: Introduction (3-4 pages)**

##### **1.1 Load modelling overview**

##### **1.2 Significance of load model standards and guidelines for power system operations and planning**

##### **1.3 Overview of associated work in load model standards and guidelines**

##### **1.4 Overview of the report**

#### **CHAPTER 2: Overview of the existing load models and load model development methodologies (10 pages)**

- *Summary*
- Provide up to date list/overview of existing load models
- Overview of load model development methodologies – measurement based and component based
- Summary of emerging load models and challenges and needs for standard approaches (e.g., power electronics based load, electric vehicles, storage devices, charging stations, etc.)
- *Conclusions*
- *References*

#### **CHAPTER 3 Standards and Guidelines for Development of Measurement Based Load models (25 -30 pages)**

- *Executive summary*
- *Overview of the chapter*
- Develop set of standards and guides for measurement based load model development
  - b. Selection of appropriate measurement signals or data and field test needed
  - c. Standard procedures for data collection (e.g. sampling rate, duration and location of monitoring)
  - d. Standard procedures for data processing and conversion to obtain required values for load model development
  - e. Standards for data cleansing (data quality for load model development)
  - f. Standard in determining suitable load model structures
  - g. Standards and guidelines should provide comprehensive range of loads
  - h. Standards and guidelines for load model validation
- *Conclusions*
- *References*

#### **CHAPTER 4 Standards and Guidelines for Development of Component Based Load models (25 -30 pages)**

- *Executive summary*
- *Overview of the chapter*

## **IEEE P2781 Standard Working Group**

- Develop set of standards and guides for component based load model development
  - a. types of individual loads that should be considered for data collection
  - b. Standards and guidelines for data selection and individual loads needed for component based approach
  - c. Standard procedures for data aggregation and data cleansing
  - d. Standards and guidelines should provide comprehensive range of loads
  - e. Standards and guidelines for load model validation
- *Conclusions*
- *References*

## **CHAPTER 5 Standards and Guidelines for load model development in emerging networks and components**

- *Executive summary*
- *Overview of the chapter*
- Overview of opportunities and challenges of load modelling with emerging networks and components (e.g. smart grid / micro grid, new data sources, active networks/elements, customer side dynamics, etc)
- Standards and guidelines for load model development for emerging networks and elements
- Standards and guidelines for load model validation for emerging networks and elements
- *Conclusions*
- *References*

## **CHAPTER 6 Standards and Guidelines for Power System Simulations with Various Load Models**

- *Executive summary*
- *Overview of the chapter*
- Overview of power system simulations, both steady state and dynamic
- Standards and guide lines for system simulation with conventional load models
- Standards and guide lines for system simulation with emerging networks and elements (e.g. smart grid, microgrid etc)
- *Conclusions*
- *References*

## **CHAPTER 6 Conclusions**

## **APPENDICES**

**Policies and Procedures for:**  
***IEEE P2781 Load Modeling and Simulation WG***

**Date of Approval: *14-May-2018***

**Consult Working Group – Entity Method - Policies and  
Procedures Template Instructions. See:  
<http://standards.ieee.org/about/sasb/audcom/bops.html>**

**DO NOT REMOVE OR MODIFY FOOTER**

Baseline Policies and Procedures for IEEE Standards WGs - Entity Method  
IEEE-SA Standards Board Approved December 2017

# ***IEEE P2781 Load Modeling and Simulation WG Policies and Procedures for Standards Development***

## **1.0 Introduction**

**Clause 1.0 through 1.5 shall not be modified except as follows: Where appropriate, replace shaded italics with the name of the Working Group and the name of the Sponsor. If the name of the Working Group is inserted only in the title (above) and at Clause 1.3, the Working Group will add the additional sentence shown in brackets, and replace [Working Group Name] in the remainder of the document with "the Working Group" or appropriate related form.**

## **1.1 Role of Standards Development and these Procedures**

**This clause shall not be modified.**

In today's technological environment, standards play a critical role in product development and market competitiveness. In the IEEE, the responsibility for how a standard originates and evolves is managed by a Sponsor. It is essential in the management of a standard's development to avoid any actions by the Sponsor or the participants that result in a violation of procedures. These procedures establish the necessary framework for a sound standardization process.

## **1.2 Conduct**

**This clause shall not be modified.**

Meeting attendees and participants in standards activities shall demonstrate respect and courtesy toward each other and shall allow each participant a fair and equal opportunity to contribute to the meeting discussion. While participating in IEEE standards development activities, all participants, including but not limited to, individuals, entity representatives, entity members, entities participating directly in the entity process, and entities participating indirectly in the individual process shall act in accordance with all applicable laws (nation-based and international), the [IEEE Code of Conduct](#), the [IEEE Code of Ethics](#), and with [IEEE-SA Standards Board Bylaws](#) (see *IEEE-SA Standards Board Bylaws* Clause 5.2.1 on "Participation in IEEE standards development") and [IEEE-SA Standards Board Operations Manual](#).

A Working Group Chair that suspects persistent violation of these principles or standards by an individual shall refer the matter to the Sponsor.

## **1.3 Modifications to these Procedures**

**This clause shall not be modified, except to identify Working Group.**

These Policies and Procedures outline the orderly transaction of business by the **IEEE P2781 Load Modeling and Simulation** Working Group, hereinafter referred to as “the Working Group”.

The Working Group may amend these procedures with the approval of its Sponsor. The Sponsor may modify these procedures. Modification in this context means that material in these procedures may be modified as long as that clause is not indicated as one that shall not be changed. The IEEE-SA Audit Committee (AudCom) strongly recommends that all subjects included in these procedures are addressed by the Working Group or Sponsor.

None of the rules or requirements in these policies and procedures may be suspended.

## **1.4 Hierarchy**

**This clause shall not be modified except to identify insert the name of the Sponsor.**

Participants engaged in the development of standards shall comply with applicable federal, state, and international laws. In addition, for standards matters, the latest version of several documents takes precedence over these procedures in the following order:

[New York State Not-for-Profit Corporation Law](#)

[IEEE Certificate of Incorporation](#)

[IEEE Constitution](#)

[IEEE Bylaws](#)

[IEEE Policies](#)

[IEEE Board of Directors Resolutions](#)

[IEEE Standards Association \(IEEE-SA\) Operations Manual](#)

[IEEE-SA Board of Governors Resolutions](#)

[IEEE-SA Standards Board Bylaws](#)

[IEEE-SA Standards Board Operations Manual](#)

[IEEE-SA Standards Board Resolutions](#)

[Policies and Procedures of \*\*PE/SBLC Smart Buildings, Loads and Customer Systems\*\*](#)

*Robert's Rules of Order Newly Revised (RONR)* is the recommended guide on questions of parliamentary procedure not addressed in these procedures.

## **1.5 Fundamental Principles of Operation**

**This clause shall not be modified.**

For the development of standards, openness and due process are mandatory.

Openness means that any entity, as defined in Clause 2.3, that has or could be reasonably expected to have a direct and material interest, and that meets the requirements of these procedures has a right to participate by:

- a) Attending Working Group meetings (in person or via electronic means)
- b) Becoming a member of the Working Group
- c) Becoming an officer of the Working Group
- d) Expressing a position and its basis,
- e) Having that position considered, and
- f) Appealing if adversely affected.

IEEE due process requires a consensus of those parties interested in the project. Consensus is defined as at least a majority agreement, but not necessarily unanimity.

Due process is based upon equity and fair play. In addition, due process requires openness and balance (i.e., the standards development process shall strive to have a balance of interests and not to be dominated by any single interest category). However, for the IEEE Standards Sponsor ballot, there shall be a balance of interests without dominance by any single interest category.

## 1.6 Definitions

**This clause shall not be modified except to include additional definitions.**

*Written communication* includes but is not limited to meeting minutes, letter, email, and fax.

*Sponsors* of IEEE standards projects are committees that are responsible for the development and coordination of the standards project and the maintenance of the standard after approval of the standard by the IEEE-SA Standards Board. (*IEEE-SA Standards Board Bylaws* 5.2.2).

*Responsible Subcommittee* is an optional subgroup of the Sponsor with delegated responsibility for approving PARs and Sponsor ballots. Responsible Subcommittees assist the Sponsor committee in the control and management of a large scope of work involving multiple working groups. A PAR study group or a working group (WG) is not a Responsible Subcommittee.

In this document, the term “Sponsor” means the sole Sponsor, the Responsible Subcommittee, or in the case of co-sponsored projects, the primary Sponsor.

*A participant* is an individual or entity involved in the standards development process (see *IEEE-SA Standards Board Bylaws* Clause 5.2.1 on “Participation in IEEE standards development”).

NOTE: An entity participant can be a member or non-member of the IEEE-SA or working group.

NOTE: An individual participant can be a member or non-member of the IEEE or IEEE-SA.

*A non-member* is an entity that has not satisfied the criteria for membership defined in 4.1.



A *member* is an Advanced Entity Member of the IEEE-SA that has satisfied the criteria for membership defined in 4.1. A member is listed on the WG roster.

A *Designated Representative* (DR) is an individual designated by a member to represent the member in the Working Group. A *Designated Representative Alternate* (DRA) is an individual designated by a member to represent the member in the Working Group when the DR is not available.

A *voting member* is a member that has satisfied the criteria for voting membership defined in 4.1. A voting member can participate in working group motions and ballots.

A *non-voting member* is a member that has not satisfied the criteria for voting membership defined in 4.1.

An *Entity Member Representative* is an individual identified by the entity as responsible for managing the membership of that entity under the IEEE-SA Corporate program.

An *observer* is a non-member that is a Corporate Member of IEEE-SA, or an entity non-member of the IEEE-SA that has chosen to observe at most one meeting of the Working Group per project (see *IEEE-SA Standards Board Bylaws* Clause 5.2.1.2 on “Membership requirements for standards developed under the entity method”).

A *technical expert* is an individual who is invited by the WG to attend at most three meetings of the WG during the lifetime of a particular project (see *IEEE-SA Standards Board Bylaws* Clause 5.2.1.2 on “Membership requirements for standards developed under the entity method”).

## **2.0 Working Group Responsibilities**

### **2.1 Primary Responsibilities**

**This clause shall not be modified except to include additional responsibilities.**

The Working Group shall:

- a) Complete the project from Project Authorization Request (PAR) approval to IEEE-SA Standards Board approval as specified by the PAR, and in compliance with IEEE-SA policies and procedures.
- b) Use the IEEE Standards document template format [or the applicable template for standards jointly developed with, or adopted from, another international standards organization].
- c) Submit to the Sponsor any documentation required by the Sponsor, for example, a project schedule or a monthly status report.

- d) Notify the Sponsor of the draft development milestones.
- e) Notify the Sponsor when the draft is ready to begin IEEE Standards Sponsor ballot.
- f) Use the IEEE-SA approved tool for Working Group meeting registration.
- g) Use the IEEE-SA approved tool for creation and submission of Working Group rosters.
- h) Use the IEEE-SA approved tool for Web hosting of Working Group information.
- i) Only those authorized to access and use IEEE's data, including personal data, from IEEE systems are permitted to do so, for the purposes intended, including to support the technical development work on the standard, and only in compliance with IEEE or IEEE-SA Privacy and data privacy policies.

## 2.2 Other Responsibilities

**This clause may be modified.**

The Working Group shall:

- a) At the time of PAR submittal, provide a rationale for the development of the standard, explaining the needs for the standard and what the standard will fulfill for industry and the general public.
- b) Obtain funding to cover dedicated support from the IEEE-SA, when desired, to expedite the standards development process.

## 2.3 Working Group Constitution

**This clause shall not be modified.**

Each entity shall be an Advanced Entity Member of the IEEE-SA in order to be eligible for membership in the Working Group. There shall always be at least three members in the Working Group during the life of the project. For other information on participation in the Working Group, see Clause 5.2.1.2 on "Membership requirements for standards developed under the entity method" of the *IEEE-SA Standards Board Bylaws*.

No one individual can be the member representative for more than one entity except for a temporary proxy vote. Each Designated Representative (DR) or Designated Representative Alternate (DRA) member representative (see Clause 4.1) can make or second motions, except for the Chair (or presiding officer). A motion made by a DR or DRA representing one entity shall not be seconded by a DR or DRA representing the same entity. Each representative shall declare what entity he or she represents and that the representative's voting shall be independent of any other entity.

The following qualify to become entity members of the Working Group:

*Corporation:* A for-profit or not-for-profit entity that is not under the control, as defined in [5.2.1.2](#) of the *IEEE-SA Standards Board Bylaws*, of another entity and that is organized under articles of incorporation or similar legal structures. Limited Liability Companies are considered to be Corporations.

*Partnership:* An unincorporated association of two or more individuals who are co-owners of a business.

*Sole proprietorship:* An unincorporated business owned by a single individual.

*Government agency:* An entity that is part of an executive, legislative, or judicial branch of a government and that has sufficient discretion in the management of its own affairs to distinguish it as separate from the administrative structure of any other governmental entity.

*Academic institution:* An educational entity that, in addition to having a controlling body such as a Board of Regents or a Board of Governors, has sufficient discretion in the management of its own affairs to distinguish it as separate from the administrative structure of any other educational entity.

In the event that, through merger or acquisition or other similar event, an entity member of the IEEE-SA has its assets totally or substantially transferred to another entity, membership in the Working Group may be transferred to the new entity, provided that the new entity is not already a member of the Working Group.

### 3.0 Officers

**This clause shall not be modified except to include additional officers.**

There shall be a Chair and a Secretary, and there should be a Vice-Chair. The office of Treasurer is suggested if significant funds are involved in the operation of the Working Group and/or its subgroups, or if the group has multiple financial reports to supply to the IEEE-SA. A person may simultaneously hold the positions of Treasurer and another office, other than Chair.

Officers shall be representatives of Advanced Entity members of the IEEE-SA.

At the first organizational meeting, the Working Group shall elect its operating officers in accordance with the procedures of its Sponsor, and, where necessary, Robert's Rules of Order.

### 3.1 Election of Officers

**This clause may be modified.**

The Chair or Sponsor designee shall appoint an Elections Administrator, whose function is to conduct an election. The Elections Administrator shall not be a nominee in the election and shall not vote in the election. An election will seek to fill offices that are either vacant, have an official in temporary appointment, when an officer's entity affiliation has changed, or when the term of office has expired.

The Working Group members shall nominate to the Elections Administrator one or more member representatives for each office to be filled at the election. Nominees shall be eligible to hold the office, if and when they are elected (see Clause 3.0). A person shall be nominated for no more than one office, except in the case of Treasurer, as per Clause 3.0. The response period for nominations shall be at least 14 calendar days. If no nomination is received for an office, a temporary appointment shall be made in accordance with Clause 3.2.

The Elections Administrator shall conduct the election by letter ballot, electronic ballot, or a vote at a meeting. Voting will conclude no sooner than after 14 calendar days for a letter or electronic ballot. Each voting member shall cast a single election ballot. Within the ballot, the voting member may vote for multiple nominees for each office with the limit of one vote per nominee. The nominee with the greatest number of approval votes shall win the election, provided ballots are returned by a majority of the eligible voters for that election. If a majority of votes is not received, the ballot can be extended or a new ballot will take place. Any tie votes will be broken by a runoff ballot, where eligible voters may cast only one vote in the election.

The election of the Chair and Vice-Chair requires confirmation from the Sponsor. If the Sponsor does not confirm the Chair or Vice-Chair, another election will be run or the Sponsor will make a temporary appointment per Clause 3.2.

If any officer's entity affiliation changes, that officer shall be subject to re-election by a majority of the members of the Working Group. If additional candidates are interested in serving in the officer role, they may run against the current officer at this time. The current officer continues to serve in his or her officer role until the close of the election. The election determines who will serve out the remainder of the existing term of office.

### **3.2 Temporary Appointments to Vacancies**

**This clause may be modified.**

If an office other than the Chair is vacant for any reason (such as resignation, removal, lack of nomination at an election), a temporary appointment shall be made by the Chair for a period of up to 12 months. In the case of Chair, the Sponsor shall make the temporary appointment, with input from the Working Group.

### **3.3 Removal of Officers**

**This clause may be modified.**

An officer may be removed by approval of two-thirds of the voting members of the Working Group meeting in Executive Session, or in accordance with the procedures of the Sponsor. The officer suggested for removal shall be given an opportunity to make a rebuttal prior to the vote on the motion for removal. Removal of the Chair requires affirmation by the Sponsor.

### **3.4 Responsibilities of Working Group Officers**

**This paragraph shall not be modified.**

When carrying out the duties of an officer described in IEEE's policies and procedures, officers of the Working Group:

- a) shall not act:
  - 1) in bad faith;
  - 2) to the detriment of IEEE-SA;
  - 3) to further the interest of any party outside IEEE over the interest of IEEE; or
  - 4) in a manner that is inconsistent with the purposes or objectives of IEEE; and
- b) shall use reasonable efforts to ensure that participants of the Working Group conduct themselves in accordance with applicable policies and procedures including, but not limited to, the *IEEE-SA Standards Board Bylaws* clause on "Participation in IEEE standards development." (See Clause 1.2.)

The officers of the Working Group shall manage the day-to-day operations of the Working Group. The officers are responsible for implementing the decisions of the Sponsor and managing the activities that result from those decisions.

**The remainder of this clause may be modified to include additional officers and their responsibilities.**

#### **3.4.1 Chair**

**This clause shall not be modified except to add additional responsibilities.**

The responsibilities of the Chair or his/her designee shall include:

- a) Leading the Working Group activity according to all of the relevant policies and procedures.
- b) Forming study groups, as necessary.
- c) Being objective.
- d) Entertaining motions, but not making motions.

- e) Not biasing discussions.
- f) Delegating necessary functions.
- g) Ensuring that all parties have the opportunity to express their views.
- h) Setting goals and deadlines and adhering to them.
- i) Being knowledgeable in IEEE standards processes and parliamentary procedures and ensuring that the processes and procedures are followed.
- j) Seeking consensus as a means of resolving issues.
- k) Prioritizing work to best serve the Working Group and its goals.
- l) Complying with the Chair's responsibility with respect to the IEEE-SA Intellectual Property Policies, including but not limited to the IEEE-SA Patent Policy (see "Patents" Clause 6 of *IEEE-SA Standards Board Bylaws* and "Call for patents" Clause 6.3.2 of *IEEE-SA Standards Board Operations Manual*) and Copyright (see "Copyright" Clause 7 of *IEEE-SA Standards Board Bylaws* and Clause 6.1 of the *IEEE-SA Standards Board Operations Manual*).
- m) Fulfilling any financial reporting requirements of the IEEE, in the absence of a Treasurer.
- n) Participating as needed in meetings of the Sponsor to represent the Working Group.
- o) Being familiar with relevant training materials available through [IEEE Standards Development Online](#).
- p) Notifying IEEE SASB of any officer election/appointment, removal, and changes in status.

### 3.4.2 Vice-Chair

**This clause may be modified to include additional responsibilities. If there is no Vice-Chair, replace text with "Not applicable."**

The responsibilities of Vice-Chair shall include:

- a) Carrying out the Chair's duties if the Chair is temporarily unable to do so or chooses to recuse himself or herself (i.e., to give a technical opinion) or carrying out those duties specifically delegated by the Chair to the Vice-Chair.
- b) Being knowledgeable in IEEE standards processes and parliamentary procedures and assisting the Chair in ensuring that the processes and procedures are followed.
- c) Being familiar with relevant training materials available through [IEEE Standards Development Online](#).

### 3.4.3 Secretary

**This clause may be modified to include additional responsibilities. If any of the responsibilities listed below is not performed by the Secretary, it shall be listed as the responsibility of one of the other officers. The 60-day shaded value in item c) may be reduced.**

The responsibilities of the Secretary include:

- a) Scheduling meetings in coordination with the Chair and distributing meeting notices.
- b) Distributing meeting agenda (as per Clause 6.0). Notification of the potential for action shall be included on any distributed agendas for meetings.
- c) Recording minutes of each meeting according to Clause 6.4 and IEEE guidelines (see <http://standards.ieee.org/develop/policies/stdslaw.pdf>), and publishing them within 60 calendar days of the end of the meeting.
- d) Creating and maintaining the membership roster, referred to in Clause 4.7, and submitting it to the Sponsor (or SCC) Secretary annually.
- e) Being responsible for the management and distribution of Working Group documentation.
- f) Maintaining lists of unresolved issues, action items, and assignments.
- g) Recording attendance of all attendees.
- h) Maintaining a current list of the names of the voting members and distributing it to the members upon request.
- i) Forwarding all changes to the roster of voting members to the Chair.
- j) The Secretary shall maintain the attendance record [and responses to letter ballots] for all members on the roster and display or announce the status of voting and non-voting members at the start of each meeting.
- k) Being familiar with relevant training materials available through [IEEE Standards Development Online](#).

If the function of Secretary is fulfilled by IEEE staff, this shall be a non-voting position and the IEEE-SA membership condition is not required. Otherwise, the Secretary shall be the Designated Representative of an Advanced Entity member.

### **3.4.4 Treasurer**

**The Working Group is responsible for its finances; therefore, an officer of the Working Group shall perform the responsibilities of the Treasurer. If there is a Treasurer, this clause may be modified to include additional responsibilities.**

**If the funds are minimal and transactions not complicated, the officer position of Treasurer is not required and can be assumed by one of the other officers. In this case, the responsibilities a) to d) below shall be added to the responsibilities of either the Vice-Chair (3.4.2), or Secretary (3.4.3) (e.g., if Clause 6.3 Meeting Fees remains in use). If there are no funds the clause is not required, and the text below shall be removed and replaced with the words “Not applicable.”**

The Treasurer shall:

- a) Maintain a budget, if applicable.
- b) Control all funds into and out of the Working Group’s bank account, if applicable.
- c) Follow IEEE policies concerning standards meetings and finances.
- d) Ensure that the Sponsor adheres to the [IEEE Financial Operations Manual](#) and the Annual Financial Report clause in the *IEEE-SA Standards Board Operations Manual*.
- e) Be familiar with relevant training materials available through [IEEE Standards Development Online](#).

## **4.0 Working Group Membership**

### **4.1 Obtaining Membership in a Working Group**

**This clause shall not be modified, except to address the shaded text.**

Working Group membership is by entity. A member shall be an Advanced Entity Member of the IEEE-SA.

A non-member may become a member only after:

- providing contact and representative (DR/DRA) information needed for the roster (see Clause 4.7),
- paying any services fee

A non-member becomes a non-voting member by attending one meeting.

A non-voting member becomes a voting member by attending **2** of the last **4** meetings and upon sending a request for voting status to the Working Group chair prior to the next meeting. The member’s voting status will be effective at the start of the next meeting.

Voting membership is granted to those entities attending the first meeting of a newly chartered Working Group upon their request to the Working Group chair.

### **4.2 Attendance at Meetings**



**This clause shall not be modified, except to address the bracketed text.**

Representatives of an entity must attend at least 50% of a meeting's duration as stated in the approved agenda [and satisfy the requirements of Clause 6.3 regarding any registration fee for the meeting] for that attendance to count towards gaining or maintaining [voting] membership. This is called "credited attendance" in order to distinguish it from attendance that does not satisfy these criteria.

[Attendance at a meeting via teleconferencing or electronic means, e.g., Internet conferencing, shall count towards the attendance requirements.]

#### **4.3 Entity Representatives**

**This clause shall not be modified.**

A member shall have one DR and may have more than one DRA participating in the Working Group. The Entity Member Representative of the entity determines the DR and DRA(s) for the Working Group. The assignment of a DR or DRA can change throughout the life of the Working Group. It is the member's responsibility to notify the Working Group Secretary of changes to the assignment of the DR or DRA(s).

Only the DR is eligible to vote on behalf of the member, except that if the DR is unable to vote, the Chair will recognize one DRA to vote on the DR's behalf.

Each individual acting as a DR or DRA can vote on behalf of only one member of the Working Group; no individual can represent the interests of more than one member of the Working Group except for a temporary proxy vote (see Clause 7.2).

#### **4.4 Observers**

**This clause shall not be modified.**

A Corporate Member of the IEEE-SA (either Basic Entity Member or Advanced Entity Member) may become an observer of the Working Group by attending a WG meeting and stating that they are attending in the role of observer.

An entity that is not a Corporate Member of the IEEE-SA may observe (i.e., send one or more individuals to attend) at most one meeting per project of the Working Group. The Secretary shall record such attendances.

An observer may speak at a Working Group meeting, with the permission of the Chair.

Observers present in a meeting shall be recorded in the minutes.

## **4.5 Retaining Membership and Voting Membership**

### **4.5.1 By Attendance**

**This clause shall not be modified, except to address the shaded text.**

A non-voting member becomes a non-member by not attending any of the last 4 meetings.

A voting member that has not attended at least 2 of the last 4 meetings becomes a non-voting member.

The Chair (or delegate) shall notify, by email, a voting member who loses their voting membership due to the operation of this rule and indicate the cause for loss of voting membership.

### **4.5.2 Response to Working Group Letter Ballots**

**This clause may be modified, e.g.: 1) replace the entire contents with “Not applicable” or 2) to include or delete the optional bracketed text and modify the shaded values.**

A voting member’s obligation to respond to Working Group letter ballots (in which they are eligible to vote) is in addition to their obligation to attend Working Group meetings.

A voting member that fails to return 2 of the last 3 Working Group letter ballots in which they are eligible to vote becomes a non-voting member. [Their existing attendances do not count towards regaining voting membership.]

The Chair (or delegate) shall notify, by email, a voting member who loses their voting membership due to the operation of this rule and indicate the cause for loss of voting membership.

If a Working Group letter ballot closes within 14 days of a meeting, any changes to voting membership resulting from the ballot shall be delayed until after the meeting.

### **4.5.3 Loss of Member Privileges**

**This clause may be modified.**

A Working Group may establish fees to cover its operation (“service fees”), in addition to meeting fees.

An entity that loses membership is not eligible for a refund of any services fee paid.

A member that fails to pay any established services fee becomes a non-member.  
That entity can continue to participate as an observer.

## 4.6 Review of Membership

**This clause shall not be modified, except to address the bracketed text.**

The procedures for obtaining and retaining membership are specified in terms of meeting attendances, [and Working Group letter ballots], [and payment of any service fees].

The Chair and Secretary should apply these procedures in a timely fashion, evaluating membership status in time for the next meeting [or Working Group letter ballot].

## 4.7 Working Group Membership Roster

**This clause shall not be modified except to include or delete the optional bracketed text.**

A Working Group roster is a vital aspect of standards development. It serves as a record of members and observers in the Working Group and is an initial tool if an issue of indemnification arises during the process of standards development. The Secretary shall make reasonable efforts to maintain a current Working Group roster. The roster shall include at least the following:

- a) Title of the Sponsor and its designation.
- b) Title of the Working Group and its designation.
- c) Officers: Chair, [Vice-Chair,] Secretary[, and Treasurer].
- d) Member representatives
  - 1) Entity name and email address
  - 2) Designated Representative (indicated by “DR”), representative email address.
  - 3) Alternate(s) (indicated by “DRA”), representative email address.
- e) Observer (Including names, entity name, addresses, and affiliations).
- f) Non-voting administrative positions (including names and addresses).

All Working Group members are required to review their information contained in the roster following each meeting they attend. If a Working Group meets only virtually, it shall determine a schedule to check the accuracy of the roster periodically.

A copy of the Working Group roster shall be supplied to the IEEE-SA at least annually by a Working Group officer or designee. Due to privacy concerns, the roster shall not be distributed, except to the IEEE-SA staff, IEEE-SA Board of Governors and IEEE-SA Standards Board, unless everybody on the roster has submitted their written approvals for such distribution.

## 4.8 Working Group Membership Public List

**This clause shall not be modified except for the distribution of the list.**

A Working Group officer or designee shall maintain a current and accurate membership list. The membership list can be posted on the Working Group web site and can be publicly distributed. The membership list shall be limited to the following:

- a) Title of the Working Group and its designation.
- b) Scope of the Working Group.
- c) Officers: Chair, [Vice- Chair], Secretary[, and Treasurer].
- d) Members: (for all) – entity name, all DR/DRA names.

## **5.0 Subgroups of the Working Group**

**This clause shall not be modified, except to select an option for the selection of the chair.**

The Working Group may, from time to time, form subgroups for the conduct of its business. Membership in the subgroup is granted to any member of the Working Group. Such formation shall be explicitly noted in the meeting minutes. At the time of formation, the Working Group shall determine the scope and duties delegated to the subgroup, and may decide to allow participation of persons who are not Working Group members and specify the terms and conditions under they participate in the subgroup. Any changes to its scope and duties will require the approval of the Working Group. Any resolution of a subgroup shall be subject to confirmation by the Working Group.

[The Chair of the Working Group shall appoint, and may dismiss, the Chair of the subgroup.]  
[The Working Group shall elect, and may remove, the Chair of the subgroup.]

## **6.0 Meetings**

**This clause shall not be modified except to modify shaded values.**

Working Group meetings may be conducted either exclusively in-person or in-person with one or more participants contributing via electronic means, or exclusively via electronic means. Working Group meetings shall be held, as decided by the Chair, or by petition of 15 % or more of the voting members, to conduct business. This may include making assignments, receiving reports of work, progressing draft standards, resolving differences between subgroups, and considering views and objections from any source.

A meeting notice shall be distributed to all members at least 30 days in advance of a face-to-face meeting and at least 15 days notice in advance for an electronic (including teleconference) meeting. A meeting agenda (including participation information) shall be distributed to all members at least 10 days in advance of a face-to-face meeting, and at least 5 days in advance for an electronic meeting. (Meetings of subgroups may be held as decided upon by the members or

Chair of the subgroup.) Notification of the potential for action shall be included on any distributed agendas for meetings.

While having a balance of all interested parties is not an official requirement for a Working Group, it is a desirable goal. As such, the officers of the Working Group should consider issues of balance and dominance that may arise and discuss them with the Sponsor.

Participants shall be asked to state their employer and affiliation at each Working Group meeting as required by the *IEEE-SA Standards Board Operations Manual* clause 5.1.2.3 on “Disclosure of affiliation”.

All IEEE Standards development meetings are open to anyone who has a material interest and wishes to attend subject to the provisions of Clause 4.1; however, some meetings may occur in Executive Session (see Clause 6.2).

## 6.1 Quorum

**This clause shall not be modified except to increase the shaded values or to state quorum definitions otherwise approved by the Sponsor.**

A quorum shall be identified before the initiation of Working Group business at a meeting, but if a quorum is not present, actions may be taken subject to confirmation by letter or electronic ballot, as detailed in Clause 7.3, or at the next Working Group meeting. Unless otherwise approved by the Sponsor, a quorum shall be defined as *one-half* of the Working Group members (i.e., the DR or DRA of each entity).

## 6.2 Executive Session

**This clause shall not be modified.**

Meetings to discuss personnel or sensitive business matters (e.g., the negotiation of contracts), or for other appropriate non-public matters (e.g., the receipt of legal advice), may be conducted in Executive Session.

The matters discussed in executive session are confidential, and therefore, attendance at the Executive Session shall be limited to those with governance authority, outside advisors (e.g., lawyers or consultants) where necessary to provide professional guidance, and select IEEE-SA staff who may have information or a perspective relevant to the subject matter discussed in Executive Session. An individual may be invited to join for a portion of the discussion and then excused at the appropriate time. In each case, except as authorized by the Working Group, participants in an Executive Session are prohibited from discussing or disclosing any information presented and discussed during such Executive Session to a third party or other person not present during the Executive Session, and shall not continue to discuss such matters after the Executive Session has adjourned.

Executive Sessions should be conducted face-to-face (in person) to provide the greatest assurance that the content of such Executive Sessions will be kept confidential. However, when necessary, Executive Sessions may include participants who participate by teleconference provided such persons agree not to disclose any information so discussed, and agree that they will participate in such conference in a manner that does not result in third parties gaining access to such discussions or information.

### **6.3 Meeting Fees**

**This clause may be modified or replaced by "Not Applicable".**

The Working Group, or meeting host, may charge a meeting fee to cover services needed for the conduct of the meeting. The fee shall not be used to restrict participation by any interested parties. The Working Group Officers shall set the meeting fees in consultation with those planning a particular meeting.

### **6.4 Minutes**

**This clause shall not be modified.**

The minutes shall record the essential business of the Working Group in concise format, including the following items at a minimum:

- a) Name of group
- b) Date and location of meeting
- c) Officer presiding, including the name of the secretary who wrote the minutes
- d) Meeting participants, including affiliation, and voting member status at the end of the meeting
- e) Call to order, Chair's remarks
- f) Reminders of IEEE policies, such as Patent policy, and Copyright policy
- g) The fact that a Call for Patents occurred and any responses made to such Call
- h) Approval of minutes of previous meeting
- i) Approval of agenda
- j) Technical topics
  - 1. Brief summary of discussion and conclusions
  - 2. Motions exactly as they are stated, including the names of mover and seconder and the outcome of each motion
- k) Action items
- l) Items reported out of executive session
- m) Recesses and time of final adjournment
- n) Next meeting - date, time, and location

All submissions, presentations, and reports considered during the meeting by the Committee/WG shall be referenced in the minutes, identifying the source of the submission. URLs should be provided where possible.

The following shall not be recorded in minutes:

- Transcriptions of detailed discussions
- Attributions of comments to specific participants

## **7.0 Voting**

### **7.1 Approval of an Action**

**This clause shall not be modified except to be compliant with the Sponsor's procedures.**

Approval of an action requires approval by a majority (or two-thirds) vote as specified below in 7.1.1 (majority) and 7.1.2 (two-thirds). The “majority, two-third vote” is defined as one of the following:

- a) At a meeting (including teleconferences) where quorum has been established, a vote carried by majority (or two-thirds) approval of the votes cast (i.e., Approve or Do Not Approve votes, excluding abstentions) by the voting members in attendance.
- b) By electronic means (including email), a vote carried by majority (or two-thirds) of the votes cast (i.e., Approve or Do Not Approve votes, excluding abstentions), provided a majority of all the voting members of the Working Group responded.

#### **7.1.1 Actions Requiring Approval by a Majority Vote**

**This clause shall not be modified except for a) moving actions to 7.1.2, b) adding actions.**

The following actions require approval by a majority vote:

- a) Formation or modification of a subgroup, including its procedures, scope, and duties
- b) Disbandment of subgroups
- c) Approval of minutes

#### **7.1.2 Actions Requiring Approval by a Two-thirds Vote**

**This clause shall not be modified except to include additional voting actions or to be compliant with the Sponsor's procedures.**

The following actions require approval by a two-thirds vote:

- a) Approval of change of the Working Group scope\*

- b) Establishment of fees, if necessary
- c) Approval to move the draft standards to the Sponsor for IEEE Standards Sponsor ballot\*

\*Items a) and c) also require approval of the Sponsor to take effect.

### **7.1.3 Voting by Chair (or Presiding Officer)**

**This clause shall not be modified.**

The Chair (or presiding officer) may exercise its entity's vote only when it could affect the outcome or when the vote is by electronic or letter ballot.

### **7.2 Proxy Voting**

**This clause shall be included and shall not be modified.**

Members of the Working Group may employ proxy voting only when other methods of participation have been exhausted. Each appointment of a proxy shall be sent to the Working Group Chair and the member serving as the proxy via fax or written communication that contains the signature of the member appointing the proxy (an email is acceptable.) A proxy shall not be valid without written acknowledgment from the Working Group Chair and the member serving as proxy of receipt of the appointment. Members serving as proxies shall inform the Chair of their proxy prior to the start of the meeting in which the proxy is to be in effect.

Any one member of the Working Group may hold no more than two proxy votes in addition to his or her vote. Proxy voting shall be allowed only for those members who cannot attend the entire meeting; proxies may not be appointed for parts of meetings. A member may appoint a proxy for no more than two meetings of the Working Group within an established six-meeting period. Proxy voting shall not count towards maintenance of membership by the member who appoints a proxy. The Chair shall announce all proxy voting to the Working Group members at the start of the meeting in which the proxy is to be in effect. The DRA of one entity may serve as a proxy for another entity, to allow the DR to serve as the representative of its entity only.

Members serving as proxies may only vote on agenda items announced through the distributed agenda prior to the meeting. If announced agenda items are amended or otherwise developed through the meeting process whereby the action being proposed is significantly different in meaning from the original motion, the Chair may determine that proxy votes shall no longer be allowed for that agenda item. The proxy voter himself or herself may also choose to abstain prior to any formal decision of the Chair.

A person appointed as proxy may not appoint another person to act in his or her stead.

### **7.3 Voting Between Meetings**



**This clause shall not be modified.**

At the discretion of the Chair the Working Group shall be allowed to conduct votes between meetings by use of a letter or electronic ballot. If such actions are to be taken, they shall follow the rules of IEEE Bylaw I-300.4(4).

## **8.0 Communications**

**This clause may be modified.**

Formal inquiries relating to the Working Group should be directed to the Chair and recorded by the Secretary. All replies to such inquiries shall be made through the Chair. These communications shall make it clear that they are responses from the Working Group and do not necessarily represent the views of the Sponsor, IEEE-SA, or IEEE. Communications shall be in compliance with the Sponsor's communication requirements.

## **9.0 Appeals**

**This clause shall not be modified.**

Any person dissatisfied with a technical decision shall follow the approved procedures for providing technical input to the Working group, including but not limited to presenting the concern to the Working Group, and making a technical comment during the applicable comment submission and/or balloting period.

Procedural concerns within the Working Group shall first be presented to the Working Group Chair for resolution. If the procedural concern is not resolved after presentation to the Chair, the concern can be brought to the Sponsor for resolution.

## **10.0 Indemnification**

**This clause shall not be modified.**

IEEE Bylaw I-300.3 discusses the IEEE policies for indemnification, which participants in the Working Group are expected to read and be familiar with. Entity representatives included in the Working Group roster will be recognized as duly authorized participants in IEEE standards development activities.