Massachusetts Technical Standards Review Group

Quarterly Meeting

December 14, 2022

The Massachusetts Technical Standards Review Group

Agenda

1:00-1:05 **Opening Comments**

1:05-2:20 **Sub-Committee Updates (15 min each)**

1. IEEE 1547 Group – including UL1741SB certification
2. ESS Ramp Rates & Schedules Group
3. Dynamic Modeling Group
4. Area Networks Group
5. Expedited Pathway Group

2:20-3:15 **Old Business – Open Items from Previous Meeting**

1. Flexible Connections – Ishaan Jena (Amp Energy) to present
2. Revised Simplified Process Tariff proposal – Russ Aney (Parallel Products) to present

3:15-3:55 **New Business – New Items Not Previously Discussed**

1. ESS requirements
2. EDC Grid Mod update
3. Electric Sector Modernization Plans
4. Equipment availability and supply chain

3:55-4:00 **Close Out**

1. Call out the next scheduled quarterly meeting date
    a. Mar 15, 2023 1PM-4PM
    b. Jun 14, 2023 1PM-4PM
2. Send topics for future meetings to Mike (Michael.Porcaro@nationalgrid.com) or Mrinmayee (mkale@newleafenergy.com)
3. Final comments

Administrative Items

- Refer to TSRG Website for all information related to the group
  https://www.mass.gov/info-details/massachusetts-technical-standards-review-group
  - Membership
  - By-Laws
  - Reference Documents
  - Past Meeting Notes & Materials
  - Common Technical Guideline
  - Upcoming meeting info and registration link

- For any questions, suggestions, or to get on the mailing list email:
  - Chair - **Michael.Porcaro@nationalgrid.com**
  - Co-Chair - **mkale@newleafenergy.com**

TSRG
1547 Update
SubGroup Update

John Bonazoli

The Massachusetts Technical Standards Review Group

IEEE 1547 Sub-Group Update

Mission Statement:

Establish clear criteria of requirements and default settings for usage of grid support functions set forth in IEEE standard 1547 - Standard for Interconnection and Interoperability of Distributed Energy Resources with Associate Electric Power Systems Interfaces.

Expected Group Output:

(1) Default settings for requirements specified in IEEE 1547

(2) Investigate usage and concerns of various modes of operation for Grid Support

(3) Create guidelines for Grid Support Functions

(4) Create requirements for communications between Facility interface and EDC central monitoring system

Team			
First Name	Last Name	Company	Affiliation
John	Bonazoli	Unitil	EDC Rep/Chair
Mrinmayee	Kale	New Leaf Energy	DER Rep/ Vice-Chair
Mauhammad	Khan	Eversource	EDC Rep
Paul	Krell	Unitil	EDC Rep
Nathan	Walsh	National Grid	EDC Rep
Mina	Moawad	Eversource	EDC alt rep
Jeannie	Amber	Eversource	EDC alt rep
Ruvini	Kankanamalage	National Grid	EDC alt rep
Joseph	Debs	Eversource	EDC alt rep
David	Ferrante	Eversource	EDC alt rep
Devon	Marcaurele	Eversource	EDC alt rep
Jeremy	Kites	Unitil	EDC alt rep
Tony	Morreale	LIG Consultants	DER Rep
Mike	Wall	NexAmp	DER Rep
Brian	Lydic	irec	DER Rep
Brad	Marszalkowski	ISO-NE	ISO Rep
Aurora	Edington	DOER	Cust/Gov Rep

Summary of Major Accomplishments & Upcoming Activities	
Completed Activities:	
5/9/2022	Finalized Requirements document
9/12/2022	Presenation of NY Grid Support functions
9/12/2022	Presenation of impact of Grid Support functions on Risk of Islanding
7/30/2022	Created scope/mission of communications task force
12/12/2022	Revised deadlines for Default Setting Document
Upcoming Activities:	
1/15/2023	Finalized membership of Communications Task Force
3/1/2023	Format Scope of EDC Requirments for Grid Support Functions

IEEE 1547 Sub-Group Update

#	Item	Relates to	Type	Resp. Person	Resp. Affiliation	Resp. Company	Due Date	Complete Date	Notes
1	Set up Communications Teams	Create communications requirments	Action	Bonazoli	EDC	Unitil	7/30/2022	7/30/2022	
2	Presentation on NY Grid functions	Research Grid Support functions	Decision	Kankanamalage	EDC	National Grid		9/12/2022	Con-Ed presented default advanced funtions adopted by NY Joint utilities
3	Presentation on Risk Of Islanding impact of inverter advanced functions	Research Grid Support functions	Decision	Kankanamalage	EDC	National Grid		9/12/2022	Study results show no indicatino that advanced inverter control functions have significant impact on island run-on times.
4	Finalize representation membershio of communicaitons task force	Create communications requirments	Action	Bonazoli	EDC	Unitil	1/15/2023		
5	Formulate Communications Task Force Scope	Communications	Action	Task Force	Other		10/27/2022		Need to better define the scope and effort of the Communications task force
6	Format scope (questions) for EDC requirements	Research autonomous Grid Support functions	Action	Kankanamalage	EDC	National Grid	3/1/2023		
7	Create guidleines for Grid Support Functions	Research autonomous Grid Support functions							

IEEE 1547-2018 Default Settings Requirements Applicability

~~ALL DER projects with applications submitted on or after January 1, 2023 are subject to requirements described in this document, however individual distribution companies may require earlier requirement date.~~

Unless otherwise noted by an individual EDC, all DER applications for facilities with nameplate capacity 500 kW or larger, submitted on or after January 1, 2023, are subject to requirements described in this document and will require documentation of compliance prior to interconnection. In addition, all DER applications for facilities of any nameplate capacity, submitted on or after October 1, 2023, are subject to these requirements and will require documentation of compliance at the time the application is submitted.

TSRG
Energy Storage SubGroup Update

Mike Porcaro

The Massachusetts Technical Standards Review Group

Energy Storage Sub-Group Update

Mission Statement:

Establish clear criteria surrounding ESS schedules & ramp rates. Consider customer impacts (negative and positive) to site operation, initial interconnection costs, market participation impacts, and long term revenue impacts. Consider technical impacts (negative and positive) to the safety, reliability, and long term system operation/maintenance.

Expected Group Output:

Agreement on ESS study & operation as it relates to ESS schedules & ramp rates. Elements that are common to all EDCs will be incorporated into the TSRG Common Guidelines, and will reference EDC standards for elements that are unique.

Following the outcome of this sub-group, project performance will be monitored, possibly requiring future adjustment.

Team

First Name	Last Name	Company	Affiliation
Michael	Porcaro	National Grid	EDC
Emily	Slack	National Grid	EDC
Gerhard	Walker	Eversource	EDC
Shakir	Iqbal	Eversource	EDC
Justin	Ulrich	Unitil	EDC
John	Bonazoli	Unitil	EDC
Kavita	Ravi	Blue Wave	Industry
Mrinmayee	Kale	Borrego	Industry
Greg	Hunt	Zero Point	Industry
Amit	Barnir	Kearsarge	Industry
Matt	Parlon	Ameresco	Industry
Gerry	Bingham	DOER	DOER
Brian	Lydic	IREC	Gov/Cust
Pierre	Journel	Engie	Industry
Jeff	Long	Engie	Industry

Summary of Major Accomplishments & Upcoming Activities

Completed Activities:	
12/7/2021	Kick off meeting with SMEs
3/24/2022	Sub Group status report at TSRG quarterly meeting
5/5/2022	EDC examples/explanation of challenges with capacity reservation for ESS & impacts to daily system control/operation & planning efforts
6/2/2022	ESS study process proposed by EDCs to the group
8/4/2022	Final coordination and agreement on ESS study process
Upcoming Activities:	
	Discussion on study supporting standard ramp rate values
	Potential safety and reliability impacts related to ramp rate
	Power control system capabilities to potentially address concerns
	Update Common Guideline to reflect ESS Study agreement

TSRG
Dynamic Modeling SubGroup Update

Shakir Iqbal

The Massachusetts Technical Standards Review Group

Dynamic Modeling Sub-Group Update

Mission Statement:

- Develop a Standardized PSCAD Inverter Model Checklist for Distribution Impact Studies
- Assemble subject matter experts and group member opinion
- Current State processes Analyzed Identify areas of concerns
- Potential solutions identified with benefits analysis
- Potential commonalities and necessary difference identification
- Incorporate to common Guideline and EDC technical standards

Expected Group Output:

- PSCAD Inverter Model Checklist for Distribution Impact Studies
- Agreed upon best practice for dynamic modeling of DG connection to the EPS
- Seeking to improve efficiency of analyses
- Incorporating common elements of all EDCs to TSRG Common Guidelines
- Referencing EDC Standards for elements that are unique

Team			
First Name	Last Name	Company	Affiliation
Ruvini	Kankanamalage	National Grid	EDC
Nathan	Walsh	National Grid	EDC
Shakir	Iqbal	Eversource	EDC
Amir	Mosaddegh	Eversource	EDC
Mina	Moawad	Eversource	EDC
Daniel	Dabkowski	Eversource	EDC
John	Bonazoli	Unitil	EDC
Paul	Krell	Unitil	EDC
Kavita	Ravi	Blue Wave	Industry
Mrinmayee	Kale	Borrego	Industry
Michael	Wall	Nexamp	Industry
Michael	Coddington	NREL	Industry
Devin	Van Zandt	EPRI	Industry
Gerry	Bingham	DOER	State
Brian	Lydic	IREC	State

Milestone Summary	
Completed Activities:	
04/08/2022	Kick off meeting with SMEs
05/13/2022	Nayak presented the "Renewable Power Modeling in PSCAD". Nayak stressed on the importance of the transient study and why the manufacturer inverter models are essential for studies.
06/02/2022	EDC Discussion on List of Settings to be provided by the Manufacturers
06/10/2022	Discussing the PSCAD Parameter Checklist
7/8/2022	Finalizing the PSCAD Item Checklist and PSCAD Setting Checklist
	Meetings were contingent since July 2022
12/09/2022	Finalized the PSCAD Inverter Checklist and the PSCAD Model Setting Checklist
Upcoming Milestones & Activities:	

Main Objectives- Checklist Finalized

- **Finalize the PSCAD Item Checklist**
- **Finalize the PSCAD Setting Checklist**
  - Grid Support Functions
  - Voltage/Frequency Trip and Mode of Operation Parameters

PSCAD Checklist	Notes
According to the one-line-diagram, is this the correct inverter model, manufacturer, and version?	Developers to confirm with manufacturer.
Does the PSCAD inverter model contain all necessary libraries?	Typically, libraries have the *.lib or *.obj file extension. The PSCAD model submission should include any required .dll files and .txt files (but not limited to).
Is the PSCAD model compatible with the passive equipment downstream of the point of interconnection (mainly GSU and grounding configuration) and upstream of the PCC or other active equipment (i.e., other inverters or controllers) within the one-line diagram?	Ensure that the inverter model is compatible with all passive elements (e.g., GSU and its configuration, grounding transformer configuration, grounding banks, capacitor banks, surge arresters). For passive elements, the developers provide information either in the form of a single-line file or an Excel spreadsheet.
Is there a user manual with instructions included with the PSCAD model package?	Ensure that the manuals are submitted along with the inverter models. A typical manual would include at minimum the sections for "How to Run the PSCAD model", Descriptions of modules and elements of the inverter model", "Description of protection device settings", "SPOV enablement", and "Modes of Inverter Operations/Functions".
Does the model have an SPOV function? What is the default SPOV setpoint? • What are the possible ranges of SPOV setpoints that the inverter is capable of? • Does the model package have instructions on how to enable and disable the SPOV setpoints? • Does the model package have instructions on how to change the SPOV setpoints for mitigation purposes?	TOV is different than SPOV setpoints. These mechanisms, referred to as Self Protection Over-Voltage (SPOV) mechanisms cause the inverter to cease to energize when the circuit voltage exceeds certain limits. The SPOV mechanisms thus can prevent both GFOV, and load-rejection overvoltage (LROV). Normally the voltage range is between 1.2 to 1.4 pu while the time threshold that the inverter can tolerate is about a few miliseconds. Manufacturer shoud issue a letter confirming the inverter model has the user adjustable SPOV settings with required threshold time to trip? The SPOV setting should be adjustable in the PSCAD model.
Does the model implement the required ISO_NE OV/UV/OF/UF settings or can those be set manually? (if user-configurable, then the manual should instruct how to modify those settings)	Developers to confirm with manufacturer. Either these settings can be hardcoded, or user-configurable, as long as the settings can be set to the ISO-NE requirement. The PSCAD Checklist should be completed along with package submission.
Does the model work at 60 Hz?	Developers to confirm with manufacturer.
Does the model turn off according to the latest IEEE 1547 after modeling a loss of source? (Now it is within 2 sec)	Manufacturer to provide the letter for their approach of anti-islanding detection (and their method), and if the model equipped with island detection module.
Does the model have anti-islanding module implemented for Risk of Islanding testing?	

Table 1. Grid Support Functions

Function	Settings	Range	Default Required Settings	Adjustability of Settings in PSCAD Software	Corresponding Section in Reference Manual
Power Factor	Enable/Disable	ON/OFF	Unity power Factor (ON) - Case by Case Otherwise	Yes	
	Power Factor	(+/-) 0-1			
Frequency Droop (Freq-Watt)	Enable/Disable	ON/OFF	ON	Yes	
	Over-frequency Droop Deadband (dbof)	See Table VI in "Default IEEE 1547-2018 Setting Requirements" Document or latest version	0.036		
	Under-frequency Droop Deadband (dbuf)		0.036		
	Under-frequency and Over-frequency Droop (kuf and kof)		0.05		
	Open Loop Response Time		5		
Voltage Reactive Power (Volt-Var)	Enable/Disable	ON/OFF	OFF	Yes	

Table 1. Voltage/Frequency Trip and Mode of Operation Parameters

Parameter	Settings	Range	Default Required Settings	Adjustability of Settings in PSCAD Software	Corresponding Section in reference manual
High voltage shall trip curve points		See Table IV in "Default IEEE 1547-2018 Setting Requirements" Document or latest version	OV2 Setting: V: 1.2 pu Trip: 0.16s	No	
			OV1 Setting: V: 1.1 pu Trip: 2.0s	No	
Low voltage shall trip curve points		See Table IV in "Default IEEE 1547-2018 Setting Requirements" Document or latest version	UV2 Setting: V: 0.5pu Trip: 1.1s	No	
			UV1 Setting: V: 0.88pu Trip: 3.0s	No	
HV Mode of Operation[1]	Cease to Energize	See Table V in "Default IEEE 1547-2018 Setting Requirements" Document or latest version	V > 1.20pu	No	

TSRG
Area Networks SubGroup Update

The Massachusetts Technical Standards Review Group

Area Networks Sub-Group

Mission Statement:

Identify system challenges for DG interconnections to area networks (per IEEE 1547 definition), which differ from radial systems. Identify amount of service territory served by area networks from each EDC to reference overall territory impact. Explore opportunities for alternative analyses and possibilities for increasing connection capabilities.

Expected Group Output:

Agreement on the requirements and means of analysis for connection of distributed generation to area networks. Elements that are common to all EDCs will be incorporated into the TSRG Common Guidelines, and will reference EDC standards for elements that are unique.

Following the outcome of this sub-group, system and project performance will be monitored, possibly requiring future adjustment.

Team			
First Name	Last Name	Company	Affiliation
Dan	Mungovan	National Grid	EDC
Mohamed	Shamog	National Grid	EDC
Tyler	Thibault	Eversource	EDC
Shakir	Iqbal	Eversource	EDC
Fritz	Octave	Eversource	EDC
Michael	Costa	Eversource	EDC
Jeremy	Kites	Unitil	EDC
Justin	Ulrich	Unitil	EDC
John	Bonazoli	Unitil	EDC
Russ	Aney	Avid Solar	Industry
Jens	Foyer	Nexamp	Industry
Gerry	Bingham	DOER	DOER
Brian	Lydic	IREC	Gov/Cust

Milestone Summary	
Completed Activities:	
12/14/2022	Kick off meeting with SMEs
03/01/2022	Sub Group status report at TSRG quarterly meeting
06/29/2022	EDC members met with Consolidated Edison
Upcoming Milestones & Activities:	
11/01/2022	Current State Processes analyzed

Area Networks Sub-Group

- **Status from Sept 2022 TSRG Quarterly Meeting**
  - MA EDC held a meeting on 6/29/2022 to discuss and learn about Consolidated Edison Interconnection to Area Networks.
  - Meeting minutes have been distributed among the EDC and discussion has begun on integrating what has been learned from ConEdison discussion.
    - Developed resources and analysis techniques to support interconnections.
    - Established remote monitoring and control within their networks.
    - Have in place sophisticated protective and relaying schemes.
  - Each individual EDC will go back and review what each company will proactively do to make the system more ready for interconnection.
  - Each EDC will develop time frame, direction, and document any potential solutions identified with benefits analysis.

Each EDC will provide progress update at the first quarterly meeting in 2023.

TSRG Expedited Process SubGroup Update

Quincy Vale

The Massachusetts Technical Standards Review Group

Expedited Process Sub-Group

- Lead: Quincy Vale
- Members
  - 6 industry representatives
  - 3 EDC representatives (1 from each company)
  - Others welcome to join upon request
  - TSRG membership overall to be engaged via quarterly meeting updates
- Group focus
  - Consider technical characteristics of projects that may/may not allow the Expedited process
  - Consider electrical characteristics of the system that may drive study need
  - Consider technical criteria that may qualify a project to stay on the Expedited track

Old Business

The Massachusetts Technical Standards Review Group

Last meeting

- Flexible Connections
  - Ishaan Jena (Amp Energy) presentation

- Simplified Process
  - Leveraging previously developed material to submit to DPU
  - Russ Aney (Parallel Products) presentation

New Business

The Massachusetts Technical Standards Review Group

Energy Storage Systems

- Working Groups
  - TSRG Subgroup (Dec ‘21 – present)
  - ESIRG (Feb ‘22 – Present)
- Impacts on
  - Day-to-day system switching/management
  - System planning opportunities – short and long term planning implications
  - Impacts on system modification requirements

- Schedules
  - Thermal analysis at initial study stages, providing feedback on:
    - Scheduled AND unscheduled operation
    - System limits, triggering need for system modifications
  - Allows for informed decision on project design
  - Schedules are based on EDC standardized schedule

- Ramp rate
  - Affects on power quality and voltage fluctuation
  - Standardized ramp rate vs variable
  - Monitoring & verification locations

Grid Modernization Update

- DPU File Room, Docket 21-80

- **Track 1 Order 10/7/2022**
  - Substation automation
  - Volt-VAR Optimization (VVO)
  - Communications
  - Advanced Distribution Management System (ADMS)
  - Measurement & verification
  - Feeder monitors
  - Advanced Distribution Automation (ADA)
    - Fault Location, Isolation, and Service Restoration (FLISR)

- **Track 2 Order 11/30/2022**
  - Advanced Load Flow (ALA)
  - Distributed Energy Resource Management System (DERMS)
  - Active Resource Integration (ARI)
  - Local power export controller

The content of this slide is not a comprehensive summary of the GridMod order, or reflective of specific elements of any individual EDC's Grid Modernization plan. Details of Grid Mod implementation are in process within each EDC. This slide is intended for conversational purposes only to facilitate discussion at this meeting.

Act Driving Clean Energy and Offshore Wind

https://malegislature.gov/Laws/SessionLaws/Acts/2022/Chapter179#:~:text=The%20purpose%20of%20the%20program,capacity%20in%20the%20offshore%20wind

EDCs to assemble Electric Sector Modernization Plans (ESMP)

(i) improve grid reliability, communications and resiliency;

(ii) enable increased, timely adoption of renewable energy & DER;

(iii) promote ESS and electrification technologies necessary to decarbonize the environment and economy;

(iv) prepare for future climate-driven impacts on the transmission and distribution systems;

(v) accommodate increased electrification and other potential future demands;

(vi) minimize/mitigate impacts on the ratepayers

Grid Modernization Advisory Counsel (GMAC)

Comnr of Energy Resources, AGO, Mass Clean Energy Tech Ctr;

Governor appointed members, representing:

- Middle and low-income residential consumers,
- Local agency administering the low-income weatherization assistance program,
- Environmental advocacy community,
- Environmental justice community organization,
- Transmission scale renewable energy industry (projects of greater than 20 megawatts),
- Distributed generation scale renewable energy industry (projects of less than 5 megawatts),
- Energy storage industry, Electric vehicle industry,
- Building electrification industry, Municipal or regional interests,
- Technical/engineering expertise in interconnecting clean energy,
- Businesses, including large commercial and industrial,
- 1 member from each electric company (non-voting members)

Equipment Availability

- Supply chain impacts
  - Affecting customer and EDC procurement
- EDC’s proactively working with equipment suppliers and internal procurement departments
  - Forecasting quantities
  - Reviewing on-hand stock
- Working with customers on issues
  - Coordinating schedules for customer side equipment delays
  - Working to minimize impacts for EDC manufacturer delays

Closing

- **Next meetings**
  - Mar 15, 2023
  - Jun 8, 2023

- **Please send any topic requests for future meetings to Chair and/or Vice Chair**
  - **Michael.Porcaro@nationalgrid.com**
  - **mkale@newleafenergy.com**