Virginia Distributed Energy Resource (DER) Interconnection Working Groups

Final Report for the Virginia State Corporation Commission's DER Interconnection Working Group Process

VOLUME 2

January 2024

This document is Volume 2 of the Final Report for the Virginia State Corporation Commission's (SCC or Commission) DER Interconnection Working Group process, which spanned from July through December 2023. Volume 2 includes all presentation materials from the seven working group meetings.

The DER interconnection working groups were convened in accordance with the Commission's March 3, 2023 Order in Case No. PUR-2022-00073, *In the matter considering utility distributed energy resource interconnection-related issues and questions*, which the SCC opened to explore issues related to DER interconnection in Virginia. The March 3, 2023 Order directed SCC Staff to convene two working groups to address issues related to the following six topics.

- ***Working Group 1:*** *Study timelines, construction timelines, and cost allocation*
- ***Working Group 2:*** *Interconnection costs, cost transparency, and dark fiber/direct transfer trip ("DTT")*

SCC Staff selected the Great Plains Institute (GPI) to facilitate both working groups; prepare a final report documenting the working group process including points of discussion, issues raised, and solutions suggested; and identify points of working group consensus where found.

Volume 2 of the final report compiles all materials presented throughout the working group process. This includes presentations made by participants, guest presenters, SCC Staff, and GPI for the seven meetings highlighted in the summary table on the following page.

For summaries and commission update reports for each meeting, please refer to the Documents List for Case No. PUR-2022-00073.[1] [2]

[1] Link to Case No. PUR-2022-00073: https://www.scc.virginia.gov/docketsearch#caseDocs/143131

[2] Volume 1 of the final report serves as the commission update report for the final combined meeting for the DER interconnection working group process.

Meeting	Date	Meeting Topic(s)	Presentations
Meeting 1 (combined for both working groups)	July 26	Combined initial kick-off meeting for both working groups	• GPI guidance/overview slides • SCC level-setting and interconnection rules overview **Meeting 1 materials begin on Volume 2, Page 4.**
Working Group 1, Meeting 2	Sept. 27	• Study process • Study timelines	• GPI guidance/overview slides • SCC walk-through of study process, timelines, and enforcement mechanisms • *Parallel Generation: Interconnection to the Grid*—Dominion[3] • *Chapter 314: Regulations Governing Interconnection of Small Electrical Generators (Virginia) effective 10/15/2020, Timeline from Interconnection Request to Small Generator Interconnection Agreement (SGIA)*—handout provided by Dominion • *DER/DERMS Program Updates*—AEP/APCo[4] Kentucky Utilities (KU) elected not to present during this meeting and instead provided a brief verbal overview. **Working Group 1, Meeting 2 materials begin on Volume 2, Page 62.**
Working Group 1, Meeting 3	Oct. 25	• Construction timelines • Cost allocation	• GPI guidance/overview slides • *How Should Exporting DERs Pay for Grid Services? One Idea to Consider*—participant presentation • *New Mexico Cost Allocation Options Sub-Group Report-Out*—participant presentation **Working Group 1, Meeting 3 materials begin on Volume 2, Page 104.**

[3] In this report, Virginia Electric and Power Company d/b/a Dominion Energy Virginia's is referred to as "Dominion."

[4] In this report, American Electric Power (Appalachian Power Company) is referred to as "AEP/APCo."

Meeting	Date	Meeting Topic(s)	Presentations
Working Group 2, Meeting 2	Sept. 19	Dark fiber/DTT (issue identification, preliminary identification of potential solutions)	• GPI guidance/overview slides • *Why DTT and Point to Point Fiber?*—Dominion • *Grid Engineering Practices & Standards Protection with High Adoption of DER*—guest presentation (Pacific Northwest National Laboratory) • *Understanding DER Islanding Risks and Mitigation Measures*—participant presentation • *Direct Transfer Trip (DTT)*—participant presentation **Working Group 2, Meeting 2 materials begin on Volume 2, Page 135.**
Working Group 2, Meeting 3	Oct. 10	• Interconnection costs • Information transparency	• GPI guidance/overview slides • *Interconnection Cost Transparency, Accuracy, and Granularity*—Dominion • *How are Cooperatives Different*?—Virginia, Maryland & Delaware Association of Electric Cooperatives • *DER Overview*—AEP/APCo **Working Group 2, Meeting 3 materials begin on Volume 2, Page 205.**
Working Group 2, Meeting 4	Oct. 30	Dark fiber/DTT (further discussion and refinement of potential solutions identified during Working Group 2, Meeting 2)	• GPI guidance/overview slides **Working Group 2, Meeting 4 materials begin on Volume 2, Page 243.**
Combined final meeting	Dec. 4	Refine solutions to include in the final report and identify consensus where it exists	• GPI guidance/overview slides **Materials from the final combined meeting for both working groups begin on Volume 2, Page 259.**

Meeting 1 Presentation Materials

Meeting 1 (July 26, 2023): *Combined initial kick-off meeting for both working groups*

- GPI guidance/overview slides
- SCC level-setting and interconnection rules overview

Note: Meeting 1 materials are presented in a compiled format, in which the SCC's level-setting slides are embedded within GPI's guidance/overview slides. The compiled presentations begin on **Volume 2, Page 4**.

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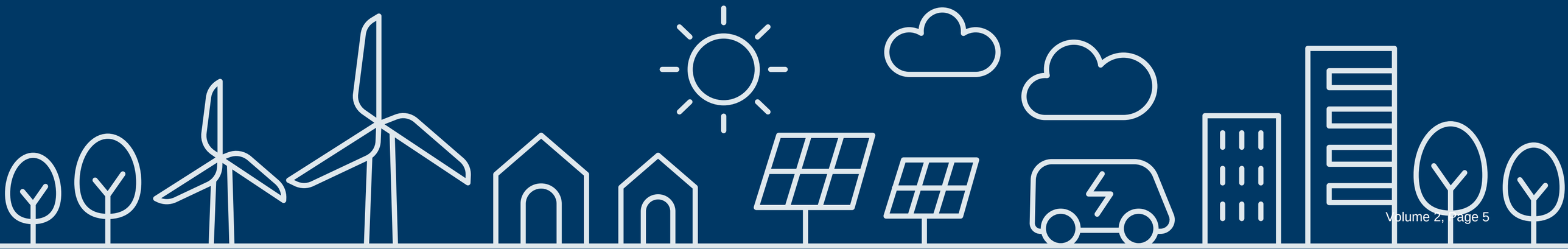
Virginia DER Interconnection Working Groups: Kickoff Meeting

July 26, 2023

-Virtual meeting-



Agenda

8:30am **Process Introduction and Kickoff**

- 8:30am: Welcome, Introductions, Meeting Logistics & Review of Agenda
- 8:50am: Level-setting
- 9:20am: Overview of Current Interconnection Rules

10:00am **Break**

10:30am **Kickoff: Working Group 1**

- 10:30am: Working Group 1 Outcome Identification
- 11:15am: Discussion – Study Timelines and Construction Timelines
- 11:35am: Discussion – Cost Allocation
- 11:55am: Next Steps
- 12:00pm: Working Group 1 Adjourns

12:00pm **Lunch Break**

1:00pm **Kickoff: Working Group 2**

- 1:00pm: Working Group 2 Outcome Identification
- 1:45pm: Discussion – Interconnection Costs and Cost Transparency
- 2:05pm: Discussion – Dark Fiber/Direct Transfer Trip (DTT)
- 2:25pm: Next Steps
- 2:30pm: Working Group 2 Adjourns

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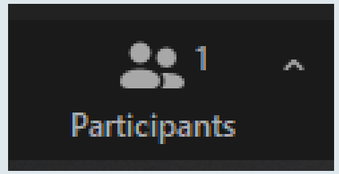
Welcome!

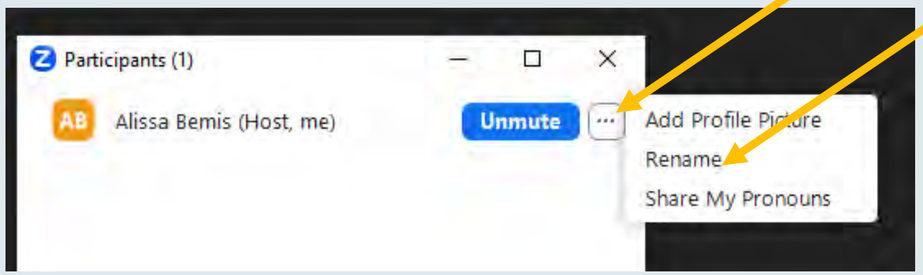
Please share your name and organization in the chat.

Add your organization to your name:

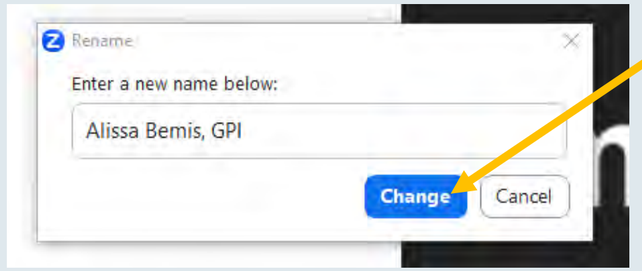
1) Click on the “Participants” icon at the bottom of your screen



2) Hover over your name in the participants list and click the three dots that appear and click on “rename”



3) Add your organization to your name and click “Change”



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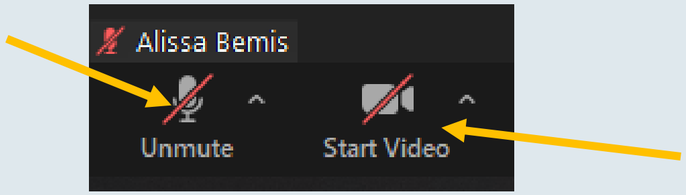
Zoom 101

Mute/Unmute and Turn on/off camera

1) Mute/unmute: Click on the microphone icon on the menu on the bottom of your screen.

1) Click on the video icon to turn your camera on and off.

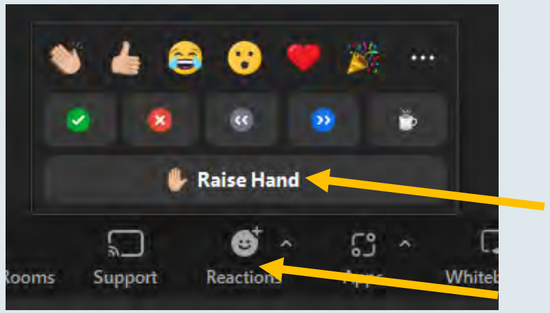


Turn on closed captions

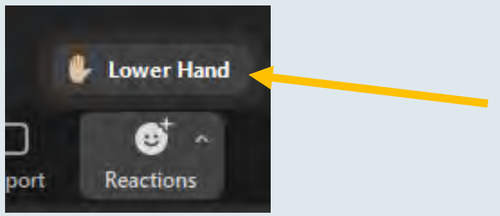
1) Click on the “Show Captions” icon at the bottom of your screen. Select the language you would like the captions in and click “Save.”

Raise your hand

1) Click on the “reactions” icon at on the menu at the bottom of your screen. Then click “Raise Hand.”



2) Once you are done speaking, click “Lower hand” to lower your hand.



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Meeting 1 Goals

1. **Level-set** on the working group context and process.
2. For each working group, identify what **outcomes participants would like to see** as a result of this process.
3. **Share initial perspectives** on the topics for both working groups.
4. **Identify priority topics for discussion** in subsequent meetings.

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Ground Rules

1. **Respect each other.** Help us to collectively uphold respect for each other's experiences and opinions, even in difficult conversations.
2. **Respect the time.** Our time together is limited and valuable, so please be mindful of the time and of others' opportunity to participate.
3. **Share your perspective and help others share theirs.** We need everyone's wisdom to achieve better understanding and develop robust solutions.
4. **Enable honesty through non-attribution.** Outside of this group, you may share what was said, who was present, and perspectives shared at an organizational level, but please refrain from attributing perspectives to individual participants without first obtaining that individual's permission. All meeting notes and materials will also adhere to this.

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Commonwealth of Virginia
STATE CORPORATION COMMISSION

PUR-2022-00073 - DER Interconnection Working Groups

Level Setting & Interconnection Rules Overview

Mike Cizenski, P.E.
PUR Deputy Director

Neil Joshipura
PUR Principal Utilities Engineering Manager

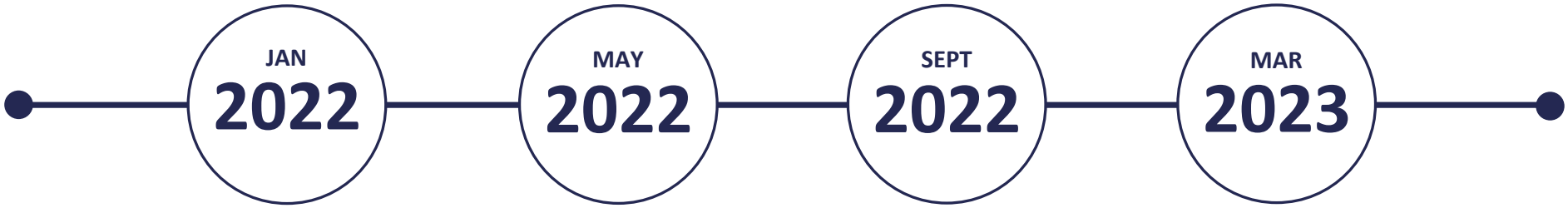
Disclaimer:

Pursuant to the Commission's Order, the State Corporation Commission has established the DER Interconnection Working Groups. The views expressed during the Working Group meetings do not state or reflect those of the Commission. These are considered "open meetings" and we ask that everyone work to only discuss information that is public. These open meetings will not be recorded. However, to ensure that the information gathered during these meetings is accurately portrayed, GPI will be taking notes both on and off screen. While gathering information for the report to be submitted to the Commission, we will not specifically refer to individuals by name in the report but rather generally to the ideas or positions of either the group or their organization.

BACKGROUND

PUR-2022-00073 - DER Interconnection Working Groups

Timeline



DOMINION GT PLAN

Commission Final Order in **PUR-2021-00127** concluded that a separate docket to explore utility DER interconnection is necessary

DER DOCKET OPENED

Order for Comment in **PUR-2022-00073**. Requested input on primary obstacles, solutions, and best practices

STAFF REPORT

Summarized comments and provided Staff's recommendations

ORDER

Commission's March 3, 2023 Order in **PUR-2022-00073** established current approach

MC1

PUR-2022-00073 - DER Interconnection Working Groups

Commission's Order on March 3, 2023

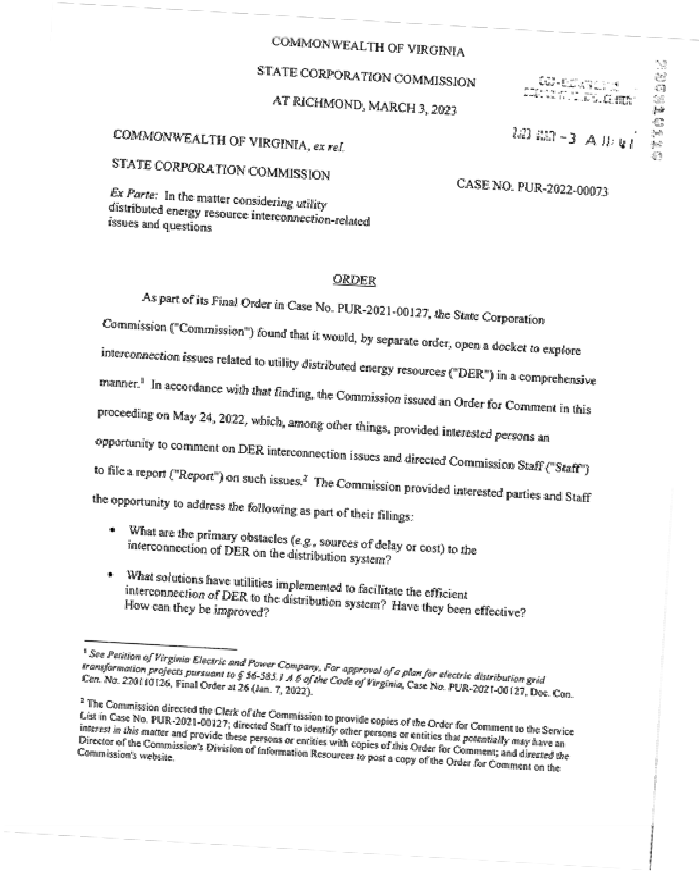
Established three main approaches:

Staff Survey

Rulemaking

Working Groups

You are here!



COMMONWEALTH OF VIRGINIA

STATE CORPORATION COMMISSION

AT RICHMOND, MARCH 3, 2023

COMMONWEALTH OF VIRGINIA, *ex rel.*

STATE CORPORATION COMMISSION

CASE NO. PUR-2022-00073

Ex Parte: In the matter considering utility distributed energy resource interconnection-related issues and questions

ORDER

As part of its Final Order in Case No. PUR-2021-00127, the State Corporation Commission ("Commission") found that it would, by separate order, open a docket to explore interconnection issues related to utility distributed energy resources ("DER") in a comprehensive manner.[1] In accordance with that finding, the Commission issued an Order for Comment in this proceeding on May 24, 2022, which, among other things, provided interested persons an opportunity to comment on DER interconnection issues and directed Commission Staff ("Staff") to file a report ("Report") on such issues.[2] The Commission provided interested parties and Staff the opportunity to address the following as part of their filings:

- What are the primary obstacles (e.g., sources of delay or cost) to the interconnection of DER on the distribution system?
- What solutions have utilities implemented to facilitate the efficient interconnection of DER to the distribution system? Have they been effective? How can they be improved?

[1] *See Petition of Virginia Electric and Power Company, For approval of a plan for electric distribution grid transformation projects pursuant to § 56-585.1 A 6 of the Code of Virginia*, Case No. PUR-2021-00127, Doc. Con. Cen. No. 220110126, Final Order at 26 (Jan. 7, 2022).

[2] The Commission directed the Clerk of the Commission to provide copies of the Order for Comment to the Service List in Case No. PUR-2021-00127; directed Staff to identify other persons or entities that potentially may have an interest in this matter and provide these persons or entities with copies of this Order for Comment; and directed the Director of the Commission's Division of Information Resources to post a copy of the Order for Comment on the Commission's website.

STAFF SURVEY

STAFF SURVEY

Commission Requested Staff to Collect feedback on:

- Application Process
- Lack of Information
- Guide for interconnection Parameters
- Cyber Security

Staff is to make a filing summarizing the responses received on or before August 1, 2023.

STAFF SURVEY

Staff Survey to Utilities:

- Current processes in place to support DER interconnection
- Online DER interconnection portals
- Hosting Capacity Map
- Online Interconnection Queues
- Interconnection reports since 2015 be made publicly available
- Interconnection Parameter Guide
- Cyber Security and data management protocols

STAFF SURVEY

Staff Survey to Developer Community:

- Online DER interconnection portals
- Hosting Capacity Map
- Interconnection Parameter Guide
- Cyber Security and data management protocols

Staff is to make a filing summarizing the responses received on or before August 1, 2023.

RULEMAKING

RULEMAKING

Commission's Order on March 3, 2023

"Finally, we find that several issues raised by commenters should be addressed through a rulemaking process that examines certain potential changes to the Interconnection Regulations. We will thus initiate a rulemaking proceeding, in a separate docket, that examines, at a minimum, whether amendments to the Interconnection Regulations on the following topics are needed…"

*Commission March 3, 2023, Order at 9.

RULEMAKING

Rulemaking Topics:

- Material Modification Language
- Dispute Resolution Language
- Requirements for Level 1 Interconnections
- Cybersecurity
- DER Definition, and
- DER Performance Standards.

*Commission March 3, 2023, Order at 9-10.

RULEMAKING

Commission's Order on March 3, 2023

"…In initiating such a rulemaking proceeding to address these issues, the Commission agrees with Staff that regulation reform will likely be a multi-step process. In other words, we recognize that the issues listed above may be ripe for consideration in the directed rulemaking, while other potential changes to the regulations may be better addressed in a future rulemaking proceeding."

May 2, 2023 – Order Initiating Rulemaking Proceeding

Case No. PUR-2023-00069

*Commission March 3, 2023, Order at 10.

WORKING GROUPS

WORKING GROUPS

Directs Staff to Convene two separate working groups:

WORKING GROUP 1

- Study Timelines
- Construction Timelines
- Cost Allocation

WORKING GROUP 2

- Interconnection Costs
- Cost Transparency
- Dark Fiber and Direct Transfer Trip (DTT)

Facilitator: GREAT PLAINS INSTITUTE

WORKING GROUPS

Scope and Requirements

- Working Group 1 - Up to **3** virtual meetings
- Working Group 2 – Up to **4** virtual meetings
- Each meetings may be up to six hours
- Working Group meetings begin by August 1, 2023 and last meeting is completed by October 31, 2023
- Within 30 days of the end of each meeting, the working group shall provide an update to the Commission on the issues discussed and any recommendations for the Commission's consideration
- Draft Final Report Mid December
- Final Report to SCC by January 12, 2024

QUESTIONS?

INTERCONNECTION RULES

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

(20 VAC 5-314.10 *et seq.*)

https://law.lis.virginia.gov/admincode/title20/agency5/chapter314/

- Adopted on May 21, 2009
- Last updated on October 15, 2020.
  - Established a Preapplication Process
  - Chapter now applies to equipment for storage of electricity for later injection
  - Improved timelines and fees to limit non serious and speculative projects
  - Added a “material modification” section.
  - Many new schedules

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 10	**Applicability and scope; waiver**
Section 20	**Definitions**
Section 30	**Siting of distributed generation facilities**
Section 35	Preapplication
Section 38	Queue number and interdependent projects
Section 39	Modification of the interconnection request
Section 40	Level 1 interconnection process
Section 50	Levels 2 and 3 interconnection request general requirements
Section 60	Level 2 Interconnection process
Section 70	Level 3 interconnection process
Section 80	Interconnection metering
Section 90	Commissioning tests
Section 100	Disputes
Section 110	Confidential information
Section 120	Equal treatment
Section 130	Record retention and reporting requirements
Section 140	Coordination with affected systems
Section 150	Capacity of the small generating facility
Section 160	Insurance, liability, and indemnification
Section 165	Assignment; sale of an existing or proposed SGF
Section 170	Schedules for Chapter 314

Section 10, 20, and 30

- **This chapter applies to:**
  - **Interconnections for retail electric customers**
  - **Independently owned generators**
  - **Energy storage for later injection into the utility system**
- **This chapter does not apply to:**
  - **Net Metering customer generators (20 VAC 5-315)**
  - **Generators pursuing interconnection through PJM**
  - **Transmission interconnected facilities**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

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Section 10, 20, and 30 cont.

- **Three Review Paths for Generators**
  - **Level 1 – SGF* no larger than 500kW**
  - **Level 2 – SGF no larger than 2MW and not qualifying for the Level 1 process**
  - **Level 3 – SGF not qualifying for the Level 1 or Level 2 process**
- **Siting – IC** must ensure compliance with local, state, and federal laws and regulations.**

*** SGF = Small Generating Facility**

**** IC = Interconnection Customer**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 35 - Preapplication

- **Informal request electric system information for a proposed project for a specific site.**
- **A formal written request along with a fee for a preapplication report.**
  - **Readily available information including, but not limited to:**
    - **Total capacity of substation or area bus, bank, or circuit**
    - **Nominal voltage**
    - **Actual or estimated peak load and minimum load data.**
- **Schedule 4 – Preapplication Report Request Form**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 38 – Queue number and interdependent projects

- **Queue number and queue position assigned upon receipt of interconnection request.**
- **Utility identifies interdependent projects (Project A, Project B). Notification at scoping meeting, as applicable or in writing.**
- **If interdependent (Project B) has the option to:**
  - **Wait on interdependent Project A to execute SGIA or withdrawn;**
  - **Proceed with the Feasibility and System Impact with and without Project A.**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 39 – Modification of the interconnection request

- **"Material Modification" - modification that has a material impact on the cost, timing, or design of interconnection facilities or upgrades or that may adversely impact other interdependent interconnection requests with higher queue numbers.**
- **A material modification can affect the status of an interconnection request in the queue.**
- **This section identifies changes that do and do not qualify as a material modification.**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 40 – Levels 1 interconnection process

- **Projects up to 500 kW**
- **Requirements to be studied as a Level 1:**
  - **Completed Levels 1 Interconnection Request Form (Schedule 5)**
  - **Site control documentation**
  - **Processing fee**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

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Section 50 – Levels 2 and 3 interconnection request general requirements

- Requirements to be studied as a Level 2 or 3:
  - Completed Levels 2 and 3 Interconnection Request Form (Schedule 6)
  - Site control documentation
  - Processing fee
- Small Generator Interconnection Agreement (SGIA) (Schedule 10)
  - SGIA specifies milestones for prepayment of estimated costs for all system upgrades identified by the utility during the study process.

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

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Section 170	Schedules for Chapter 314

Section 60 – Levels 2 interconnection process

- SGF is no larger than 2 MW and does not qualify for the Level 1 process.
- Must pass certain screens to qualify as a Level 2 interconnection.
- Allows to a supplemental review to allow for additional studies to determine if a SGF could qualify as a Level 2 interconnection.
- SGF may be elevated to the Level 3 interconnection process.

INTERCONNECTION RULES

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Section 70 – Level 3 interconnection process

- **Projects that do not qualify for the Level 1 or Level 2 interconnection processes.**
- **Five stages of the Level 3 process**
  - **Scoping Meeting**
    - **Interdependency determination**
  - **Feasibility Study (Schedule 7)**
  - **System Impact Study (Schedule 8)**
  - **Facilities Study (Schedule 9)**
  - **Construction Planning Meeting**
    - **Identify and determine the milestones for the construction of the system upgrades and attachment facilities.**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 80 – Interconnection metering

- **Any metering, including telemetering, shall be provided by the utility at the IC's expense in accordance with commission requirements or the utility's specifications.**

Section 90 – Commissioning tests

- **Commissioning tests of the IC's installed equipment shall be performed pursuant to applicable codes and standards.**
- **Utility shall be allowed to witness the commissioning tests.**

INTERCONNECTION RULES

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Section 100 - Disputes

- **Written notice of dispute**
- **Three approaches for handling a dispute.**
  - **Informal resolution**
  - **Resolution assistance from PUR**
  - **Dispute resolution venue (*e.g.,* mediation, settlement judge, etc.)**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

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Section 110 – Confidential information

- **Identifies the treatment of confidential information.**
- **Identifies information not deemed confidential after a queue number has been assigned.**

Section 120 – Equal treatment

- **Utility shall receive, process, and analyze all interconnection requests in a timely manner.**
- **Utility shall use the same reasonable efforts for all ICs.**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 10	Applicability and scope; waiver
Section 20	Definitions
Section 30	Siting of distributed generation facilities
Section 35	Preapplication
Section 38	Queue number and interdependent projects
Section 39	Modification of the interconnection request
Section 40	Level 1 interconnection process
Section 50	Levels 2 and 3 interconnection request general requirements
Section 60	Level 2 Interconnection process
Section 70	Level 3 interconnection process
Section 80	Interconnection metering
Section 90	Commissioning tests
Section 100	**Disputes**
Section 110	**Confidential information**
Section 120	**Equal treatment**
Section 130	**Record retention and reporting requirements**
Section 140	Coordination with affected systems
Section 150	Capacity of the small generating facility
Section 160	Insurance, liability, and indemnification
Section 165	Assignment; sale of an existing or proposed SGF
Section 170	Schedules for Chapter 314

Section 130 – Record retention and reporting requirements

- **Utility shall maintain three years of data.**
- **Each utility shall annually file a report to PUR identifying certain information regarding projects and queue position.**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 140 – Coordination with affected systems

- **The utility shall coordinate the conduct of any studies required to determine the impact of the SGF on affected systems with affected system operators.**

Section 150 – Capacity of the small generating facility

- **The interconnection request shall be evaluated using the maximum capacity that the SGF is capable of injecting into the utility's electric system.**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 160 – Insurance, liability, and indemnification

- **Identifies liability insurance minimums for different project sizes.**
- **Certificates of insurances**

Section 165 – Assignment; sale of an existing or proposed SGF

- **Transfer of ownership**
- **Change of control**
- **New interconnection request and processing fee are required but can retain the existing queue position.**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 170 – Schedules for Chapter 314

- **Schedule 1 – Glossary of Terms**
  - **Applies to Schedules 2-9**
- **Schedule 2 - Certification of Small Generator Equipment Packages**
  - **Small generating facility equipment needs to be certified for interconnected operation.**
- **Schedule 3 - Certification Codes and Standards**
- **Schedule 4 – Generating Facility Preapplication Report Request Form**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 170 – Schedules for Chapter 314 (cont.)

- **Schedule 5 – Level 1 Interconnection Request Form**
  - **Processing fee**
- **Schedule 6 - Levels 2 And 3 Interconnection Request Form**
  - **Processing fee (Levels 2 and 3)**
  - **Deposit (Level 3)**
- **Schedule 7 – Level 3 Feasibility Study Agreement**
- **Schedule 8 – Level 3 System Impact Study Agreement**
- **Schedule 9 – Level 3 Facilities Study Agreement**

INTERCONNECTION RULES

Chapter 314. Regulations Governing Interconnection of Small Electrical Generators and Storage

Section 170 – Schedules for Chapter 314 (cont.)

- **Schedule 10 – Small Generator Interconnection Agreement (SGIA)**
  - **Effective Date, term, termination, and disconnection**
  - **Cost responsibility**
  - **Billing, payment, milestones, and financial security**
  - **Assignment, liability, indemnity, force majeure, consequential damages, and default**

QUESTIONS?

-Break-

Working Group 1 participants, please return at 10:30am. Working Group 2 participants, please return at 1:00pm.

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Working Group 1 Kickoff

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Outcome Identification

Discussion: Study Timelines and Construction Timelines

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Discussion: Cost Allocation

Next Steps

- August Working Group 1 Meeting—date TBD

- Complete the brief post-meeting survey
  - Identify whether you will be participating in one or both Working Groups
  - Provide feedback on issues identified today
  - Identify additional issues

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-Lunch Break-

Working Group 2 will begin at 1:00pm.

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Working Group 2 Kickoff

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Outcome Identification

Discussion: Interconnection Costs and Cost Transparency

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Discussion: Dark Fiber/ Direct Transfer Trip

Next Steps

- August Working Group 2 Meeting—date TBD

- Complete the brief post-meeting survey
  - Identify whether you will be participating in one or both Working Groups
  - Provide feedback on issues identified today
  - Identify additional issues not discussed today

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THANK YOU

Virginia DER Interconnection Working Groups; July 26, 2023

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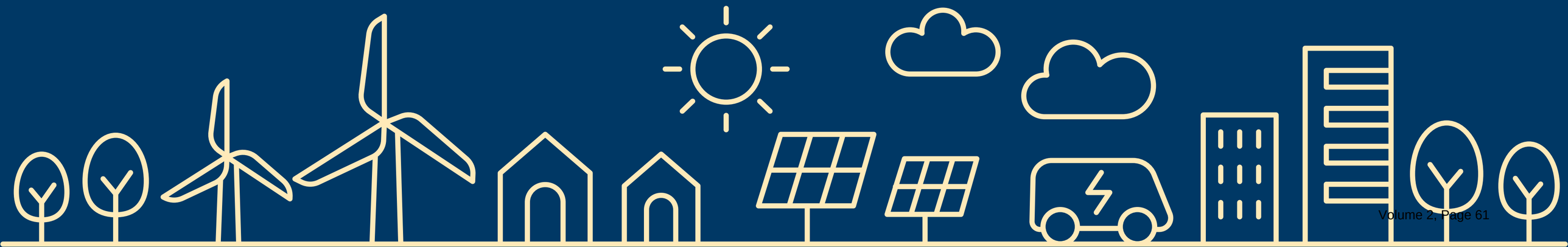

Working Group 1, Meeting 2 Presentation Materials

Working Group 1, Meeting 2 (September 27, 2023): *Study process and study timelines*

- GPI guidance/overview slides **(Volume 2, Page 63–Volume 2, Page 76)**
- SCC walk-through of study process, timelines, and enforcement mechanisms **(Volume 2, Page 77)**
- *Parallel Generation: Interconnection to the Grid*—Dominion **(Volume 2, Page 78–Volume 2, Page 91)**
- Chapter 314: Regulations Governing Interconnection of Small Electrical Generators (Virginia) effective 10/15/2020, Timeline from Interconnection Request to Small Generator Interconnection Agreement (SGIA)—handout provided by Dominion **(Volume 2, Page 92–Volume 2, Page 94)**
- *DER/DERMS Program Updates*—AEP/APCo **(Volume 2, Page 95–Volume 2, Page 103)**

Note: Kentucky Utilities (KU) elected not to present during this meeting and instead provided a brief verbal overview.

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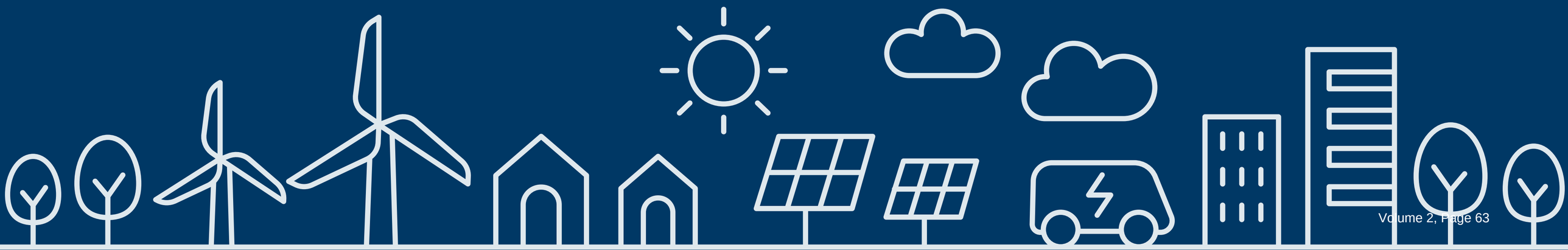
Virginia DER Interconnection Working Groups

Working Group 1, Meeting 2

September 27, 2023

-Virtual meeting-



Agenda

8:30am **Welcome and Introductions, Process Update & Agenda Review**

8:45am **Presentation from SCC on study process, timelines, and enforcement mechanisms**

9:00am **Discussion: Challenges associated with the current study process and timelines**

- Opportunity for parties to share what challenges they've encountered
- Identify what would constitute a reasonably efficient timeline for parts of the study process that are causing delays

10:00am **Break**

10:30am **Discussion: Strategies to improve efficiency of current study timelines and processes**

- Focus on current sequential study process and enforcement mechanisms

12:00pm **Lunch Break**

1:00pm **Discussion: Alternative approaches to the sequential study process**

- Focus on alternatives to the sequential study process that would improve efficiency

2:25pm **Wrap up and next steps**

2:30pm **Adjourn**

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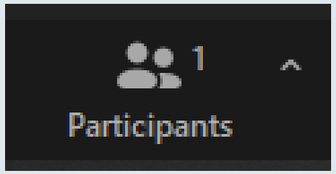
Welcome!

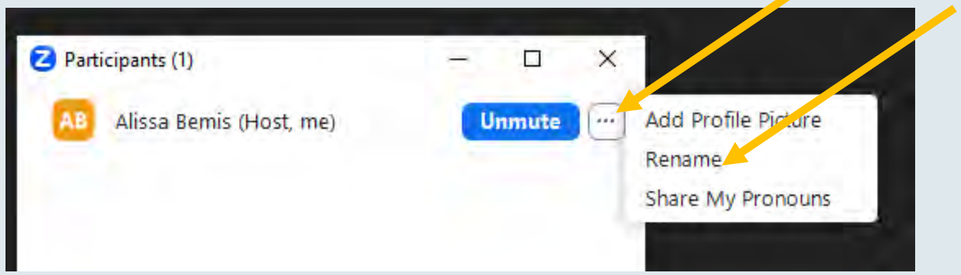
Please share your name and organization in the chat.

Add your organization to your name:

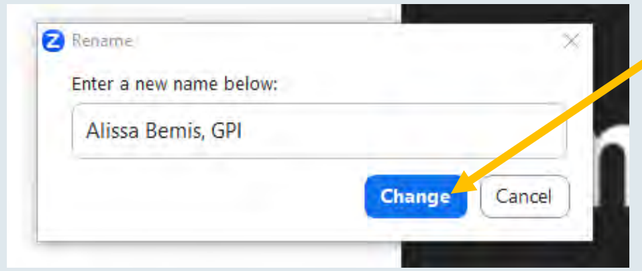
1) Click on the “Participants” icon at the bottom of your screen



2) Hover over your name in the participants list and click the three dots that appear and click on “rename”



3) Add your organization to your name and click “Change”



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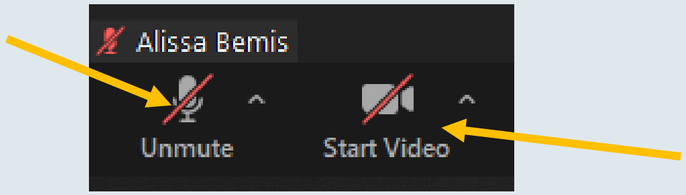
Zoom 101

Mute/Unmute and Turn on/off camera

1) Mute/unmute: Click on the microphone icon on the menu on the bottom of your screen.

1) Click on the video icon to turn your camera on and off.

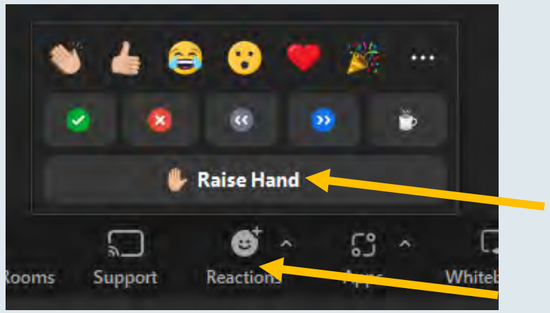


Turn on closed captions

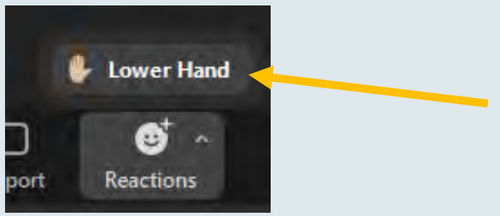
1) Click on the “Show Captions” icon at the bottom of your screen. Select the language you would like the captions in and click “Save.”

Raise your hand

1) Click on the “reactions” icon at on the menu at the bottom of your screen. Then click “Raise Hand.”



2) Once you are done speaking, click “Lower hand” to lower your hand.



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Meeting Goals

1. Level-set on the **current study process and timelines** as described in Chapter 314, Regulations Governing Interconnection of Small Electrical Generators and Storage (20 VAC 5-314.10 et seq.).
2. Identify what would constitute a **reasonably efficient study timeline and process**.
3. Understand **what parts of the current sequential study process cause delays**, better understand what those delays mean to different parties, and **discuss strategies that could reduce these delays**.
4. Identify **alternatives to the current study process** that would result in improved process and timeline efficiencies.

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Ground Rules

1. **Respect each other.** Help us to collectively uphold respect for each other's experiences and opinions, even in difficult conversations.
2. **Respect the time.** Our time together is limited and valuable, so please be mindful of the time and of others' opportunity to participate.
3. **Share your perspective and help others share theirs.** We need everyone's wisdom to achieve better understanding and develop robust solutions.
4. **Enable honesty through non-attribution.** Outside of this group, you may share what was said, who was present, and perspectives shared at an organizational level, but please refrain from attributing perspectives to individual participants without first obtaining that individual's permission. All meeting notes and materials will also adhere to this.

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Presentation and Q&A:

Virginia SCC

Study process, timelines, and enforcement mechanisms

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Discussion: Challenges associated with the current study process

What challenges have utilities, developers, and others encountered?

What parts of the current sequential study process cause the greatest timeline delays?

What would constitute a reasonably efficient timeline for these parts of the study process and for the study process overall?

-Break-

Please return at 10:30am.

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Discussion: Strategies to improve efficiency of current study timelines and processes

Focusing on the current sequential study process, what could utilities, developers, and other parties do differently that would improve the process?

What enforcement mechanisms could be employed to better encourage alignment with established study timelines?

-Lunch-

Please return at 1:00pm.

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Discussion: Alternative approaches to the sequential study process

What alternative study approaches would make for a more expeditious and efficient study process?

What is an appropriate framework for these alternative study processes? Does the framework differ for behind- and front-of-meter development?

Next Steps

- WG2, Mtg 3 – October 10
- WG1, Mtg 3 – October 25
- WG2, Mtg 4 – October 27

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THANK YOU

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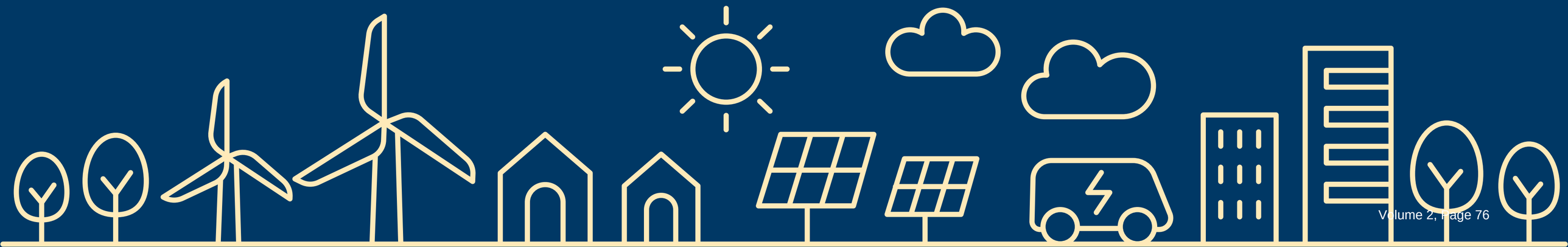
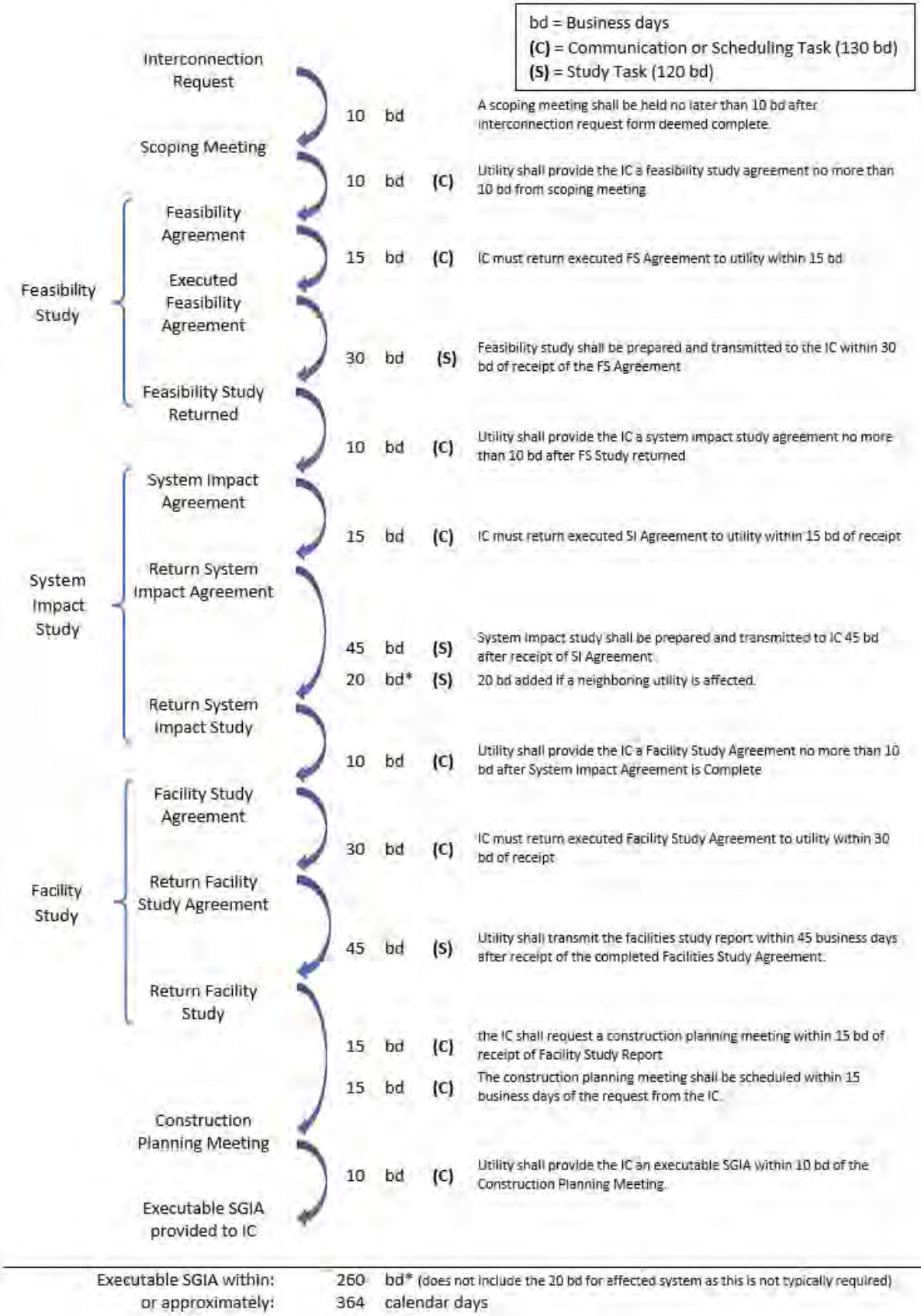


Attachment MAC- 1: Interconnection Process Timeline



Parallel Generation:

Interconnection to the Grid

Agenda

- Distribution Voltage Interconnection Requests
- Interconnection Process Overview
- Dominion Energy Virginia Queue Status Overview
- Interconnection Request Considerations
- Questions

Distribution Voltage Interconnections

(<69 kV)

Solar Interconnections

Interconnection to the Distribution System

- Utility Considerations
  - Safety, reliability, and operability of the grid for all customers
  - Customized studies to identify grid modifications needed to accommodate generator interconnection

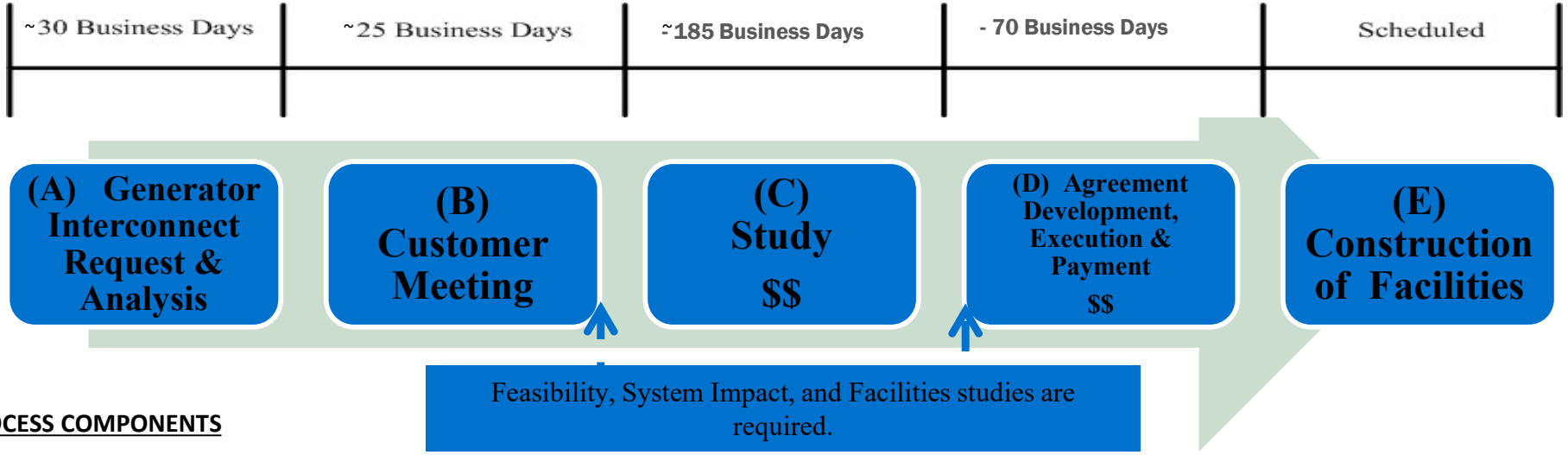
- State Jurisdictional Interconnection Procedures
  - North Carolina Interconnection Procedures
  - Chapter 314 of the Virginia Administrative Code

- FERC Jurisdictional Interconnection Procedures
  - PJM Open Access Transmission Tariff (PJM OATT)
  - Applicable to FERC Jurisdictional Interconnections at distribution voltages that desire to sell into the PJM Market

Dominion Energy

High Level View of Interconnect Process

Virginia State Jurisdictional Procedures



PROCESS COMPONENTS

(A) Completed Request Form, Proof of Site Control, plus fee

(B) Customer Meeting to review application & discuss potential scope

(C) Feasibility, System Impact, and Facilities studies to determine scope, protection requirements, cost estimates, & construction time estimates

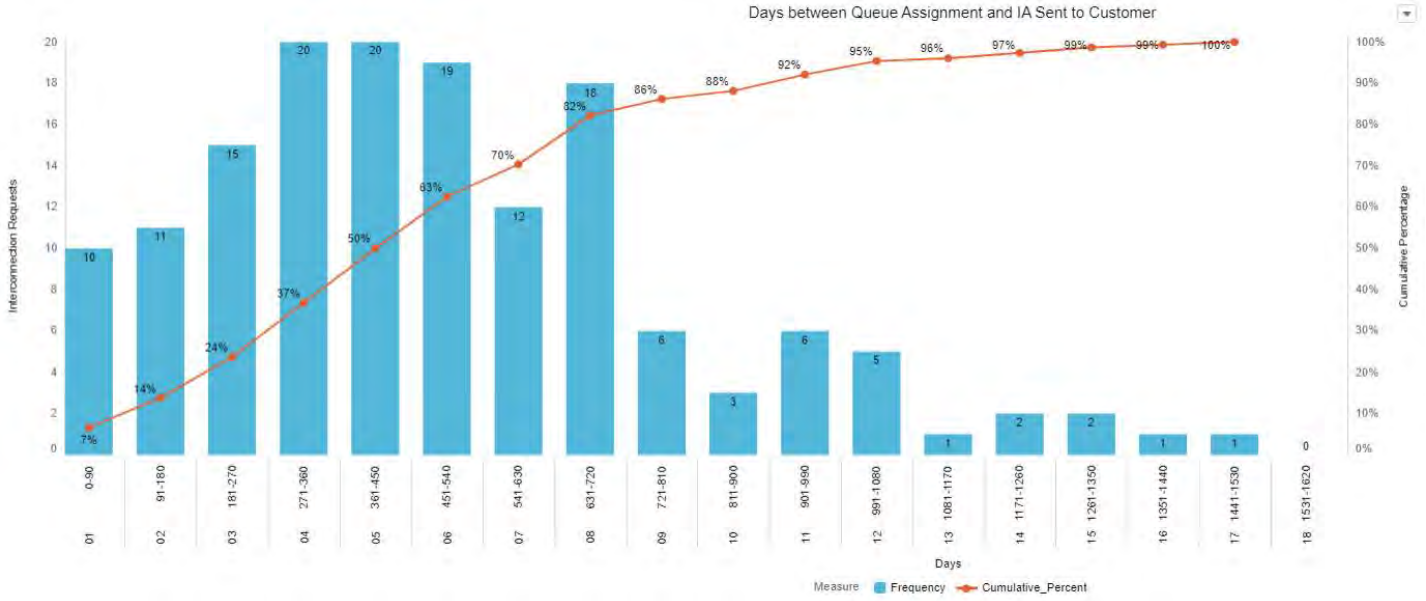
(D) Development and execution of Interconnection Agreement & payment of charges

(E) Construction of Facilities & completion of Operational Tests to enable operation of generating facility

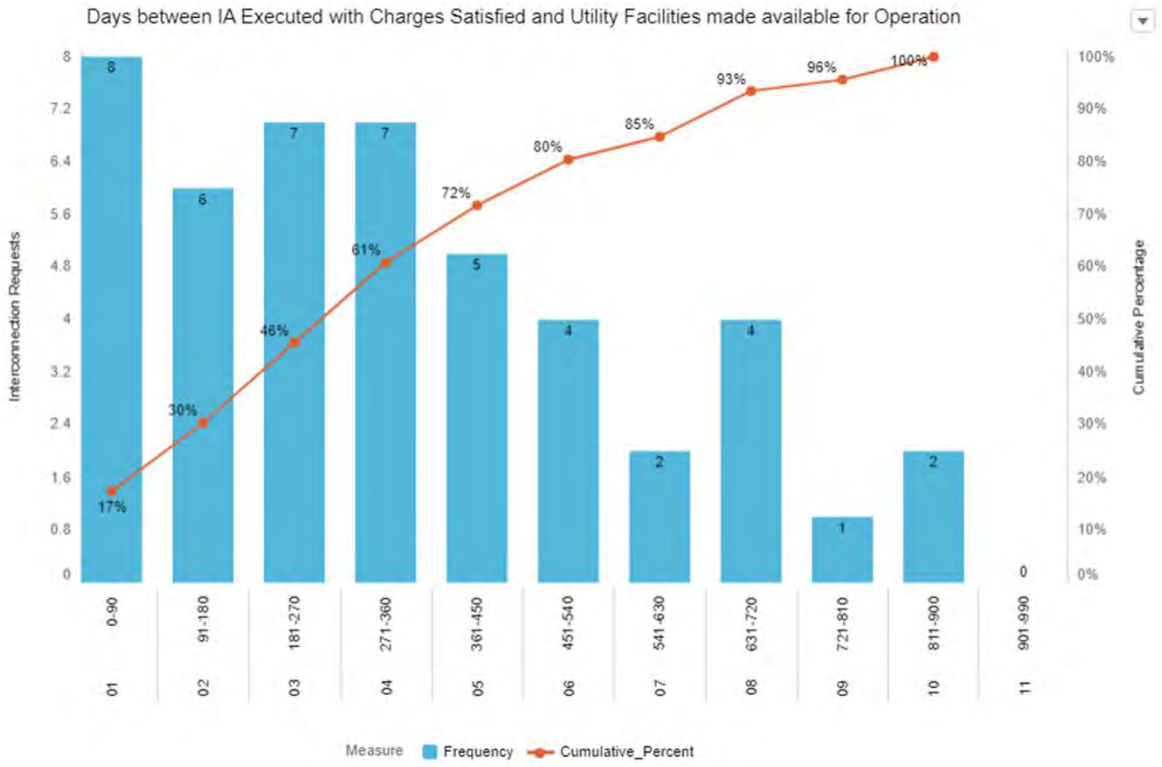
*Time frames assume that the Interconnection Request is first in the queue on a substation transformer and not dependent upon the completion of an earlier-queued request.

Approximate Time Frames*	
TIME FRAME FROM INTERCONNECTION REQUEST TO EXECUTION OF AGREEMENT	10 – 16 MONTHS
CONSTRUCTION TIME FRAMES DEPENDING ON REQUIREMENTS DETERMINED BY THE STUDIES.	12 – 48 MONTHS
TOTAL TIME FROM REQUEST TO COMPLETION OF CONSTRUCTION	22 – 64 MONTHS

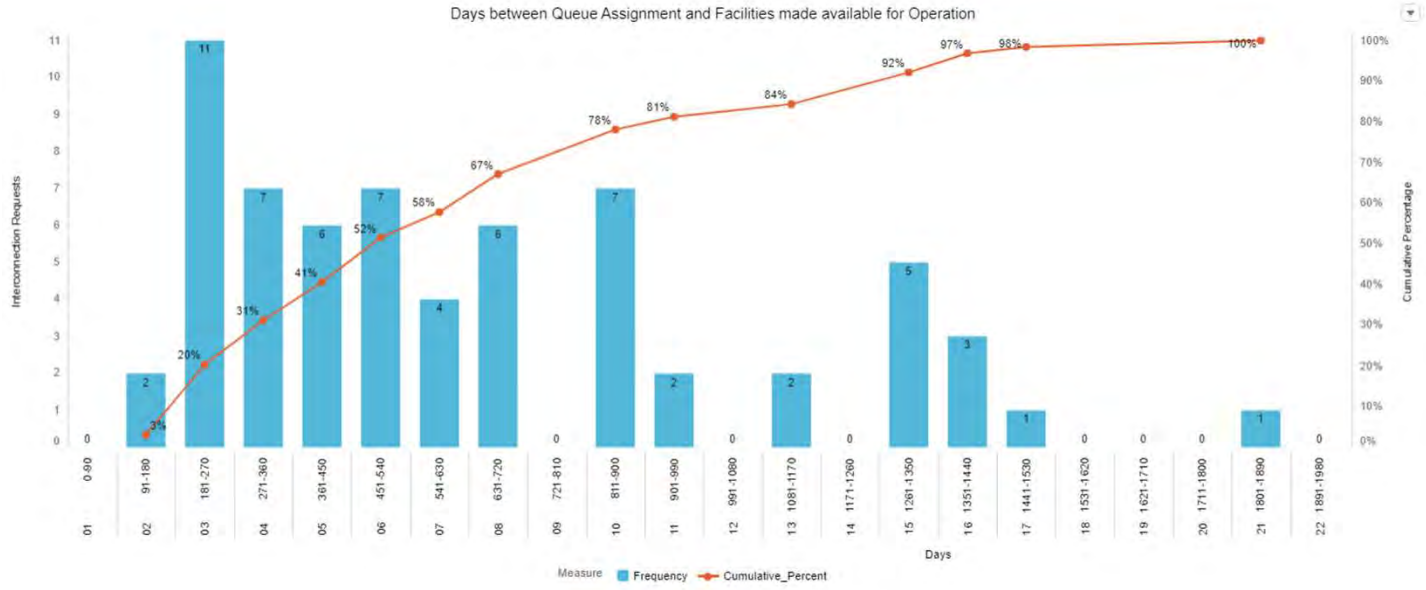
Dominion Energy Virginia Queue Performance
Data as of July 28, 2023



Dominion Energy Virginia Queue Performance
Data as of July 28, 2023



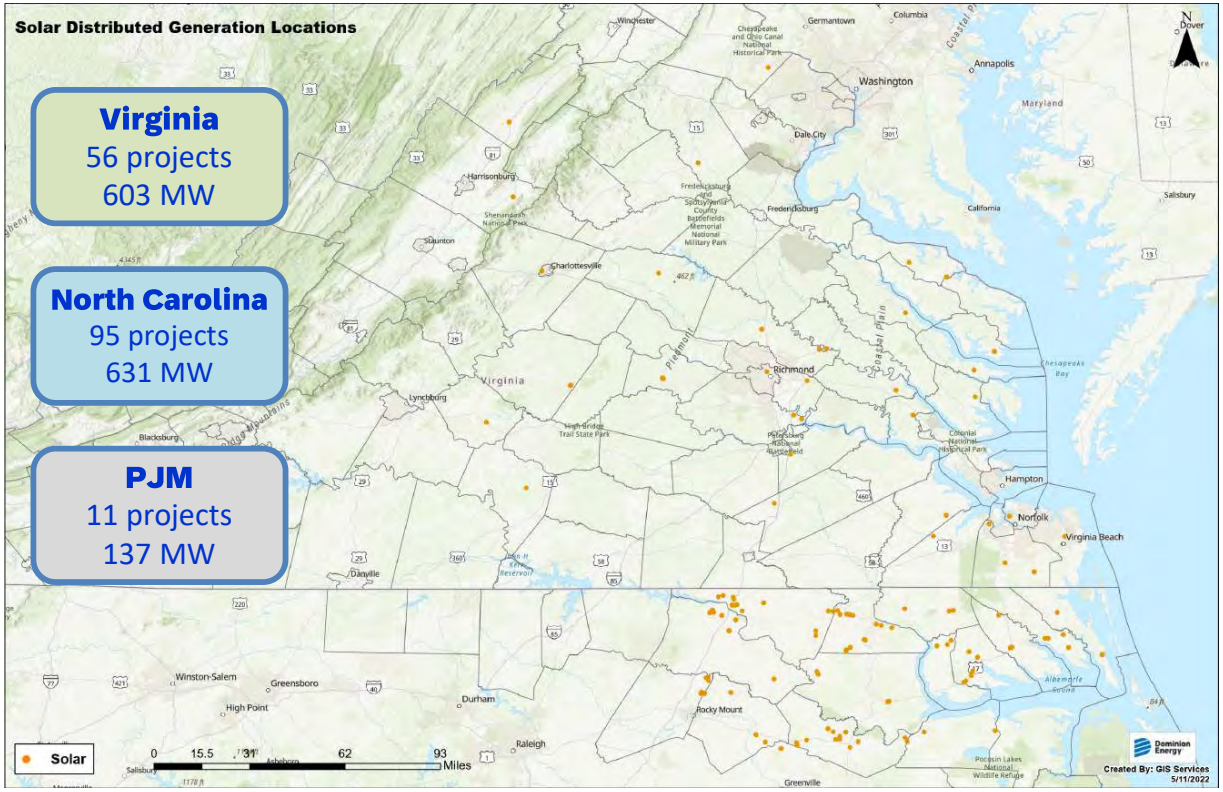
Dominion Energy Virginia Queue Performance
Data as of July 28, 2023



Dominion Energy Virginia
Queue Status Report Summary
Data as of July 28, 2023

	Column Labels									
	Count of Queue No				Sum of Capacity (MW)				Total Count of Queue No	Total Sum of Capacity (MW)
Row Labels	In Construction	Project A	Project B	Subordinate	In Construction	Project A	Project B	Subordinate		
Battery	11	18	13	21	38	296	164	216	63	714
Diesel		8				21			8	21
Nat. Gas	1	3			22	21			4	43
Other		2				4			2	4
Solar	87	148	118	344	681	946	664	1,629	697	3,920
Grand Total	**99**	**179**	**131**	**365**	**741**	**1,287**	**828**	**1,845**	**774**	**4,702**

Distribution Voltage Solar Interconnections



Interconnection Request Considerations

- Hosting Capacity Map
  - Geographic representation of electric infrastructure interconnection capacity
  - Considers existing capacity in operation; does not include interconnection requests not yet connected
- Dominion Energy Virginia Queue Status Report
  - Interconnection Requests and associated status
  - Sortable by Substation and Circuit
- DER Interconnection Parameters Manual
  - Technical background and guidance concerning the interconnection of DER to the DEV distribution grid
  - For information purposes only
- Pre-application Inquiries
  - Obtain high-level electric infrastructure and queue status information for a site prior to submitting an Interconnection Request
  - Information can be helpful in estimating the viability of a site for a particular size project
- Confirm design of a project prior to submitting an Interconnection Request
  - Reduce potential for changes in design once a study has started
  - Some changes may require withdrawal of the existing request and submission of a new request
- Reply in a timely manner to data inquiries from the Utility regarding the Interconnection Request

For more information, please visit

DominionEnergy.com

Key Words: Parallel Generation

Questions?

Chapter 314: Regulations Governing Interconnection of Small Electrical Generators (Virginia) effective 10/15/2020

Timeline from Interconnection Request to Small Generator Interconnection Agreement (SGIA)

The timeline below shows the actions required of the Interconnection Customer (IC) and the Utility to proceed from an initial Interconnection Request to an executed Interconnection Agreement. The timeline references relevant sections from the Procedures, except as noted. Highlighted actions indicate those within the control of the Interconnection Customer which may allow the Interconnection Customer to expedite the process by providing prompt responses. The timeline assumes a project size greater than 2 MW that goes through each Study phase to the execution of an Interconnection Agreement (Level 3 Interconnection).

Note: Time frames are extended if Affected Systems are involved. Time frames are also extended if modifications occur to the Utility or Interconnection Customer facilities or requirements. Also, per 20VAC5-314-10A, the utility shall make reasonable efforts to meet all time frames provided in these regulations unless the utility and the IC agree to a different schedule. If the utility cannot meet a deadline provided herein, it shall notify the IC, explain the reason for the failure to meet the deadline, and provide an estimated time by which it will complete the applicable interconnection procedure in the process.

Section	Action	Business Days to Complete Action	Total Business Days
20VAC5-314-50 A.	The Interconnection Customer shall submit a completed Levels 2 and 3 Interconnection Request Form (Schedule 6…) to the utility, with the processing fee specified in the Interconnection Request Form.	0	0
20VAC5-314-170, Schedule 6, Section 6.	Site control documentation must be submitted with the Interconnection Request Form. (…)Site control may be demonstrated through: 1. Ownership of, a leasehold interest in, or a right to develop a site for the purpose of constructing the small generating facility; 2. An option to purchase or acquire a leasehold site for such purpose; 3. An exclusivity or other business relationship between the interconnection customer and the entity having the right to sell, lease, or grant the IC the right to possess or occupy a site for such purpose; 4. An existing permanent service metered account with the utility at the site and in the name of the IC.	0	0
20VAC5-314-50 A.	The Utility interconnection customer shall be notified of receipt by the utility within three business days of receiving the interconnection request…	3	3
20VAC5-314-50 A.	The Utility shall notify the Interconnection Customer within ten Business Days of the receipt of the Interconnection Request Form as to whether the Interconnection Request Form is complete or incomplete. If the Interconnection Request is incomplete, the Utility shall so notify the IC, including a written list detailing all information that must be provided to complete the Interconnection Request Form.	10	10
20VAC5-314-50 A.	The Interconnection Customer will have ten Business Days after receipt of the notice of incomplete information to submit the listed information or to request an extension of time to provide such information. If the IC does not provide the listed information or a request for an extension of time within the deadline, the Interconnection Request will be deemed withdrawn.	10	20
20VAC5-314-50 C.	The utility shall prioritize interdependent projects pursuant to Section 20VAC5-314-38.	0	20
20VAC5-314-70 B.	A scoping meeting will be held within ten Business Days after the Interconnection Request Form is deemed complete, or as otherwise mutually agreed to in writing by the Parties. The Utility and the Interconnection Customer will bring to the meeting personnel, including system engineers and other resources as may be reasonably required to accomplish the purpose of the meeting. The purpose of the scoping meeting is to discuss the interconnection request and the utility's preliminary interdependency determination. The parties shall discuss the studies and the cost responsibilities for the studies. The scoping meeting may be omitted by mutual agreement.	10	30
20VAC5-314-70 A and C.1	If the Parties agree that a Feasibility Study should be performed, the Utility shall provide the IC with a feasibility study agreement… no later than ten business days after the scoping meeting. If the Parties agree to combine any of the studies, the Utility shall provide the IC with a written agreement for a combined study that shall, at a minimum, include milestones for completion.	10	40
20VAC5-314-70 A and C.2	To maintain its position in the utility's interconnection queue, the IC must execute the feasibility study agreement or agreement to combine studies, as applicable, and return it to the utility along with the deposit specified in Schedule 6 of Section 20VAC5-314-170 within 15 business days after receipt of the agreement…	15	55
20VAC5-314-70 C.10	A feasibility study report shall be prepared and transmitted to the IC within 30 business days of the utility's receipt of the complete and executed feasibility study agreement and required deposit.	30	85
20VAC5-314-70 D.1	No later than ten business days after the parties agree that a system impact study should be performed, the utility shall provide the IC a system impact study agreement including an outline of the scope of the system impact study and an estimate of the cost to perform the study.	10	95

20VAC5-314-70 D.2	To maintain its position in the utility's interconnection queue, the IC must execute the system impact study agreement and return it to the utility along with the deposit specified in Schedule 6 of Section 20VAC5-314-170, if applicable, for the system impact study within 15 business days after receipt of the agreement.	15	110
20VAC5-314-70 D.7 and D.9	Affected systems may participate in the preparation of a system impact study… All affected systems shall be afforded an opportunity to review and comment upon a system impact study that covers potential adverse system impacts on their electric systems, and the utility has 20 additional business days to complete a system impact study requiring review by affected systems. A system impact study, if required, shall be completed and the results transmitted to the IC within 45 business days after an agreement is signed by the parties, or in accordance with the utility's queuing procedures.	45 days (65 days if an Affected System is involved)	155 days (175 days if an Affected System is involved)
20VAC5-314-70 D.10	If the system impact study shows that facility modifications are needed to accommodate the SGR, then within ten business days following transmittal of the system impact study report, the utility shall send the IC a facilities study agreement…	10	165 days (185 days if an Affected System is involved)
20VAC5-314-70 E.2	To maintain its position in the utility's interconnection queue, the IC must execute the facilities study agreement and return it to the utility along with the deposit specified in Schedule 6 of Section 20VAC5-314-170, if applicable, for the facilities study within 30 business days after receipt of the agreement, unless an extension has been agreed to with the utility.	30	195 days (215 days if an Affected System is involved)
20VAC5-314-70 A and E.7	In cases where system upgrades are required, the utility shall transmit the facilities study report within 45 business days after receipt of the completed Facilities Study Agreement. In cases where no system upgrades are necessary, and the required facilities are limited to customer's interconnection facilities and attachment facilities only, the utility shall transmit the facilities study report within 30 business days after receipt of the completed Facilities Study Agreement. If the Parties mutually agreed to combine studies via the execution of an agreement, the utility shall transmit the combined study report within the aggregate time frames of the individual studies being combined after receipt of the completed Combined Study Agreement (9 months for a standard combined study; 10 months if an Affected System is participating).	30 to 45	225 to 240 days (245 to 260 days if an Affected System is involved)
20VAC5-314-70 F.1, F.2, and F.3	A construction planning meeting will be requested in writing by the Interconnection Customer within 15 business days of receipt of the final study report and scheduled within 15 business days of the Interconnection Customer request, or as otherwise mutually agreed to in writing by the Parties. The purpose of the construction planning meeting is to identify the tasks for each Party and determine the milestones for the construction of the upgrades and attachment facilities to incorporate into the SGIA.	30	255 to 270 days (275 days to 290 days if an Affected System is involved)
20VAC5-314-70 G	Within ten business days after the construction planning meeting, the utility shall provide the interconnection customer an executable SGIA (Schedule 10…).	10	265 to 280 days (285 days to 300 days if an Affected System is involved)
20VAC5-314-50 F	After receiving the SGIA from the utility, the IC shall have 30 business days to sign and return the SGIA, along with the prepayment or financial security of estimated upgrade and attachment facilities costs	30	295 to 310 days (315 to 330 days if an Affected System is involved)

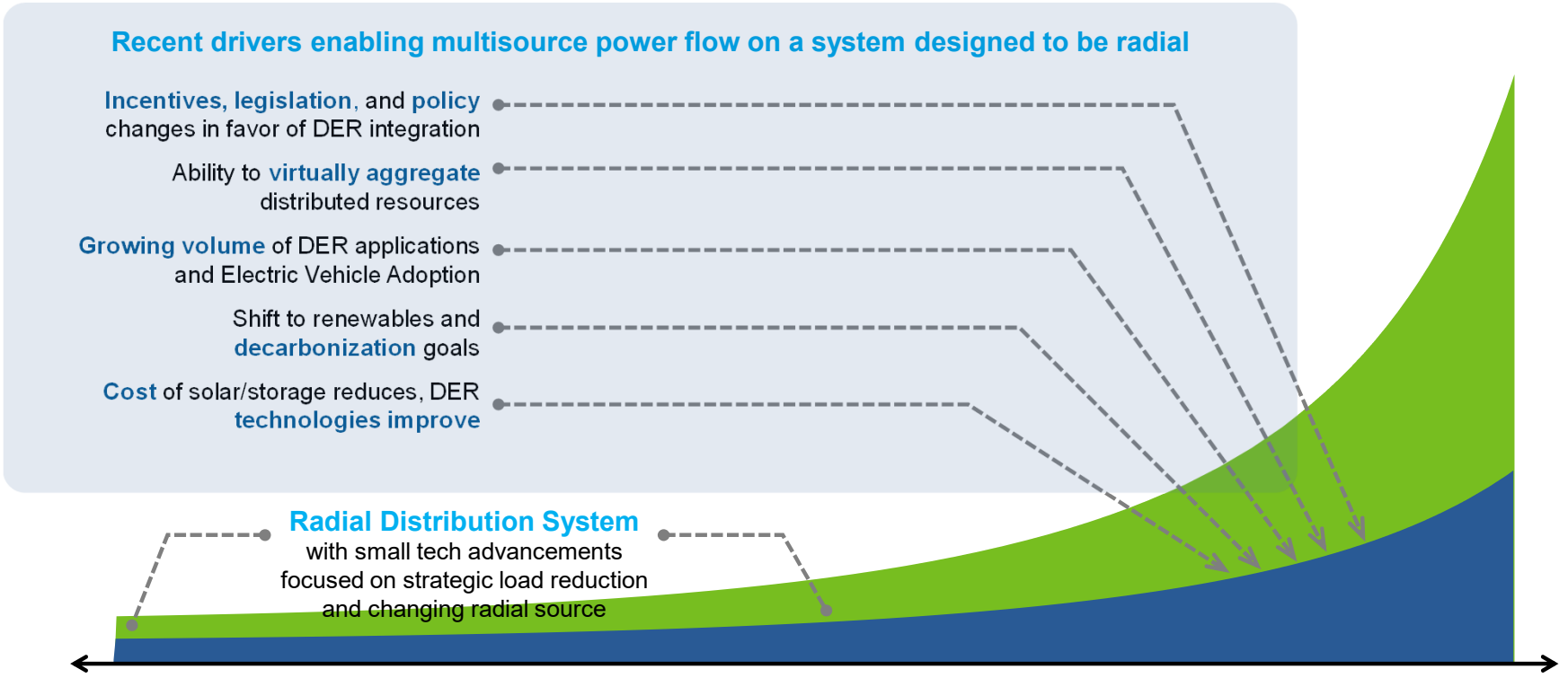
DER/DERMS Program Updates

September 27, 2023

Agenda

1. Key Outcomes: Interconnection Procedures (TIIR, SIP, Pro-forma)
2. Key topics from VA

Distribution's Rate of Change



KEY OUTCOMES: STANDARDIZED INTERCONNECTION PROCEDURES (TIIR, SIP, PRO-FORMA)

Standardizing Interconnection Procedures

Technical Interconnection and Interoperability Requirements (TIIR): Comprehensive set of enterprise-wide technical requirements to connect DERs and align to industry standards (IEEE-1547-2018).

Standardized Interconnection Process (SIP): Standardized process that accounts for state differentiation while establishing consistent tracks to process applications with similar complexities/sizes.

Interconnection Services Agreement Pro-Forma: Standard pro-forma agreement approach with supplementary state exhibits.

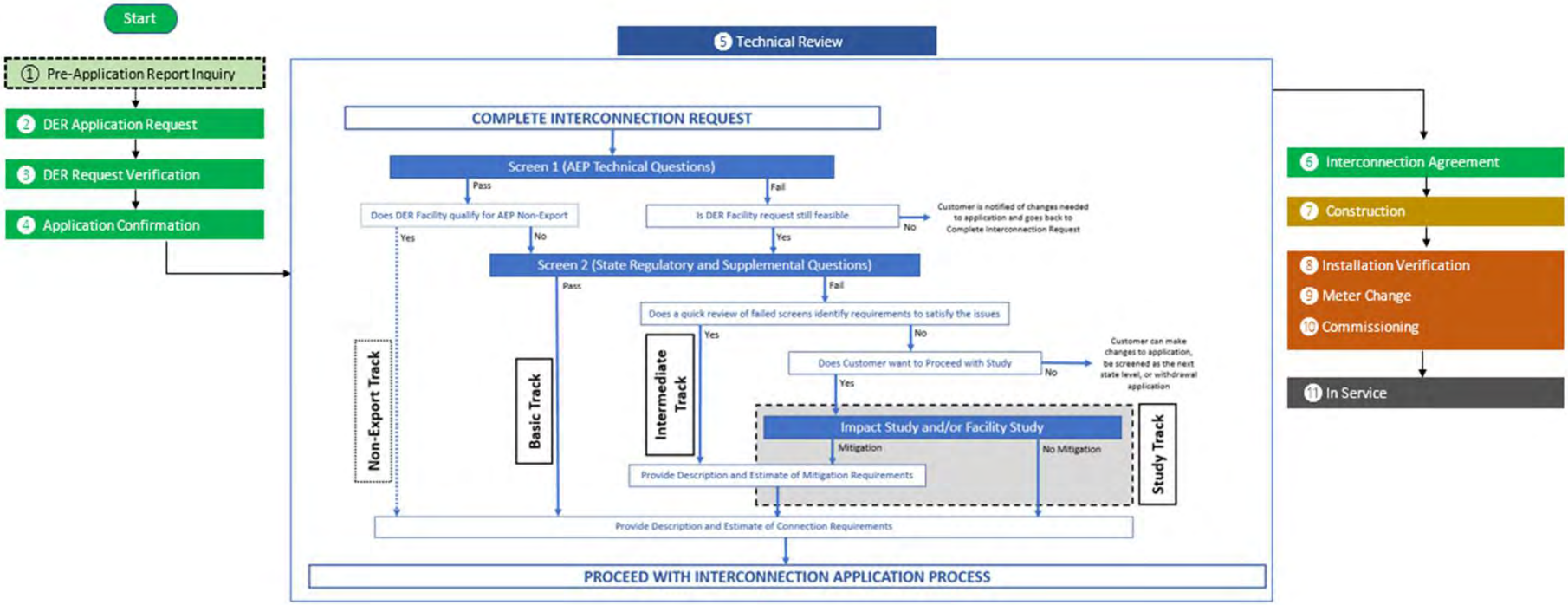
TIIR (Tech Requirements) Key Points

- Based on industry standards and best practices
- Approximately 50/50 split between AEP requirements and requirements derived from IEEE 1547-2018
- Jurisdictions to implement the AEP requirements at the effective date (early August 2023)
- The TIIR will show Exceptions for any jurisdictions that have a regulatory hurdle to clear before implementing the 1547-2018 standards (exceptions apply only to those requirements)
- Websites will be updated to support issuing and communicating the new requirements.

SIP(Process) Key Points

- We are in the process of aligning to an 11-step process with multiple tracks to differentiate size/complexity of DERs.
- State requirements will be accounted for in the process (screening questions, leveling, fees, durations).
- Tools will need to be developed and refreshed to standardize the process.
- Dashboards, reporting, durations, and visibility into the process will improve as we standardize.

SIP(Process) 11-Step Diagram



ISA(Agreement) Pro Forma Key Points

- Analyzed the current ISAs in use in each state to determine best language and terms for AEP to adopt.
- Developing a consistent standard Pro Forma agreement main body supported by several standard Exhibits which will accommodate the needs of individual states.
- Standardizing the agreements will help to identify and access project specific information and reduce the effort to adjust to new standards, technologies, and state changes.

Working Group 1, Meeting 3: Presentation Materials

Working Group 1, Meeting 3 (October 25, 2023): *Construction timelines and cost allocation*

- GPI guidance/overview slides **(Volume 2, Page 105–Volume 2, Page 120)**
- *How Should Exporting DERs Pay for Grid Services? One Idea to Consider*—participant presentation **(Volume 2, Page 121–Volume 2, Page 126)**
- *New Mexico Cost Allocation Options Sub-Group Report-Out*—participant presentation **(Volume 2, Page 127–Volume 2, Page 135)**

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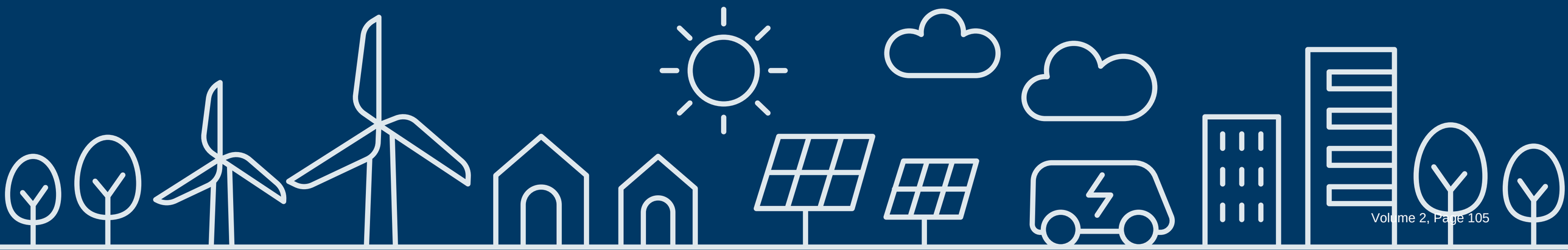
Virginia DER Interconnection Working Groups

Working Group 1, Meeting 3

October 25, 2023

-Virtual meeting-



Agenda

8:30am	**Welcome & introductions, process update, and agenda review**
8:40am	**Discussion: Construction timeline issues and potential solutions**
9:20am	**Discussion: Cost allocation issue identification** Identifying different parties' biggest cost allocation issues
10:00am	**Break**
10:30am	**Discussion: Interconnection cost allocation strategies and approaches** What cost allocation strategies are parties most interested in exploring?
12:00pm	**Lunch Break**
1:00pm	**Discussion: Potential solutions to cost allocation issues in Virginia** Which cost allocation strategies of interest could feasibly address identified issues, and how?
2:25pm	**Wrap up and next steps**
2:30pm	**Adjourn**

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Welcome!

Please share your name and organization in the chat.

Add your organization to your name:

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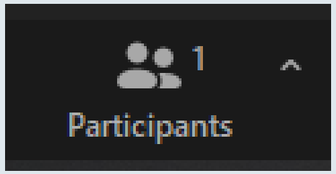

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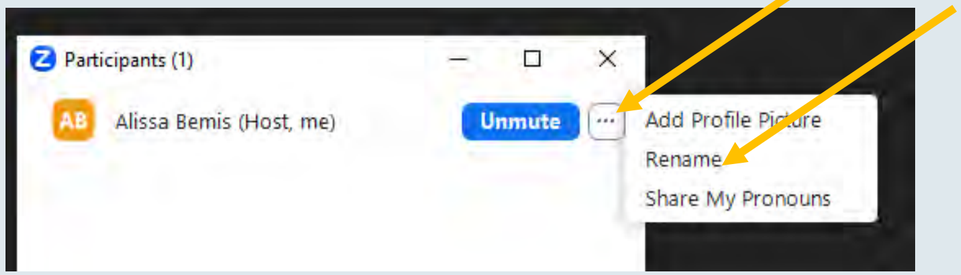

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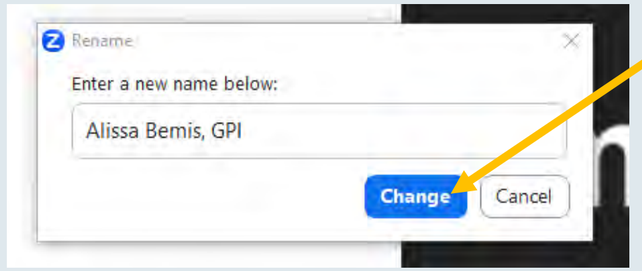

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Zoom 101

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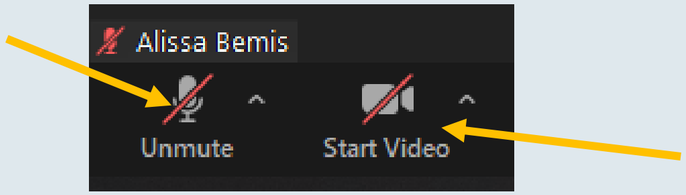

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Raise your hand

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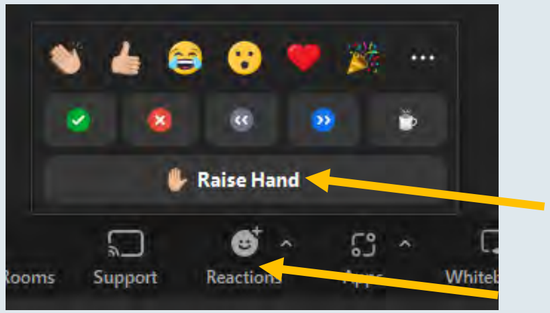

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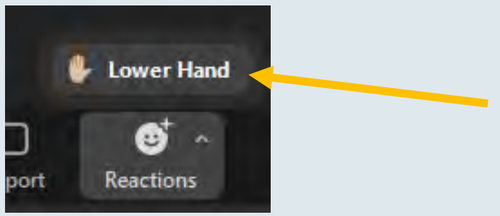

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Meeting Goals

1. Understand the **factors that contribute to construction timeline delays** and which parties have the ability to address those factors.

2. Identify what are the **biggest cost allocation issues** according to different parties.

3. Discuss **interconnection cost allocation strategies**—including those practiced in other jurisdictions—and identify which of those strategies participants think would **best address cost allocation issues in Virginia**.

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Ground Rules

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2. **Respect the time.** Our time together is limited and valuable, so please be mindful of the time and of others' opportunity to participate.
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Reminder: Shared Resource Library, hosted via Airtable

VA DER Interconnection Working G... | Use this data

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	Name	Document	Working Group(s)	Additional Notes
RESOURCE TYPE: Meeting Materials	Count 4			
1	Meeting 1, Working Groups 1&2		Both Working Groups	
2	Meeting 2, Working Group 2		Working Group 2	
3	Meeting 2, Working Group 1		Working Group 1	
4	Meeting 3, Working Group 2		Working Group 2	
RESOURCE TYPE: Process Documents	Count 1			
5	DER Interconnection Working Groups Process Summary		Both Working Groups	
RESOURCE TYPE: Resources	Count 4			
6	3/3/2023 Order directing Staff to establish DER interconnection working groups		Both Working Groups	Case No. PUR-2022-00073
7	5/24/2022 Order opening Case No. PUR-2022-00073		Both Working Groups	Case No. PUR-2022-00073
8	9/19/2022 Staff report on DER interconnection issues and questions		Both Working Groups	Case No. PUR-2022-00073
9	1/7/2022 Order directing the Commission to open a separate docket to explor...		Both Working Groups	Case No. PUR-2021-00127

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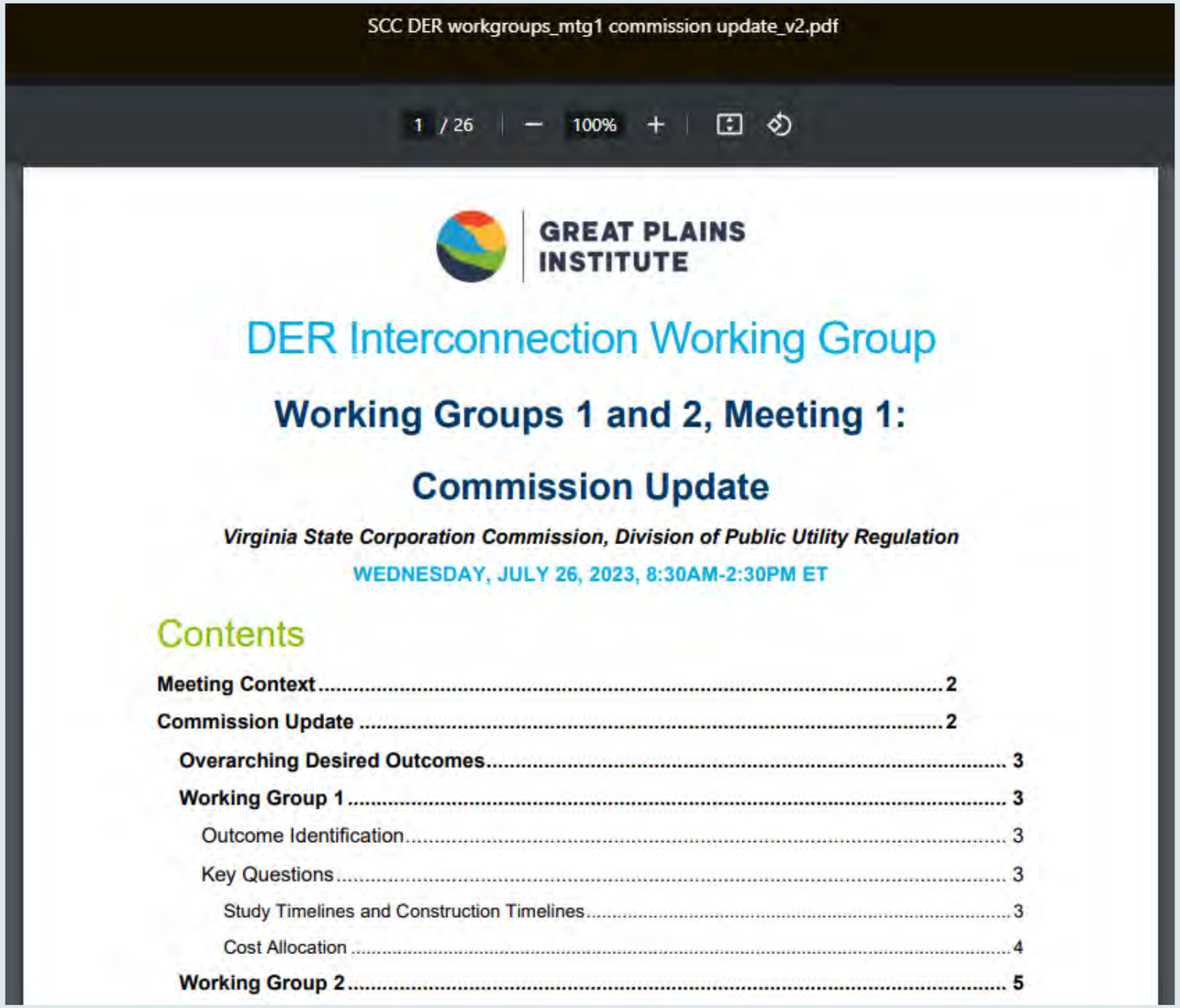
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DER Interconnection Working Group
Working Groups 1 and 2, Meeting 1:
Commission Update
Virginia State Corporation Commission, Division of Public Utility Regulation
WEDNESDAY, JULY 26, 2023, 8:30AM-2:30PM ET
Contents
Meeting Context 2
Commission Update 2
Overarching Desired Outcomes 3
Working Group 1 3
Outcome Identification 3
Key Questions 3
Study Timelines and Construction Timelines 3
Cost Allocation 4
Working Group 2 5

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Discussion:
Construction Timelines

- What factors are contributing to DER construction delays?
- What actions could parties (the Commission, utilities, developers, others?) take to reduce those delays?
- Are there approaches from other jurisdictions that could be replicated in Virginia?

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Discussion: Cost allocation issue identification

What are the biggest cost allocation issues that parties would like to see improved through this process?

- Developers?
- Utilities and co-ops?
- Other parties?

-Break-

Please return at 10:35am.

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Discussion:

Interconnection Cost Allocation Strategies & Approaches

What strategies and/or actions related to cost allocation are you most interested in exploring? These may include…

- Approaches practiced in other jurisdictions
- Existing practices in Virginia
- Alternative approaches that may not currently be in practice

-Lunch-

Please return at 1:15pm.

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Discussion:

Exploring Potential Solutions to Cost Allocation Issues in Virginia

- Of the top solutions that participants identified, which could address participants' top issues, and how?
- Which preferred solutions would be feasible in Virginia? If any solutions would not be feasible, what changes might be needed to make them feasible?
- What actions are required from which parties to make a solution viable? Are any interim steps required?

Next Steps

- Upcoming meetings:
  - WG2, Mtg 4 – **Monday, 10/30**
  - Final combined meeting – **Monday, 12/5**

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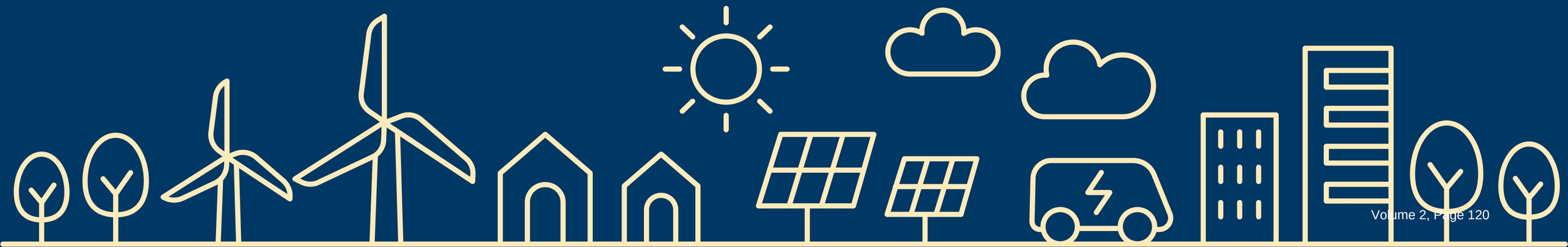

How Should Exporting DERs Pay for Grid Services? One Idea to Consider

Wired Group

Unleashing Latent Value in Distribution Utility Businesses

DER Interconnection Working Group 1, Meeting 3

October 25, 2023

Dennis Stephens, Sr. Technical Consultant, Wired Group

Preview

- Perspectives on grid uses and users, today and tomorrow.
- Proposal for consideration: Charge DER exporters primarily as a customer class for use of the grid over time, rather than up-front for interconnection costs only.
- Pros and cons of proposal to various stakeholders.

Perspectives on Grid Use/Users, Today and Tomorrow

TODAY

- The grid is already in place; DER exporters must pay the cost to tap into it “up-front”.
- DER exporters are responsible for covering incremental construction costs associated with interconnection.
- The grid is designed primarily for getting energy from generators on transmission lines to loads on distribution lines.
- DER interconnection requirements/design and determination of costs to be charged to DER are part of the same process.

TOMORROW

- DER exporters are customers of utility distribution services, just like loads.
- DER customers are responsible for their share of grid costs, including costs to build, upgrade, repair, operate, and maintain.
- The grid is designed primarily to move energy around regardless of where it is generated or where it is needed.
- DER interconnection requirements/design only influences a portion of costs charged to DER (the “up-front” portion). The majority of costs to be charged to DER are determined in rate cases.

Proposal: Charge DER exporters over time for use of the grid, rather than up-front only for interconnection costs

- Rate design: $/peak kW “served” assessed on monthly bill (just like loads).
- Interconnection Costs: Some amount recovered up-front, but majority recovered over time via the $/kW charge (just like line extension policy for new loads). After initial up-front recovery, specific costs are no longer linked to a specific DER.
- Process: Exporting DER are added as a customer class in rate case class cost of service studies (CCOSS). Share of grid costs (build, upgrade, repair, operate, maintain) DER should bear are determined via “cost causation” and “beneficiary pays” processes that are standard components of rate case CCOSS (just like loads).
- Potential Adjustments: Account for “Value of Renewables” when determining the $/kW charge for exporting DER.

Pros and Cons of Proposal to Various Stakeholders

PROS	Developers	Utilities	Load Customers
Interconnection Costs	Virtually eliminates "last man in" issue; drastically reduces up-front cost the developer must finance.	Utilities rate base (and profit from) facilities installed to handle DER capacity.	Ongoing rates paid by exporting DERs help to reduce rates for all other customers.
Interconnection Cost estimates	Greater cost certainty. Less need to apply just to get cost estimate.	Fewer "exploratory" interconnection applications to process.	Reduces interconnection study costs all customers have historically covered in rates.
Storage	Adding storage reduces both initial and ongoing payments to utilities.	Exporting DER more likely to add storage.	Storage "smooths" DER injections (less peak-y) and reduces DER accommodation costs shared.
Interconnection study time	Should be reduced due to fewer exploratory apps.		Potentially lower cost to comply with Virginia RPS
CONS	**Developers**	**Utilities**	**Load Customers**
Interconnection Costs	Up-front interconnection costs largely replaced, but with new ongoing costs.	Must add DER forecasts to T&D capacity planning processes.	Potentially higher cost to comply with Virginia RPS

Volume 2, Page 125

For More Information:

Name	Utility	Regulator/Case	Description
DG Interconnection Demonstration Project (2/14/2017)	Niagara Mohawk d/b/a National Grid	New York DPS 14-M-0101 (Reforming Energy Vision)	This is essentially the "Group" approach to cost allocation, but with no specific DER interconnection applications to study. It is essentially a 'build it and DER will come" strategy. Program has been expanded since the initial application. Does not go quite as far as this Proposal, but is a clear step in that direction.
DER Rate Design and Compensation. November, 2016.	N/A	Report by the National Association of Regulatory Utility Commissioners.	A good overview of policy issues and the drivers of rate design associated with DER proliferation.

Dennis Stephens, Wired Group, dstephens@wiredgroup.net

New Mexico
Cost Allocation Options Sub-Group Report-Out

August 27, 2021

Draft Guiding Principle

The ideal cost allocation solution should promote the interconnection of distributed generation in support of New Mexico's decarbonization goals and the Grid Modernization Roadmap, facilitating efficient utilization of existing available capacity and equitably allocating the costs of necessary upgrades to all beneficiaries

Current Paradigm:

Cost Causer Pays 100%
EDC Paid at Cost

Historical regulatory paradigm which evolved to support an electric system which featured large, centralized generation sending electricity unidirectionally down to load, and which thus understandably allocated costs to the sole beneficiaries of the upgrades: the interconnecting facilities.

Alternative #1:

Cost Sharing 1.0
Retroactive Cost Sharing by Projects
EDC Paid at Cost

The first attempt at addressing the challenges of the first-mover problem: having subsequently-interconnecting facilities share in the costs of the upgrades necessitated by the triggering project.

Alternative #2:

Cost Sharing 2.0
Prospective Cost Sharing by Projects
EDC Paid at Cost

An attempt to deal with the lack of uptake of Retroactive Cost Sharing: identifying a “per kW” cost for system upgrades, and then assessing costs appropriately for all interconnecting facilities based upon their size/share of the upgrade.

Alternative #3:

Multi-Beneficiary Cost Sharing
EDC Able to Rate Base a Portion of Costs on the grounds of Societal Benefits

The latest innovation in cost allocation, which recognizes the fact that upgrading the distribution system to interconnect DG facilities provides additional benefits beyond those projects and which seeks to share costs more broadly and which seeks to incentivize the utilities to undertake the necessary work to do so.

Alternative #4:

Ratebasing Costs to Point of Common Coupling

A concept being increasingly discussed in the face of GHG reduction mandates, resiliency efforts and the need to create a truly bi-directional grid in order to support beneficial electrification of buildings and transport.

Alternative #5:

Integrated Proactive System Planning

Currently in various stages of development/implementation in a variety of states including New York, Massachusetts, New Jersey and others. Recognizes that a fundamentally new approach is required.

Working Group 2, Meeting 2 Presentation Materials

Working Group 2, Meeting 2 (September 19, 2023): Dark fiber/DTT—*issue identification and preliminary identification of potential solutions*

- GPI guidance/overview slides **(Volume 2, Page 136–Volume 2, Page 149)**
- *Why DTT and Point to Point Fiber?*—Dominion **(Volume 2, Page 150–Volume 2, Page 169)**
- *Grid Engineering Practices & Standards Protection with High Adoption of DER*—guest presentation (Pacific Northwest National Laboratory) **(Volume 2, Page 170–Volume 2, Page 179)**
- *Understanding DER Islanding Risks and Mitigation Measures*—participant presentation, IREC **(Volume 2, Page 180–Volume 2, Page 190)**
- *Direct Transfer Trip (DTT)*—participant presentation **(Volume 2, Page 191–Volume 2, Page 204)**

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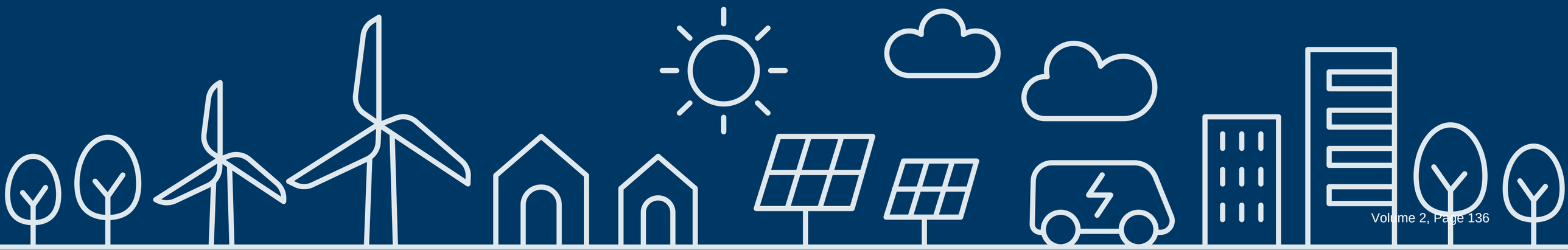
Virginia DER Interconnection Working Groups

Working Group 2, Meeting 2

September 19, 2023

-Virtual meeting-



Agenda

8:30am **Process Introduction and Kickoff**

- Welcome, Introductions, Process Update & Review of Agenda

8:45am **Dominion presentation by Brian Starling on dark fiber, with Q&A**

9:30am **Presentation on technical standards and approaches to system protection with high DER penetration, with Q&A**

- Pacific Northwest National Laboratory (PNNL), Todd Wall
- Interstate Renewable Energy Council (IREC), Shay Banton

10:15am **Break**

10:45am **Discussion: DTT and its alternatives**

12:00pm **Lunch Break**

1:00pm **Discussion: Potential solutions related to dark fiber/DTT**

2:25pm **Wrap up and next steps**

2:30pm **Adjourn**

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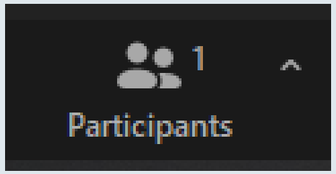

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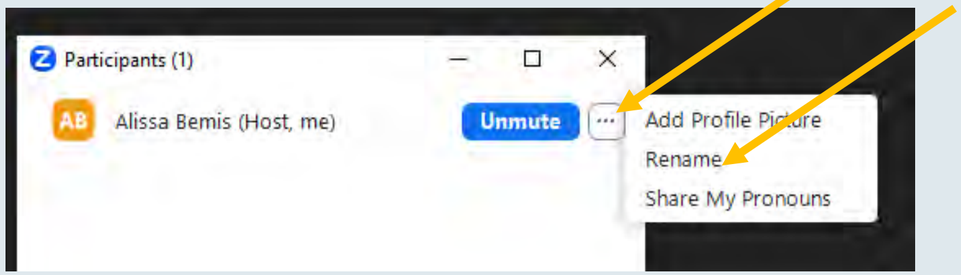

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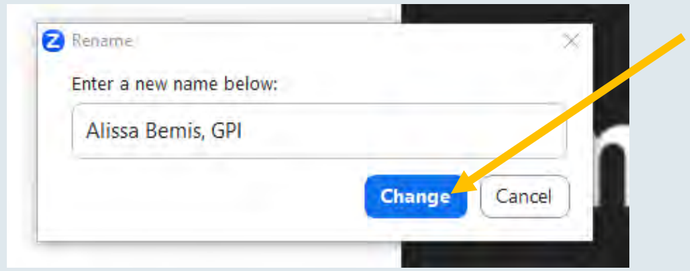

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Zoom 101

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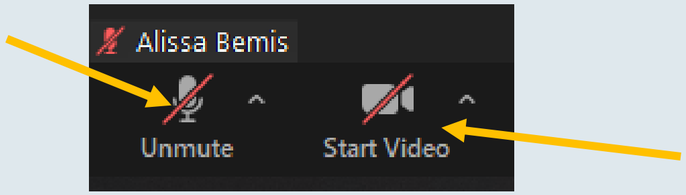

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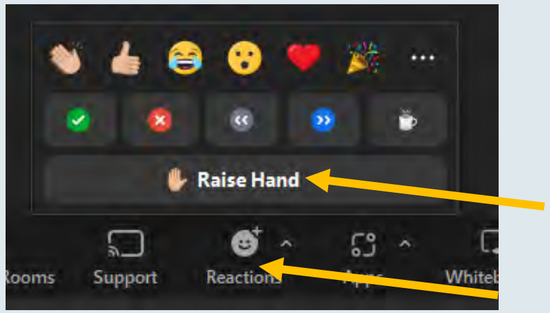

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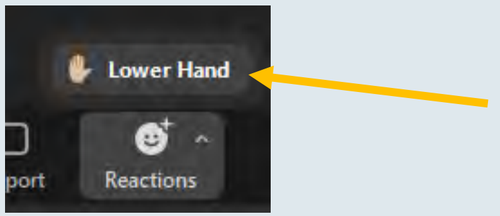

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Meeting Goals

1. **Level-set** on the **technical anti-islanding standards for DER interconnection.**
2. **Explore and discuss** technologies that meet those standards.
3. **Identify potential solutions** that could be considered as an alternative to dark fiber for DTT implementation.

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Presentation and Q&A:

Dominion Energy

Dark Fiber/DTT

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Presentation and Q&A:

Pacific Northwest National Laboratory and IREC

Approaches to System Protection with High DER Penetration

-Break-

Please return at 10:45am.

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Discussion:
DTT and its alternatives

-Lunch-

Please return at 1:00pm.

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Discussion:

Potential solutions related to dark fiber/DTT

Key discussion questions:

- What does DTT offer for meeting reliability standards?
- What do other technologies offer for meeting reliability standards?
- What are the advantages/disadvantages of each?
- **What solutions/recommendations do group members think should be considered with respect to DTT?**
- **Are there any potential approaches that should *not* be considered?**

Next Steps

- WG1, Mtg 2 – September 27
- WG2, Mtg 3 – October 10
- WG1, Mtg 3 – October 25
- WG2, Mtg 4 – October 27

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THANK YOU

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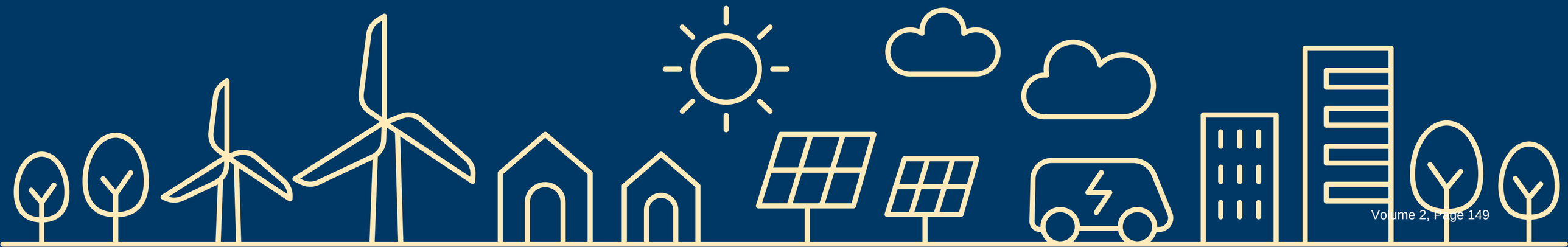


Why DTT and Point to Point Fiber?

(Communication Assisted Protection)

J. Brian Starling

Manager System Protection Engineering

Background on DTT

(AKA Permission to Operate PTO)

- Our primary concern is and will always be the delivery of safe and reliable power to our customers. Safety is one of Dominion Energy's Core Values.

- DTT is part of the protection scheme, not only an anti-islanding scheme; speed and reliability of the protection scheme is paramount.

- Faults which are not properly and promptly cleared result in excessive arc flash hazards, risks to the public, and property damage. For each second there is a 14% increase in arc energy at 34.5kV with 20MW of DER.

- The industry has been using DTT for over 50 years. DTT protection schemes are integral parts of the way we protect Dominion Energy's system.

Why DTT is required ?

(Instead of Solely Using Inverters (IBRs) For Fault Clearing)

- Dominion Energy has no visibility or control over customer's inverter settings and we've seen in the past how something as small as a firmware change can affect how the protective functions operate.

- UL Standards certify the individual inverters meet the IEEE requirements on a bench test. Utilities need the grid to act as a one system which requires proper protection requirements.

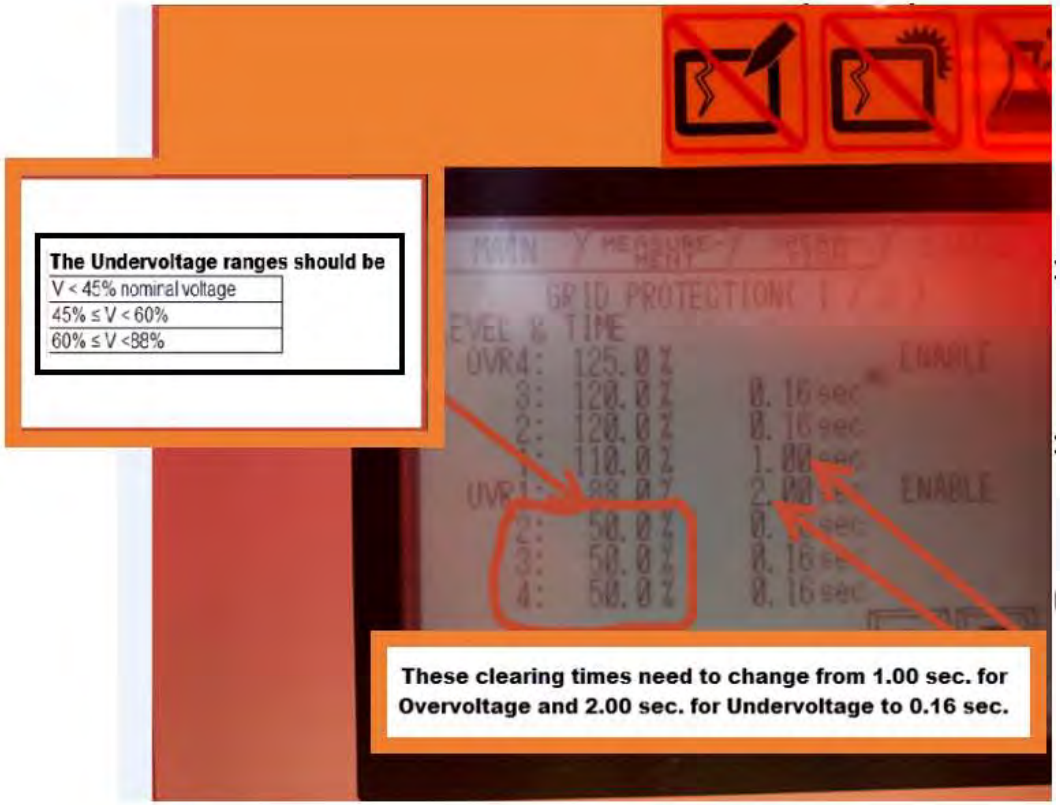
- Dominion Energy has found that for high impedance faults on our 34.5kV system, there are gaps where the system voltage does not dip low enough for inverters to detect the imbalance.

- Industry Testing and Publications have shown that mixtures of synchronous machines and IBRs have compromised the effectiveness of IBR protection response. (EPRI brief 3002022456)

Dominion Energy

Why DTT is required ?

(The Utility is ultimately responsible for Protection of Its System)



Field Operating Experience

- Dominion Energy's existing Infrastructure does not facilitate periodically checking for changes in Inverter Settings.
- Incorrect Trip Times Present a Safety Concern to the general public if the inverter is the only means to isolate a fault.
- Inverter protection is needed as a secondary measure of protection with the primary protection coming from the utility.
- Dominion Energy's Distributed Energy Management System may provide mechanism to ensure settings changes are detected promptly.

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How does protection work?

- 2 most common ways to protect utility grade electric circuits

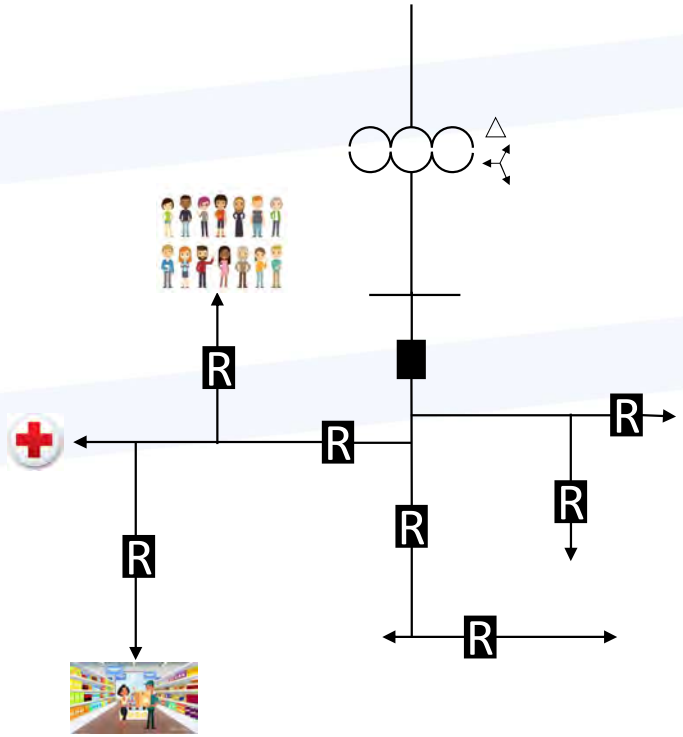
Overcurrent Protection

- Transformers can produce a finite amount of power.
- The power goes down proportionally the further down the circuit the fault occurs.
- Allows the circuit to determine zone of protection

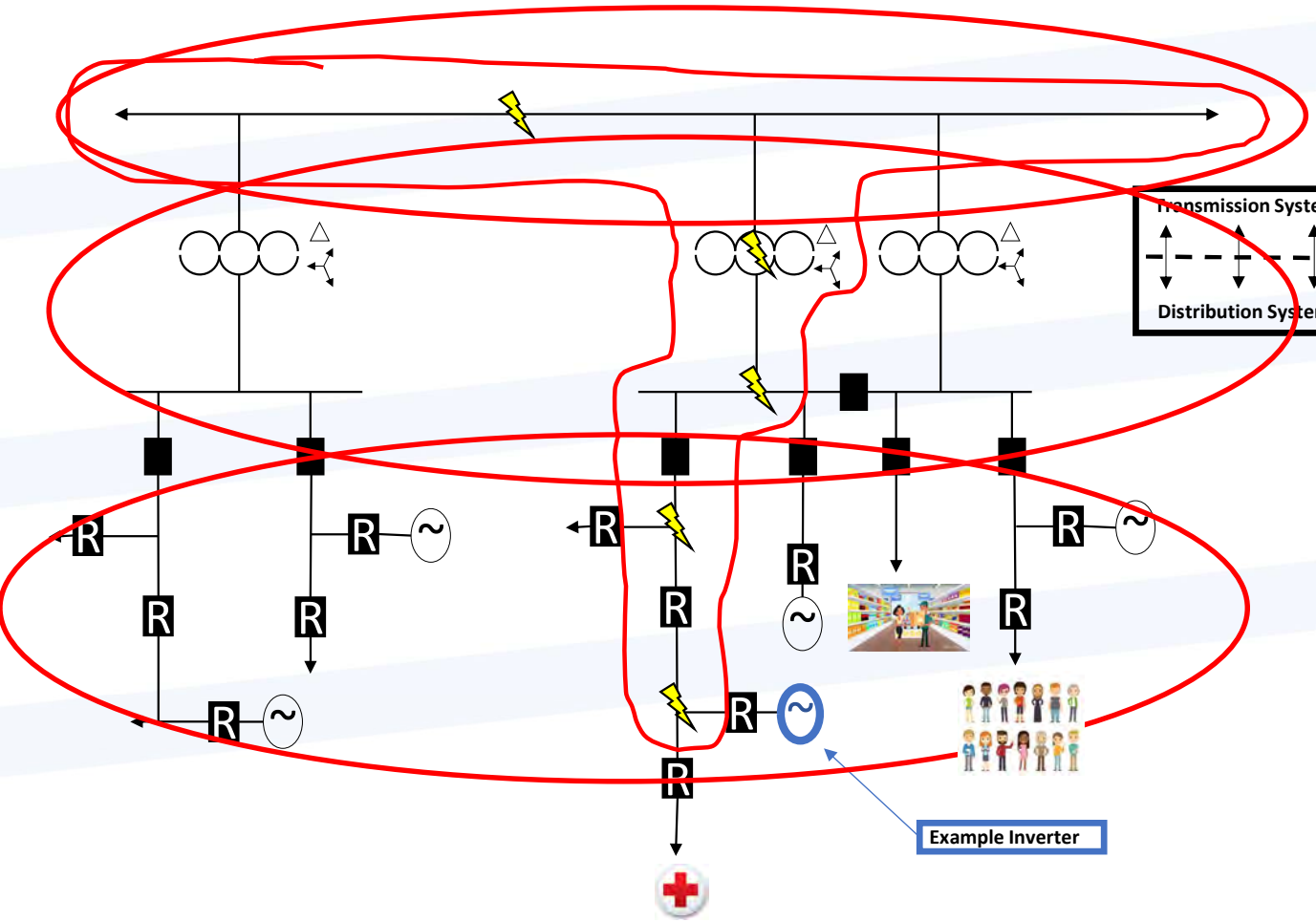
Distance Protection

- Uses a voltage to current ratio to determine a direction and distance the to fault.
- Applied on long circuits requiring more complex protection equipment.
- Used extensively on power transmission applications with communication channels to coordinate tripping.

Both methods require a communicate channel when sources or generation is located at more than one point.



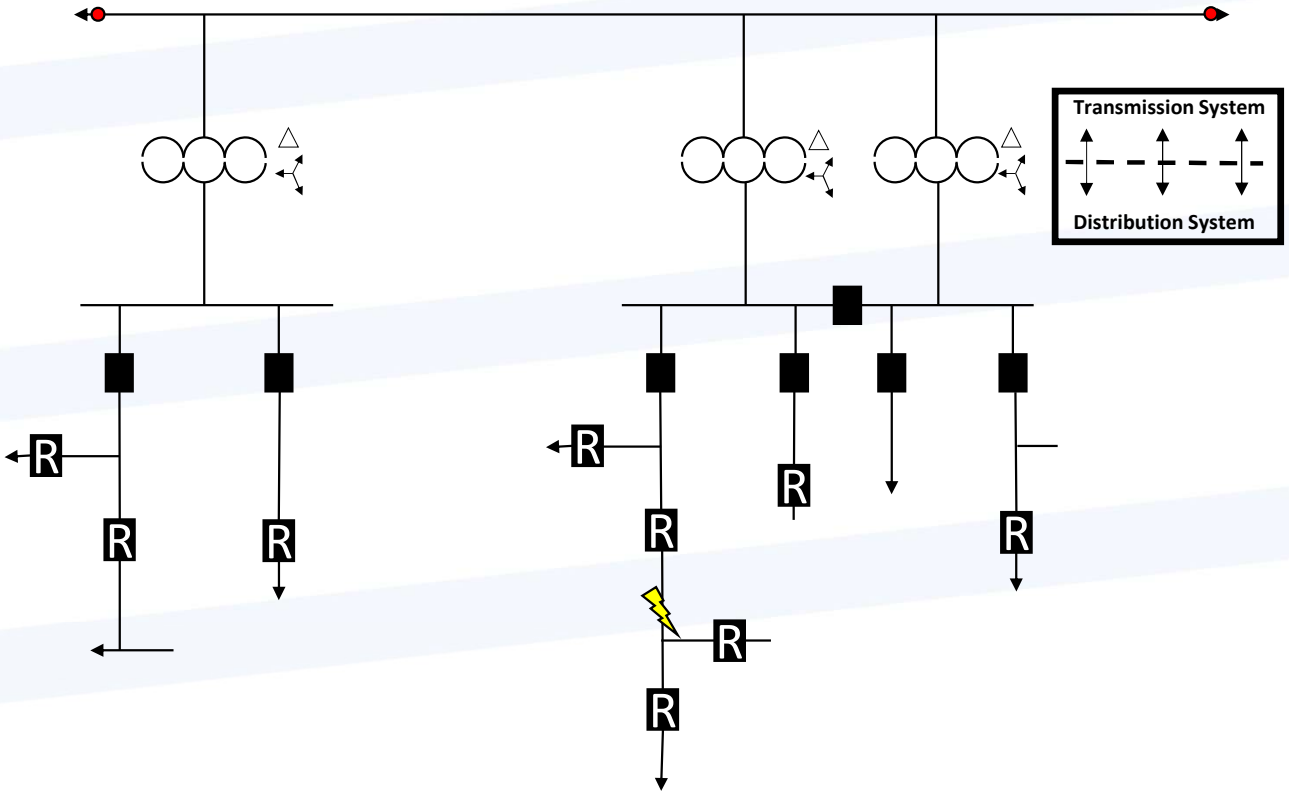
Why Communication Assisted Protection Schemes (DTT)?



- Faults represented by
- **RED** area identifies the zone that the **Example Inverter** must come offline for
- Without communication assisted protection, either too much or not enough is generation tripped offline
- The grid of the future will need the DER to meet system load. Overtripping could result in a loss of the system.

Dominion Energy

Why Communication Assisted Protection Schemes (DTT)?



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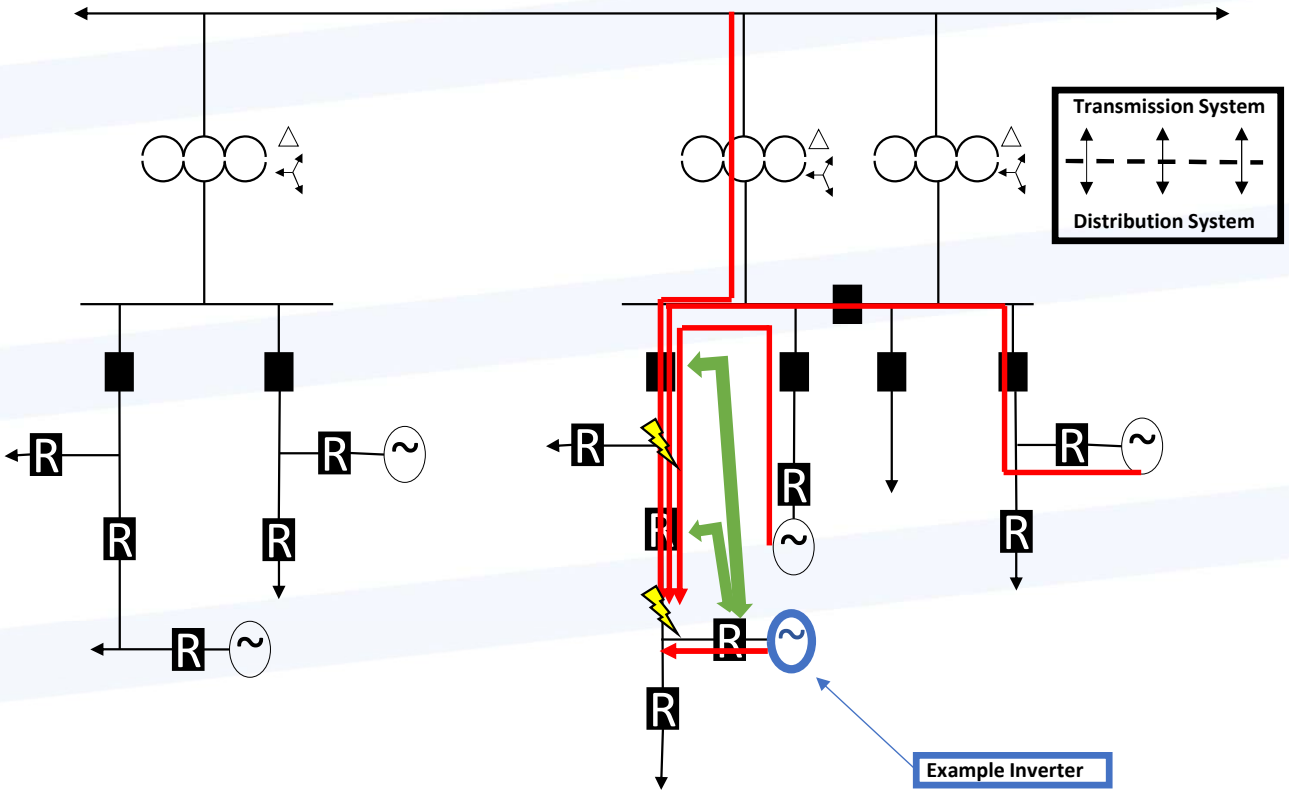
Dominion Energy

Why Communication Assisted Protection Schemes (DTT)?



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- Without communication assisted protection, either too much or not enough is generation tripped offline
- The grid of the future will need the DER to meet system load. Overtripping could result in a loss of the system.

Dominion Energy

Why Communication Assisted Protection Schemes (DTT)?

- Dominion Energy will need the solar generation capacity to ensure increasing load demands are met. As we move more towards an Inverter-Based Resource (IBR) powered grid with limited to no inertia, overtrips will occur without communication assisted protection schemes.
- The Texas Odessa event is a great example of what can happen when the inverters go offline for not detecting faults in the correct zone.
- Propper inverter settings along with a communication signal would prevent these types of grid disturbances
- **Event:** On May 9, 2021 a line to ground fault resulted in a loss of 1100 MW of Solar 200 miles away. ERCOT could have lost the system that day.
- **Event:** On June 4, 2022 a line to ground fault resulted in a loss of 2560 MW of Solar over 300 miles away. ERCOT could have lost the system that day.

Faults on Transmission (66-500kV)

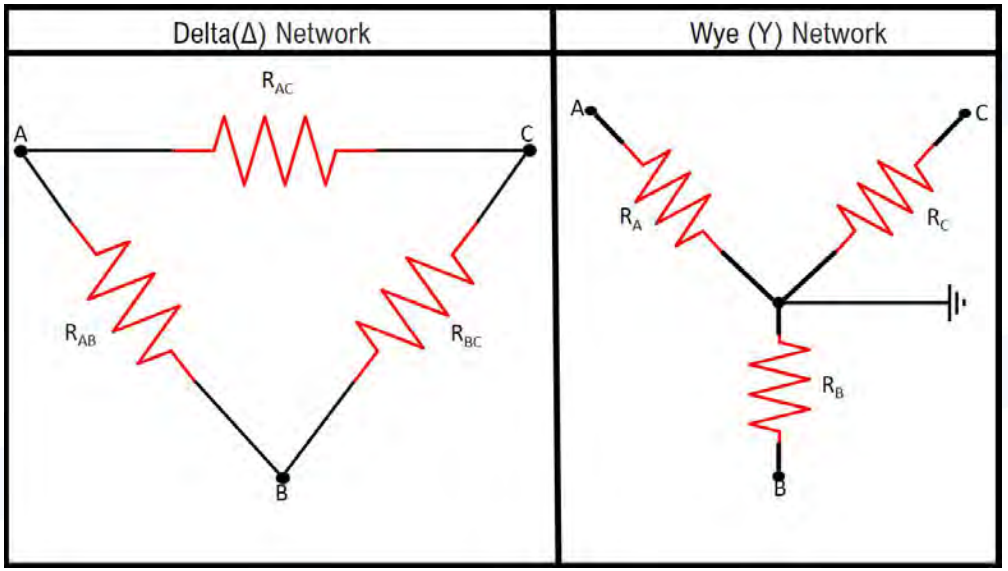
- About 750 Transmission line faults in the past 5 years
- Transmission system is connected to the distribution system by transformers at substations.
- These transformers are connected to grid in a manner the industry refers to as Delta – Wye.

Dominion Energy

Operation of a Delta – Wye Transformer

Transmission System

3 Phase Power



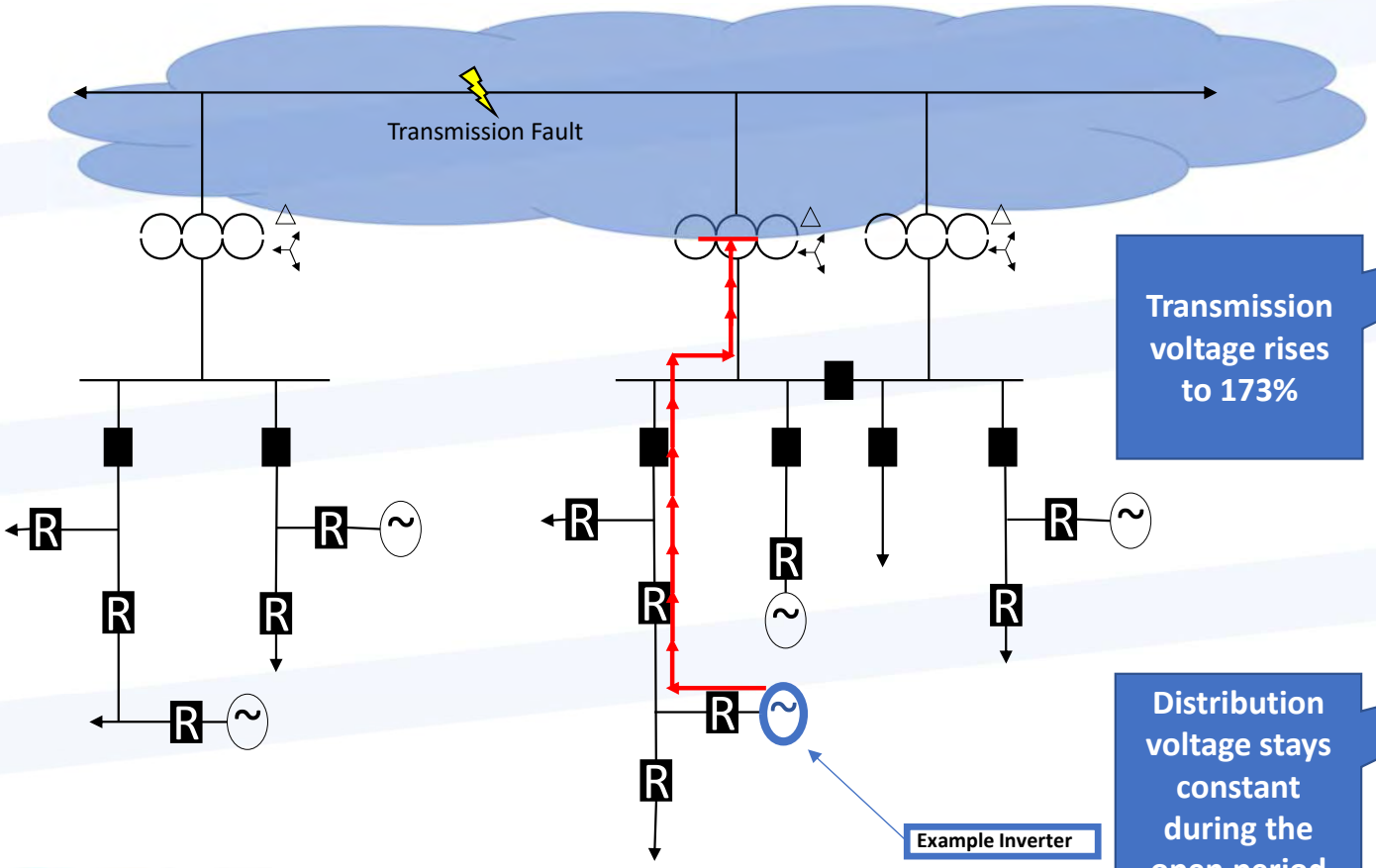
Distribution System

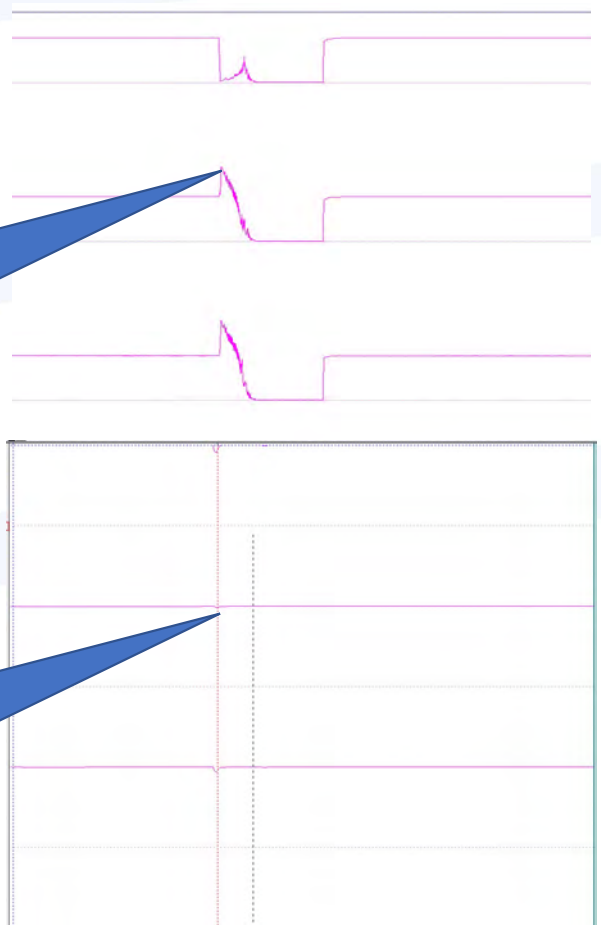
Single Phase Power

Dominion Energy

Why Communication Assisted Protection Schemes (DTT)?

On a Delta-Wye System…Transmission Faults cannot be seen by DERs





Transmission voltage rises to 173%

Distribution voltage stays constant during the open period

Dominion Energy

Why Communication Assisted Protection Schemes (DTT)?

On a Delta-Wye System…Transmission Faults cannot be seen by DERs

- All DERs need to be isolated during fault conditions.
- Without communication assisted tripping (DTT), Transmission Faults are back fed from Distribution System.
- In this Example, the arrestor was damaged and failed as a result of the overvoltage condition. Forced outage was extended another 3.5 hours until load could be switched.

Dominion Energy

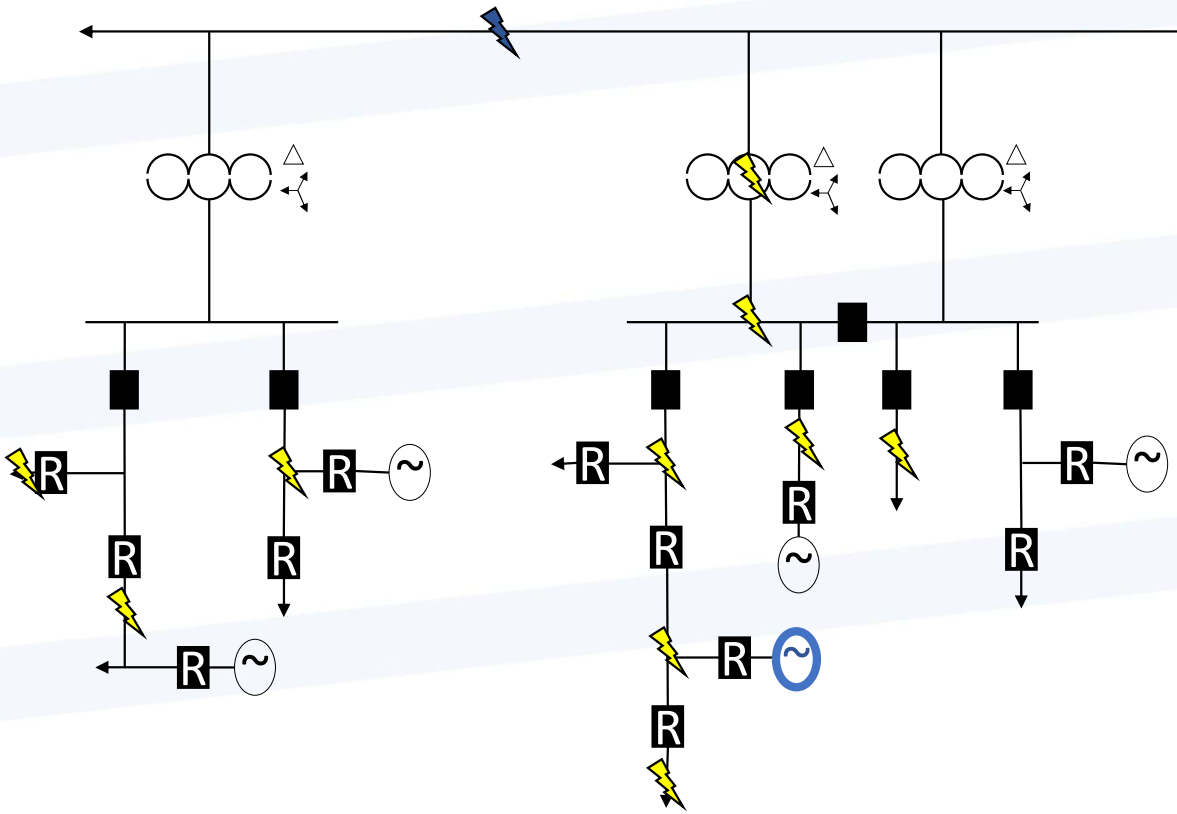
Faults on Distribution Substations (4-46kV)

- About 400 Substation faults in the past 5 years.
- Substation connects the Transmission System to the Distribution System through Transformers and Circuit Breakers.
- Substation Transformers are the most expensive and longest lead time items in the fleet by orders of magnitude.
- Transformers are filled with mineral oil for insulative and cooling effects. This oil is flammable.
- High Speed protection is required to ensure equipment is not destroyed during fault conditions.

Dominion Energy

Why Communication Assisted Protection Schemes (DTT)?

An Example of Distribution Level Faults

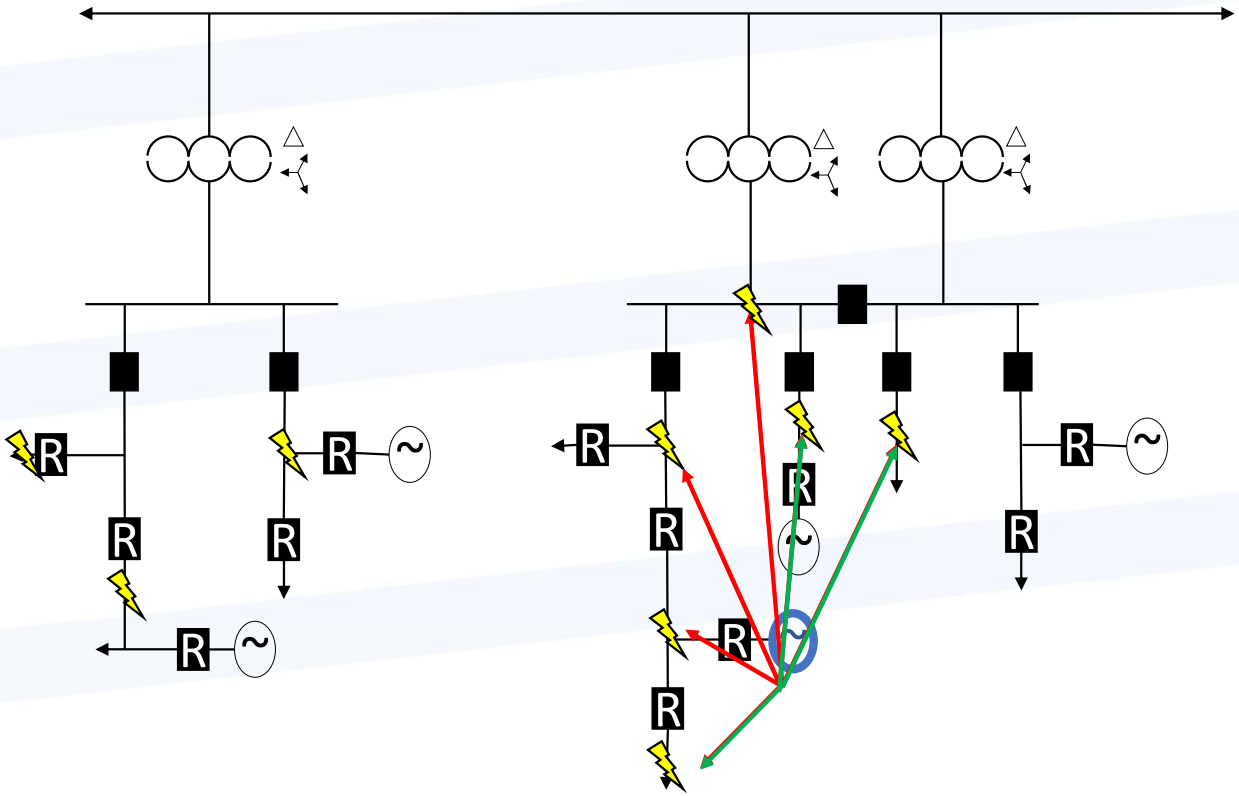


- **Inverters can identify the presence of most faults. However, cannot coordinate or clear correctly without communication mediums.**

Dominion Energy

Why Communication Assisted Protection Schemes (DTT)?

An Example of Distribution Level Faults



- **Inverters can identify the presence of most faults. However, cannot coordinate or clear correctly without communication mediums.**

Dominion Energy

Operational Experience with Communications Mediums

Communication Medium	Obsolescence & Availabilty	Latency	Reliability	Supports Grid of The Future	Cyber Security
Plain Old Telephone Service "POTS"	✗	✓	✗	✗	✗
Point to Point Wireless/Microwave	✓	✓	✗	✗	✓
Power Line Carrier	✓	✗	✗	✗	✓
Telco Leased Fiber	✓	✓	✗	✓	✗
Dedicated Point to Point Fiber	✓	✓	✓	✓	✓
Single Carrier Cellular	✓	✓	✗	✗	✗

Questions

INTERCONNECTION INNOVATION e-XCHANGE
U.S. DEPARTMENT OF ENERGY

Grid Engineering Practices & Standards Protection with High Adoption of DER | 5/3/23

An initiative spearheaded by the Solar Energy Technologies Office and the Wind Energy Technologies Office

This presentation is an excerpt from an i2X Solution Exchange held in May, 2023.

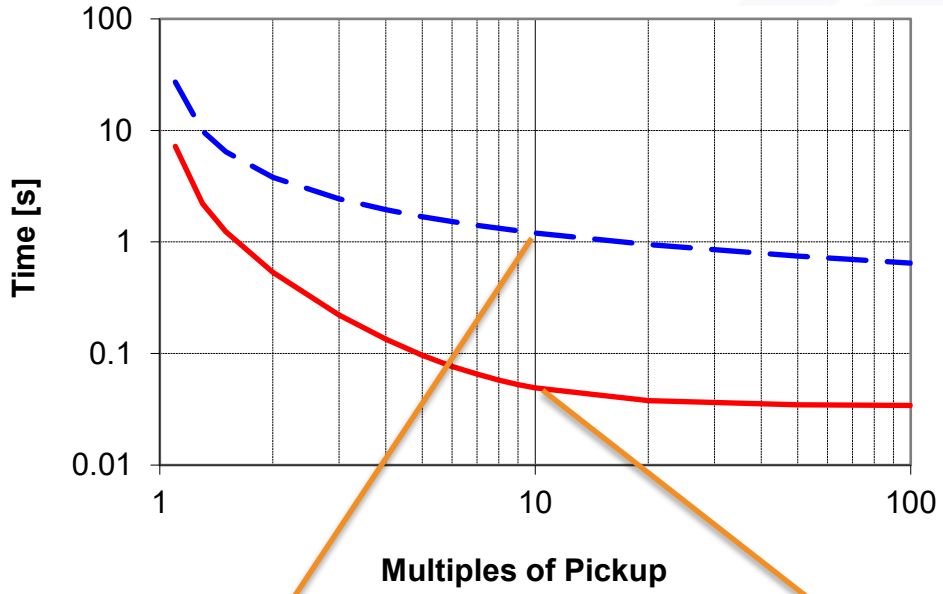
For the full presentation and recording, please visit: https://www.energy.gov/eere/i2x/i2x-solution-e-xchanges

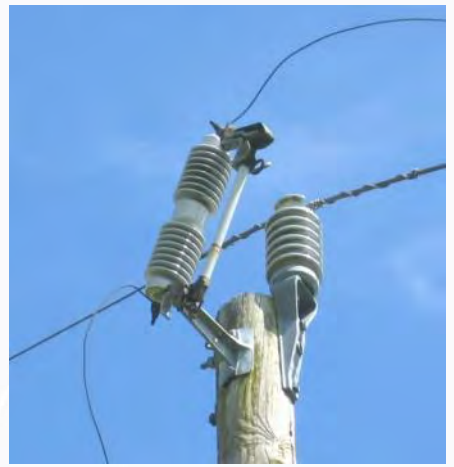
Agenda

- Conventional Distribution Feeder and System Protection
- Protection Concerns with High DER and Studies
  - Phase Current and Phase Angle
  - Anti-Islanding Screening
- Other Protection Concerns
- Costing Data

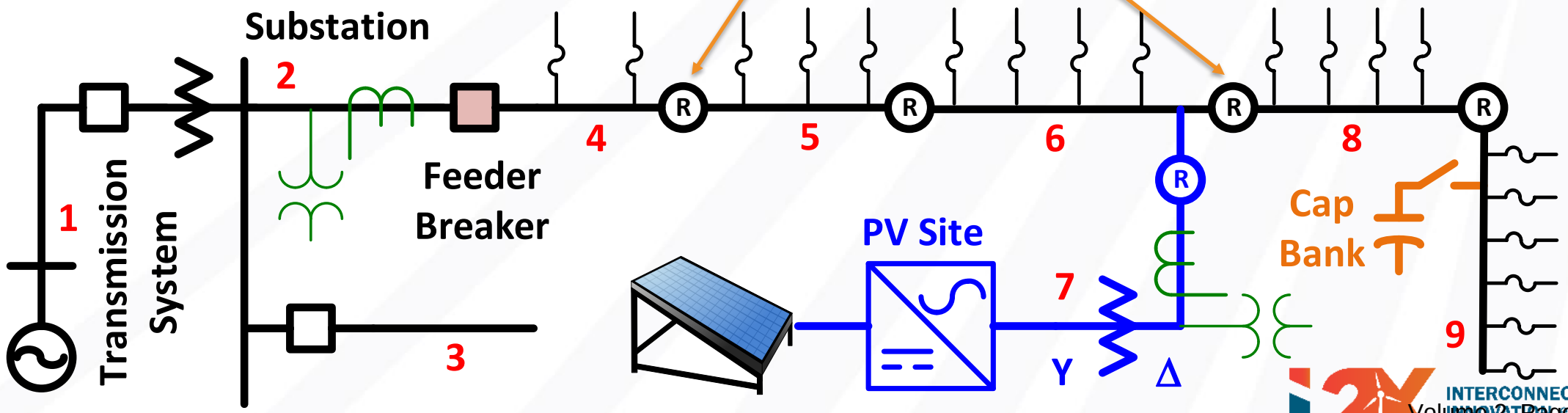
Time Overcurrent Protection has worked well on radial feeders without DER.

Recloser

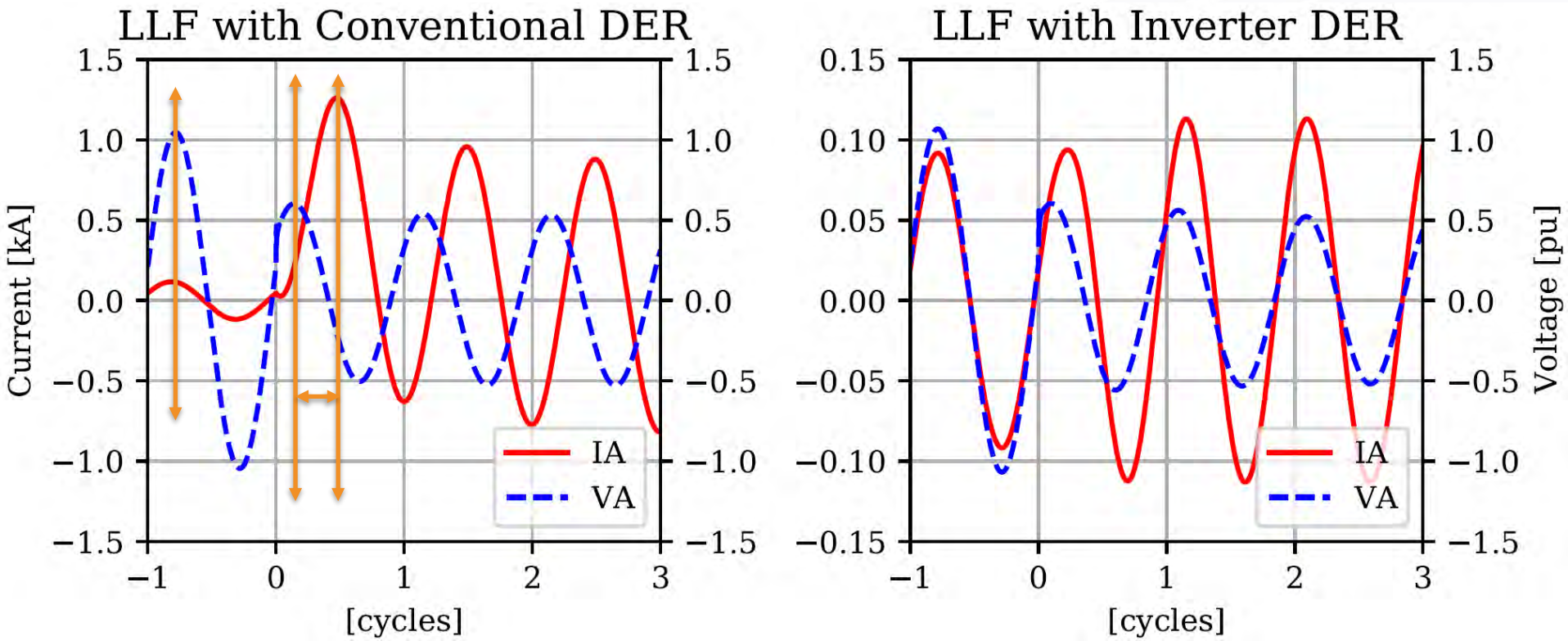




Fuse



IBR contribute fault currents of lower magnitude and in phase with the voltage, compared to conventional rotating machines.

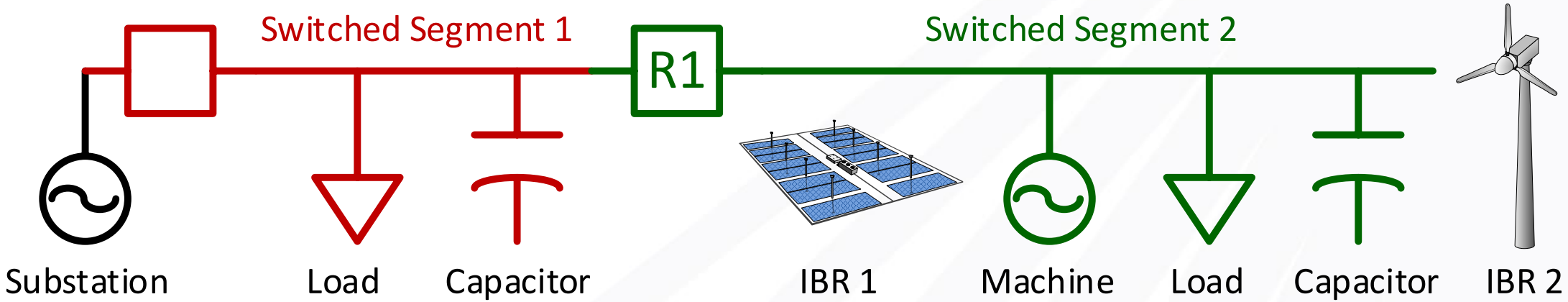


- Distant fault results in voltage drop at time zero
- Conventional generator produces 5-6 times normal phase current after fault.
- Phase angle shifts right to 90-degree lagging angle

- Distant fault results in voltage drop at time zero
- IBR produces only 1.2 times normal current after fault at about 1-cycle.
- By 2-cycles, current and voltage are back in phase.

Some conventional relays require an increase in current and phase shift to detect fault.

Suggested Guidelines for Anti-Islanding Screening (2012)

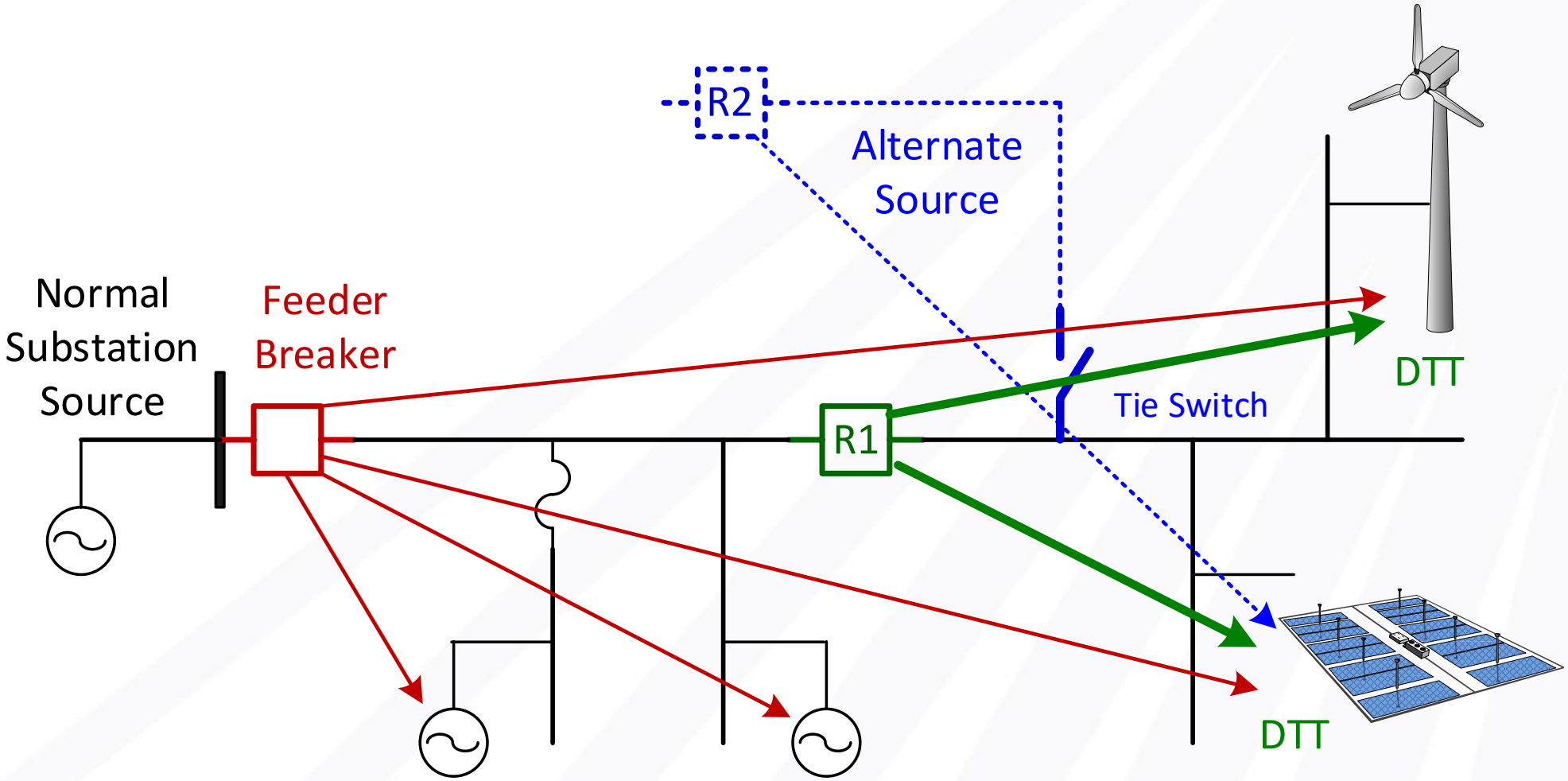


Additional Study Recommended for Direct Transfer Trip if:

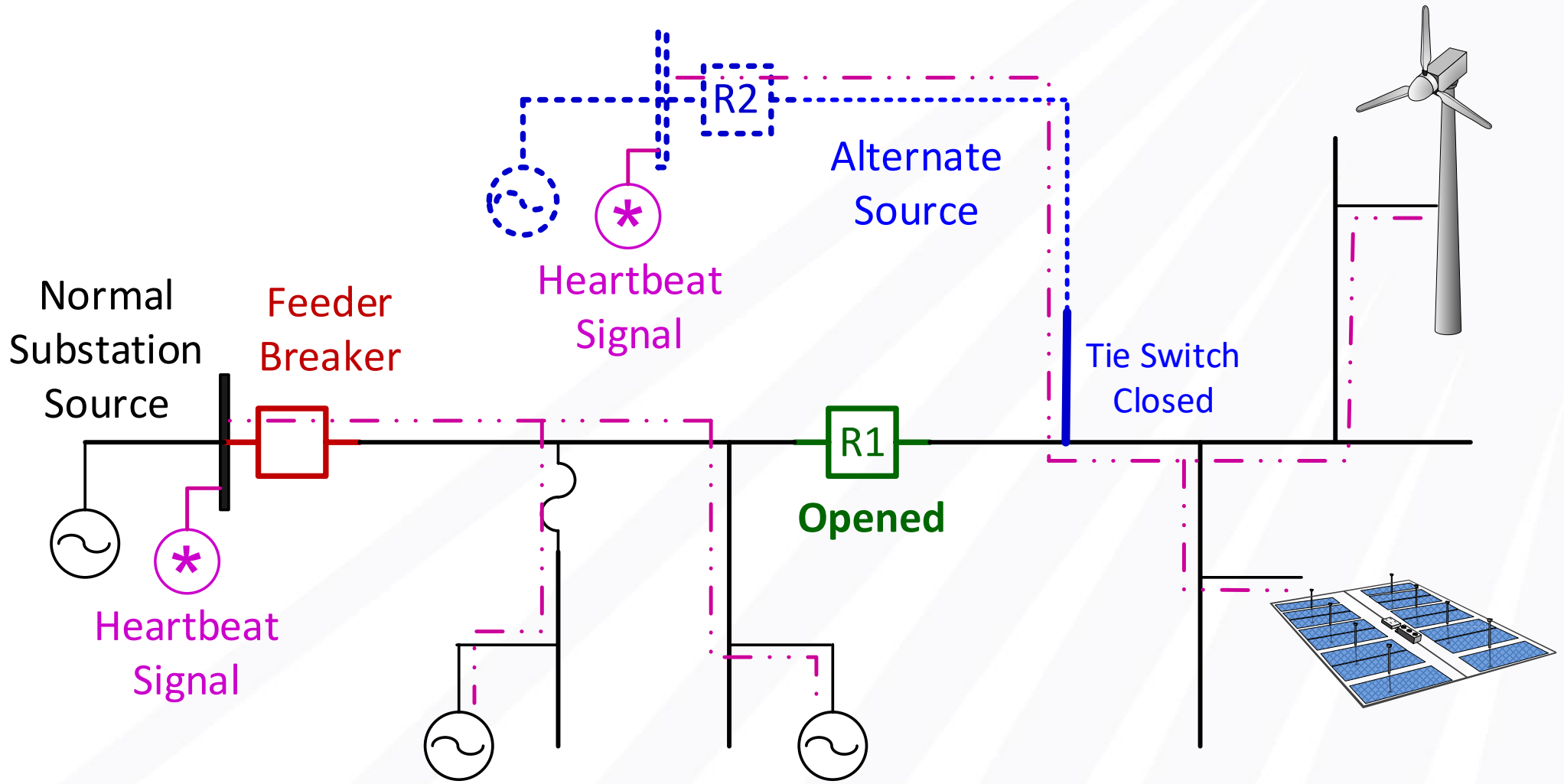
- Total DER real power output > 67% of minimum time-coincident segment load. If so:
  - Reactive power balanced in the segment within 1%, or
  - Less than 67% of total IBR capacity comes from the same vendor, or
  - Rotating machine DER is more than 25% of the total DER
- The guidelines rely on undervoltage trip within 2 seconds. With ride-through permitted since 2014 in IEEE 1547, the guideline may now be invalid.

- https://www.osti.gov/servlets/purl/1039001/, then revised to exclude grid impedance screen,
- https://energy.sandia.gov/wp-content/gallery/uploads/SAND2012-1365-v2.pdf

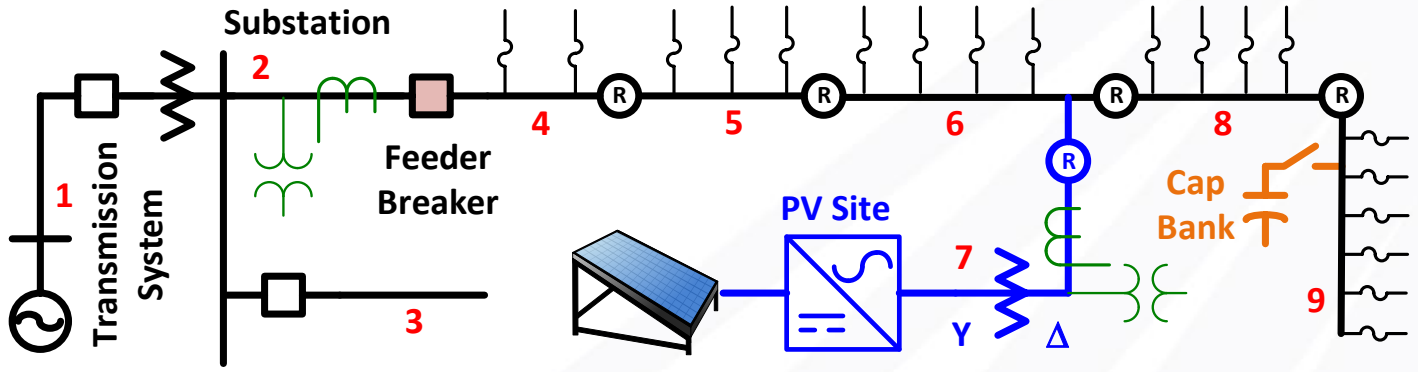
DTT on a distribution circuit with two switched segments, an alternate utility source, and four community, commercial, or utility-scale DER.



Permissive DTT with Wind and Solar DER Connected to Alternate Source



Additional Protection Impacts



Desensitization of device – DER downstream of a protection device (Breaker or Recloser) can reduce the fault current "seen" by the device and prevent tripping due to DER fault current injection.

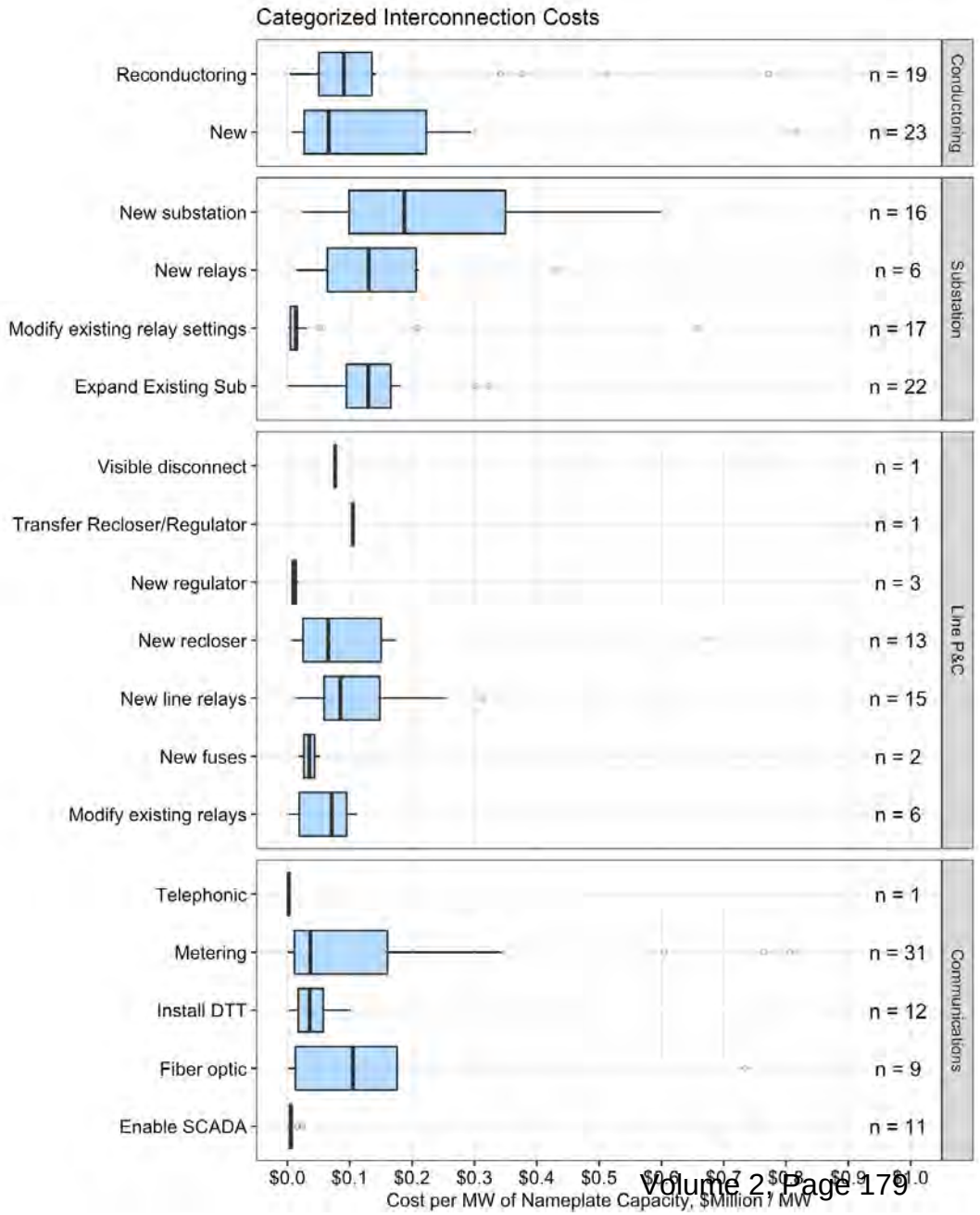
Overcurrent pickup settings must be updated and relays upgrades for bi-directional overcurrent protection

All in-line protection devices operating on a per phase basis must be upgraded to gang operated reclosers or switches.

Network Upgrade Cost Benchmarking

System Category	Sub-category	# of Occurrences
Conductoring	New Conductors	23
	Upgrade Existing Conductors	19
Substation	Expand Existing Substation	17
	New Substation	6
	New Relays	22
	Modify Existing Relay Settings	16
Line Protection and Control	New Regulator	3
	New Recloser	13
	New Line Relays	15
	Modify Existing Relays	6
	New Fuses	2
	Visible disconnect	1
	Transfer Recloser/Regulator	1
Communications	Fiber Optic Cable	9
	Telephonic Connection	1
	Enable Supervisory Control and Data Acquisition	11
	Install Direct Transfer Trip Capability at Neighboring Subs/Control Centers	12
Metering		31

https://www.osti.gov/biblio/1882599



Understanding DER Islanding Risks and Mitigation Measures

A brief overview of key concepts and important considerations

SHAY BANTON

Pronouns: They/Them

Regulatory Program Engineer & Energy Justice Advocate

IREC

Interstate Renewable Energy Council (IREC)

IREC builds the foundation for rapid adoption of clean energy and energy efficiency to benefit people, the economy, and our planet.

IREC

Today's Guiding Questions

What	What is unintentional islanding?
Why	Why does islanding occur and why is it bad?
When	When should we be concerned about islanding?
How	How can we prevent sustained islands?

What is...

ISLANDING?

A condition in which a portion of an Area EPS is energized solely by one or more Local EPSs through the associated PCCs while that portion of the Area EPS is electrically separated from the rest of the Area EPS on all phases to which the DER is connected. When an island exists, the DER energizing the island may be said to be “islanding”.

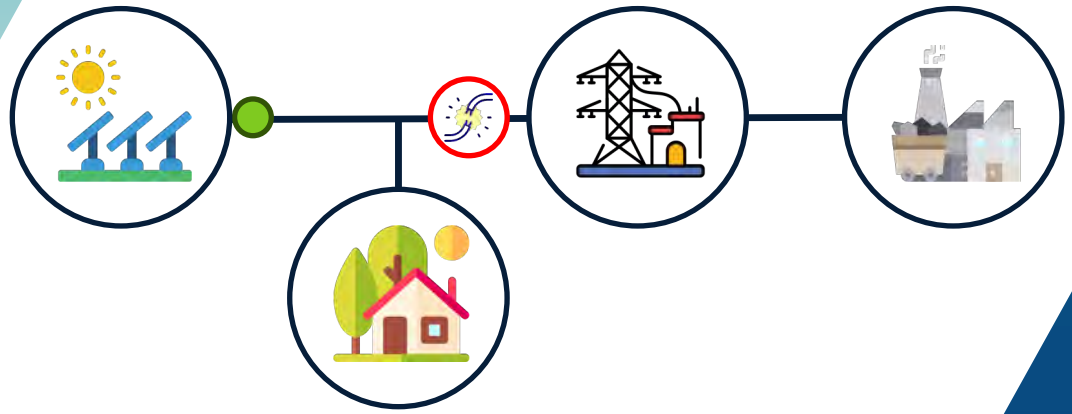
(IEEE 1547-2018, p. 24)

IREC

What is...

ISLANDING?

When a segment of the electrical grid remains energized by distributed energy resources for a period after being electrically isolated from the rest of the grid. *Unintentional* indicates that the island was not planned or designed for.



IREC

Why should we be worried?

Unintentional islanding can create unsafe conditions for…

Line Workers

Equipment

The Public

What about grid-tied inverters?

Early investigations into islanding risks found…

"Islanding happens only when the network is in a balanced condition and the network is disconnected at that very moment. […] When multiplying the probability of a balanced condition with the probability of maintenance, the risk of encountering an island becomes virtually zero." [1]

"the additional risk presented by islanding [of PV systems under worst-case penetration scenarios] does not materially increase the risk that already exists as long as the risk is managed properly [i.e., software solutions]." [2]

[1] Bas Verhoeven, Probability Of Islanding In Utility Networks Due To Grid Connected Photovoltaic Power Systems, International Energy Agency (IEA), p. 42-43 (Sept. 2002), https://iea-pvps.org/wp-content/uploads/2020/01/rep5_07.pdf
[2] Neil Cullen et al., Risk Analysis Of Islanding Of Photovoltaic Power Systems Within Low Voltage Distribution Networks, International Energy Agency (IEA), p. iii-iv (March 2002), https://iea-pvps.org/wp-content/uploads/2020/01/rep5_08.pdf

What about grid-tied inverters?

Later investigations of UL certified inverters found…

"The evaluation connected multiple inverters certified to meet IEEE 1547 and investigated the interactions among the sources. This evaluation indicated the multi-inverter configuration did not interfere or cause the [anti-islanding detection algorithms within the] inverters to operate incorrectly." [3]

"However, these results are highly encouraging in that they present the first laboratory test of multi-inverter, multi-point islands, and no island durations longer than 640 ms were observed, despite the challenging island-detection conditions that were created." [4]

[3] Sigifredo Gonzalez et al., Multi-PV Inverter Utility Interconnection Evaluations, Sandia National Laboratory (SNL) & Northern Plains Power Technologies (NPPT), p. 6 (June 2011), https://energy.sandia.gov/wp-content/gallery/uploads/MULTI-PV-INVERTER-UTILITY-INTERCONNECTION-EVALUATIONSSAND2011-3898C1.pdf

[4] Anderson Hoke et al., Experimental Evaluation of PV Inverter Anti-Islanding with Grid Support Functions in Multi-Inverter Island Scenarios, National Renewable Energy Laboratory & SolarCity, p. 46 (July 2016), https://www.nrel.gov/docs/fy16osti/66732.pdf.

Practices in Developed Markets

NEW YORK

Risk of islanding analysis performed for UL-certified inverters.

Voltage-supervised reclosing blocking may be required. DTT is rare. [5]

MASSACHUSETTS

Risk of islanding analysis performed for UL-certified inverters.

N-Grid: DTT generally not required, reclose blocking used instead. [6]

ILLINOIS

DTT required only for 10MVA+ projects, feeders with high amounts of rotating generation, or that back feed the transmission system. [7]

[5] The Joint Utilities of New York, Unintentional Islanding Protection Practice For Generation Connected To The Distribution System, p. 2 (Feb. 9, 2017), https://dps.ny.gov/system/files/documents/2022/11/islanding-risk-requirements-2-09-2017.pdf

[6] Massachusetts Technical Standard Review Group, Common Technical Standards Manual, p. 5-10 (December 22, 2022), https://www.mass.gov/doc/tsrg-common-guideline-2022-12-22/download

[7] Commonwealth Edison, DER Interconnection Guidelines for Customers – Interconnection for Parallel Generation, p. 11 (July 20, 2018), https://www.comed.com/SiteCollectionDocuments/MyAccount/MyService/DER_Interconnection_Guidelines_for_Customers.pdf

Recommendations

1. Require UL-certified inverters that use a pre-approved & robust anti-islanding methodology
2. Adopt standardized risk of islanding screening and detailed study process
3. When study is failed, utilize supervised reclose blocking to ensure synchronization

Thank You!

If you have any questions, contact:

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Regulatory Program Engineer &
Energy Justice Advocate | IREC
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Direct Transfer Trip (DTT)

9/19/23

Mrinmayee Kale

John Kotula

new leaf energy

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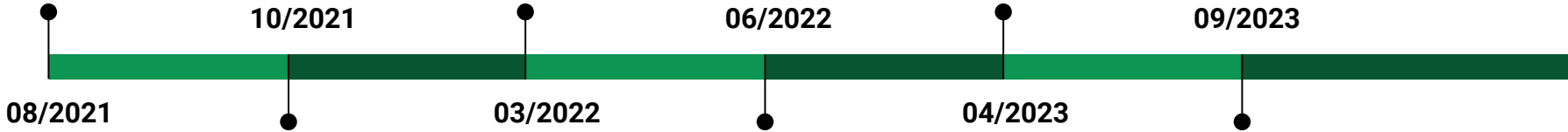
Contents

- Timeline of past discussions
- DTT scope of work
- Electric Grid basics and Regulated utility responsibilities
- Why Dominion uses DTT? An overview
- Alternative practices and study methodologies from other utilities

Timeline of past discussions



CCSA/CHESSA/Dominion (1st Meeting)

Industry presentation

NDA/Collaboration to exchange information

NDA executed to enable sharing of Impact studies from other markets and literature.

CCSA/CHESSA/Dominion

Dominion presentation on Literature review and findings

CCSA/CHESSA/Dominion (2nd meeting)

Dominion presentation

CCSA/CHESSA/Dominion (DTT workshops)

6/2-Dominion presentation on pilot results to dark fiber alternatives

6/13-National Grid (MA) presentation

RLC Engineering presentation

SCC DER Interconnection Working group 2

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DTT Dominion VA

- **DTT Scope of work:**
  - Addition of relaying at substation ~$500k
  - **Dark fiber** connection between site and substation - ~$200k/mile
  - Substation control house upgrade - ~$750K-$1M

- No cost sharing mechanism
- According to Dominion interconnection parameters document, **every project above 250kW** is vulnerable to DTT costs.
- If a **control house upgrade** is triggered due to DTT relay panels, the project and almost all projects in queue become **economically infeasible**.

References: Interconnection Parameters for Net Metering Distributed Energy Resources

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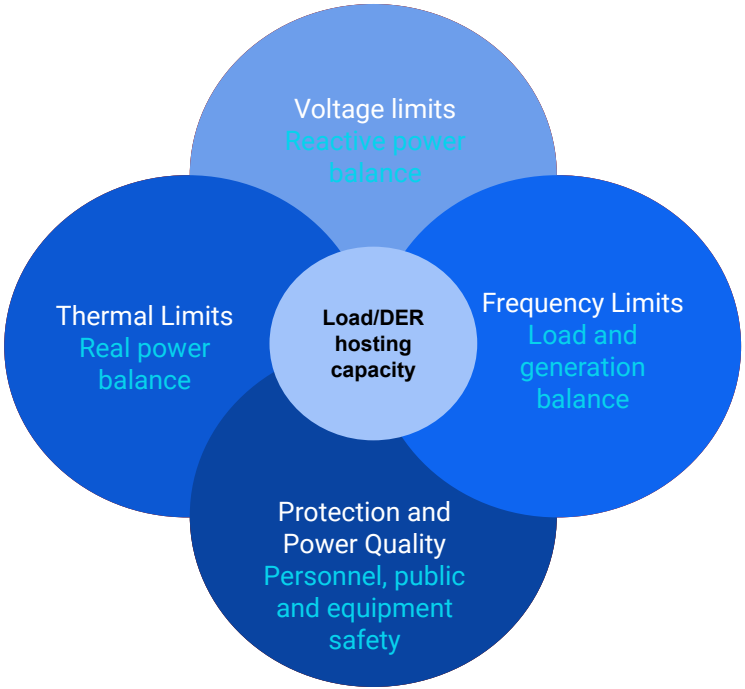
Electric Grid Basics and regulated utility responsibilities



Responsibilities of regulated distribution utilities

- Personnel (NFPA 70E, NESC) and public safety
- Equipment safety
- Power quality (IEEE 519-2014, ANSI C84.1)
- Reliability (IEEE 1366) - SAIFI, SAIDI and CAIDI, CAIFI

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Why Dominion uses DTT?

- Personnel safety
  - Increase in risk of electrocution due to addition of certified inverter based DER
  - Personnel Safety (Arc Flash) while Line Workers perform hotline (Energized) work.
- Anti-Islanding
  - Island maintained once utility source is disconnected from load customers
    - Interactions of mix of DER technologies
- Reliability
  - Temporary Overvoltage of Transmission and Distribution Level Equipment
  - Maintain Selectivity of Protection
  - Reclosing Coordination
  - Out of Step Reclosing
  - Open phase conditions

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Personnel safety - Increase in risk of electrocution due to addition of certified inverter based DER

- **Current state Dominion:**
  - **Dominion uses the IEEE 1547.2-2008 screening criteria. This is an extremely limiting criteria.**

    If the **aggregate DR capacity is less than one-third of the local EPS load**, it is generally agreed that, should an unintentional island form, the DR will be unable to continue to energize the load connected within the local EPS and maintain acceptable voltage and frequency.
  - Dominion **does not conduct a comprehensive risk analysis** quantifying the increased risk of electrocution due to addition of certified inverter based DER with anti-islanding capabilities **in an impact study.**

- **Alternative utility practices**
  - Several utilities in the US use the newer **SANDIA 2012** islanding screens and **SANDIA 2018** research on islanding detection performance with mixed DER types.
    - National Grid (MA, NY)
    - Eversource(MA, CT)
    - CMP, Versant(ME)
  - **Excel Energy technical specifications**: "The need for transfer trip installation is dictated by the size and type of the DER in relation to minimum loading of the feeder, presence of large rotating loads, and existing DER size, type, and method for anti-islanding detection. **In most scenarios, inverter-based DER using UL 1741 certified inverters will not require DTT.** The system impact study will determine specific requirements. "

References:
IEEE 1547.2 2008 IEEE Application Guide for IEEE std 1547-2003, SANDIA Report -SAND2012-1365 Unintentional Islanding detection performance with mixed DER types, Xcel Energy Technical Specifications Manua, I

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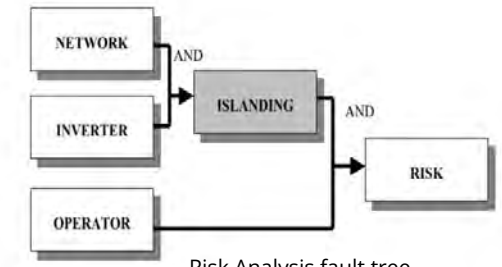
Personnel safety - Increase in risk of electrocution due to addition of certified inverter based DER

- Probability of electrocution due to addition of certified IBRs
  - Network - **load/generation (p&Q) match and loss of mains**
  - Inverter - **Inverter anti-islanding mechanism fails**
  - Operator - **operator touches conductor**



Risk Analysis fault tree

- **IEA PVPS Task 5 – Study**
  - The “benchmark” risk that already exists for network operators and customers is of the order of **1 in every million.**
  - The risk of electric shock associated with islanding of PV systems under worst-case PV penetration scenarios to both network operators and customers is typically **one in a billion.**
  - Thus, the additional risk presented by islanding does not materially increase the risk that already exists as long as the risk is managed properly
  - **Balanced conditions occur very rarely for low, medium and high penetration levels of PV-systems.**

- **Balanced conditions occur very rarely for low, medium and high penetration levels of PV-systems. The probability that balanced conditions are present in the power network and that the power network is disconnected at that exact time is virtually zero.**

References:

Risk Analysis of Islanding of Photovoltaic Power Systems Within Low Voltage Distribution Networks

Probability of islanding in utility networks due to grid connected PV-systems

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Anti-Islanding - Interactions of mix of DER technologies

- **Current state Dominion**
  - **IEEE 1547.2-2008 screening criteria. This is an extremely limiting criteria.**

If the **aggregate DR capacity is less than one-third of the local EPS load**, it is generally agreed that, should an unintentional island form, the DR will be unable to continue to energize the load connected within the local EPS and maintain acceptable voltage and frequency.

  - Dominion **does not conduct a PSCAD study testing** anti-islanding capabilities of certified inverter based DER in an impact study.

- **Alternative practices from other utilities**
  - Several utilities in the US use the newer **SANDIA 2012** islanding screens and **SANDIA 2018** research on islanding detection performance with mixed DER types.
    - National Grid (MA, NY)
    - Eversource(MA, CT)
    - CMP, Versant(ME)
  - Projects that fail the screens are studied to test if there is a sustained island that the inverter is incapable to detecting. This is common practice for Eversource MA and Versant in ME.
  - Revise technical standard requiring installation of DER that utilize bidirectional positive feedback mechanism for frequency and phase shift.

References:
Unintentional Islanding detection performance with mixed DER types

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Personnel Safety - (Arc Flash) while Line Workers perform hotline (Energized) work

Arc Flash

- Short circuit event due to contact between two live parts or one live part and ground.
- Arc flash is the extreme heat and blinding light produced by the arc fault. If the conditions are right, an arc flash can reach the final stage and result in an enormous electrical explosion known as an arc blast.
- Relevant standard: NFPA 70E

Common causes of arc flash

• Equipment failure
• Dropping un-insulated tools or metal parts
• Using incorrectly specified instruments
• Live work on damaged equipment such as cables
• Loose connections and exposed live parts
• Lack of awareness and training

Arc Flash incident energy

• Increases as fault clearing time increases
• Increases as fault current increases
• Decreases as distance of worker from fault location increases

new leaf energy Confidential © New Leaf Energy, Inc. 2022

References:
Arc flash PPE categories

Personnel Safety - (Arc Flash) while Line Workers perform hotline (Energized) work.

- **Current state Dominion**
  - Criteria is to limit **Arc Flash Incident Energy < 8 cal/cm2**
  - **Incident energy calculated only for single phase-to-ground faults**, the other phases are covered while work is performed
  - **Dominion does not provide study results for arc flash incident energy calculations** that shows that addition of a **specific project** causes increase in arc flash energy that would **require a change in PPE category.**
  - Dominion assumes that there will be an increase in fault clearing times due to fault current contribution from inverter based DER.

- **Alternative practices from other utilities**
  - MA and NY utilities **consider a standard 1.2xFLA** as the fault contribution from an inverter based resource.
  - Utilities use test reports provided by inverter manufacturers. Several show that inverter **fault contribution drops below FLA within a couple of cycles.**
  - Revise technical standard requiring installation of preferred transformer winding (Yg/Yg, Yg/D with NGR, etc) and/or grounding devices by DER sites to reduce fault current contribution.

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References:
Arc flash PPE categories
ArcCalc at Dominion Energy, CIGRE US National Committee, 2017 Grid of the Future Symposium"

Reliability

- **Current state Dominion**
  - Temporary Overvoltage of Transmission and Distribution Level Equipment - DTT
  - 3V0 at substation is deemed unreliable
  - Dominion **does not conduct a study testing** SPOV/Very fast overvoltage trip settings of certified inverter based DER in an impact study.
  - The passive anti-islanding settings are so strict, the DER cannot participate in ride through for any transmission or distribution faults
  - Impact study **does not include a recloser co-ordination study**

Function		Set Point	Total Clearing Time (sec)
27	Under-voltage	V < 45% nominal voltage	0.160
		45% ≤ V < 60%	0.160
		60% ≤ V <88%	0.160
59	Over-voltage	110% < V < 120%	0.160
		V ≥ 120% nominal voltage	0.160
81U	Under-frequency	F < 57.0 Hz	0.160
		F < 59.5 Hz	0.160
81O	Over-frequency	F > 60.5 Hz	0.160
		F > 62.0 Hz	0.160
	Overall Anti-Islanding	Disconnect inverter from system (PCC)	0.160
	Steady State Power Factor	UNITY Power Factor	
LVRT	Low Voltage Ride Through	DISABLE	
HVRT	High Voltage Ride Through	DISABLE	
LFRT	Low Frequency Ride Through	DISABLE	
HFRT	High Frequency Ride Through	DISABLE	
ZVRT	Zero Voltage Ride Through	DISABLE	
	Volt/Var Control	DISABLE	
	Volt/Watt Control	DISABLE	
	Frequency/Watt	DISABLE	

Table 2: *DER Inverter Settings*

References:
ISO-NE Source requirement document, Volume 2, Page 202

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Reliability

- **Alternative practices from other utilities**
  - Utilities that take advantage of the inverter's SPOV/very fast overvoltage trip settings and adhere to ride-through requirements as required by ISO-NE.
    - National Grid (MA, NY)
    - Eversource(MA, CT)
    - CMP, Versant(ME)
  - MA, NY, ME and HI utilities make use of either the inverter's SPOV functionality or set a very fast overvoltage trip, typically set within **~1.3-1.4pu pickup and 1ms clearing time.** HI even has a test procedure that is prescribed for inverter type testing and the newest IEEE 1547.1 testing procedure standard will incorporate a similar test for inverters.
  - In cases where the inverter **can't "see"** the GFO voltage, a **grounding transformer or neutral grounding reactor** can be incorporated in the design. MA, NY and ME **utilities prescribe a effective grounding standard and perform grounding studies** as part of the impact study to determine if DERs are effectively grounded as designed.
  - NGrid in MA and NY and CMP in ME conducts a recloser co-ordination study as part of impact study.

References: ISO-NE source requirement document

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Suggested next steps for working group

- **Dominion embarks on a revision in technical standards for inverter based DERs to meet, that take advantage of inverter based DER capabilities**
- **Dominion commits to conducting comprehensive project-specific studies for risk of islanding, solutions for groundfault overvoltage, arc flash incident energy calculations, recloser co-ordination all taking into consideration the abilities of certified IBR.**

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Working Group 2, Meeting 3 Presentation Materials

Working Group 2, Meeting 3 (October 10, 2023): *Interconnection costs and information transparency*

- GPI guidance/overview slides **(Volume 2, Page 206–Volume 2, Page 221)**
- Interconnection Cost Transparency, Accuracy, and Granularity—Dominion **(Volume 2, Page 222–Volume 2, Page 228)**
- How are Cooperatives Different?—Virginia, Maryland & Delaware Association of Electric Cooperatives **(Volume 2, Page 229–Volume 2, Page 236)**
- DER Overview—AEP/APCo **(Volume 2, Page 237–Volume 2, Page 243)**

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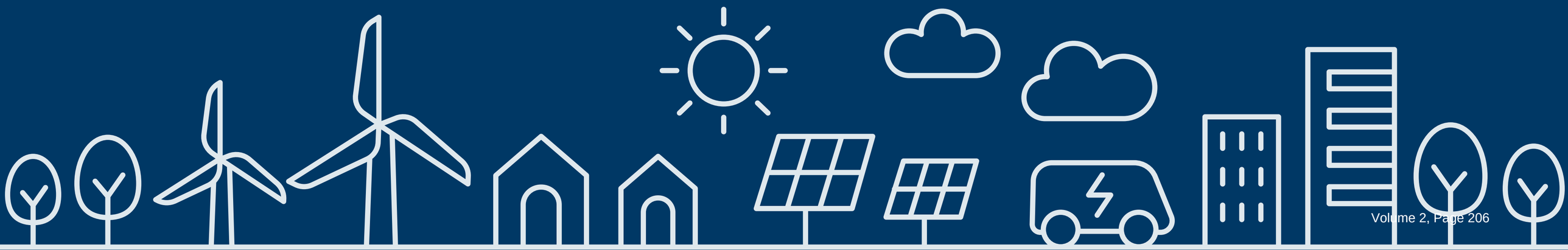
Virginia DER Interconnection Working Groups

Working Group 2, Meeting 3

October 10, 2023

-Virtual meeting-



Agenda

8:30am **Welcome and Introductions, Process Update & Agenda Review**

8:45am **Presentations from co-ops and utilities: Current cost information availability**

10:00am **Break**

10:30am **Discussion: Interconnection cost implications**

Challenges that parties have experienced related to interconnection costs or cost information availability, and the implications of those challenges.

12:00pm **Lunch Break**

1:00pm **Discussion: Improving interconnection cost and cost transparency issues**

Solutions to and recommendations of strategies that would address cost-related issues.

2:25pm **Wrap up and next steps**

2:30pm **Adjourn**

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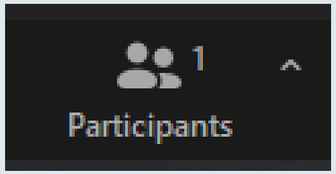
Welcome!

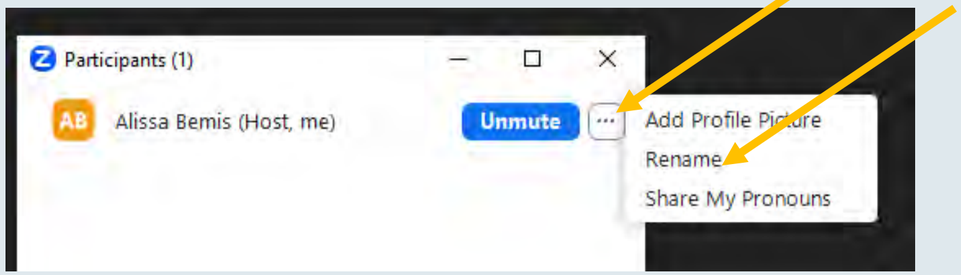
Please share your name and organization in the chat.

Add your organization to your name:

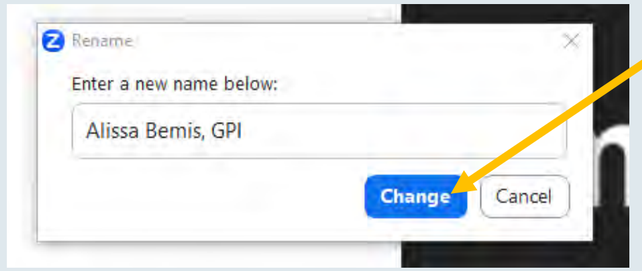
1) Click on the “Participants” icon at the bottom of your screen



2) Hover over your name in the participants list and click the three dots that appear and click on “rename”



3) Add your organization to your name and click “Change”



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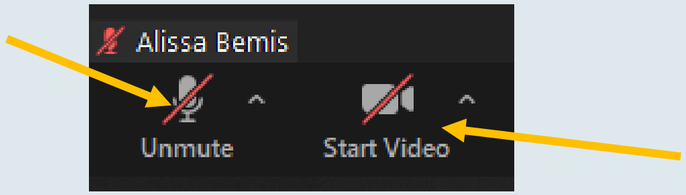
Zoom 101

Mute/Unmute and Turn on/off camera

1) Mute/unmute: Click on the microphone icon on the menu on the bottom of your screen.

1) Click on the video icon to turn your camera on and off.

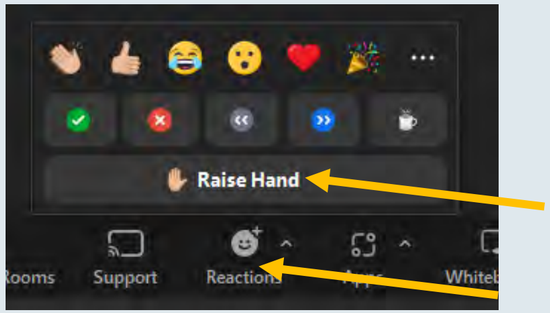


Turn on closed captions

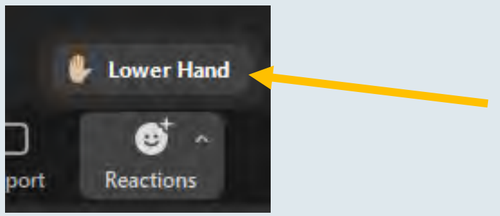
1) Click on the “Show Captions” icon at the bottom of your screen. Select the language you would like the captions in and click “Save.”

Raise your hand

1) Click on the “reactions” icon at on the menu at the bottom of your screen. Then click “Raise Hand.”



2) Once you are done speaking, click “Lower hand” to lower your hand.



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Meeting Goals

1. Understand what **interconnection cost information already exists** and where to access it.
2. Understand **what challenges parties have faced** with respect to interconnection costs and cost transparency.
3. Understand what additional interconnection cost information different parties need to **make informed decisions and improve process efficiency.**
4. Discuss **potential solutions** that would result in:
    a. Improved information access and quality
    b. Information availability earlier in the study process
    c. Enforcement strategies that encourage parties to provide reliable information

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Ground Rules

1. **Respect each other.** Help us to collectively uphold respect for each other's experiences and opinions, even in difficult conversations.
2. **Respect the time.** Our time together is limited and valuable, so please be mindful of the time and of others' opportunity to participate.
3. **Share your perspective and help others share theirs.** We need everyone's wisdom to achieve better understanding and develop robust solutions.
4. **Enable honesty through non-attribution.** Outside of this group, you may share what was said, who was present, and perspectives shared at an organizational level, but please refrain from attributing perspectives to individual participants without first obtaining that individual's permission. All meeting notes and materials will also adhere to this.

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Reminder:

Homework 2 due Friday, 10/13

Virginia SCC Interconnection Working Group #2

Homework 2: Potential Solutions to Challenges Associated with DTT/Dark Fiber

Instructions: The following solutions related to DER interconnection challenges associated with DTT/dark fiber were raised during the Working Group 2 meeting on 9/19/23. Please review the list below and do the following:

A. Use the track changes feature to make suggested edits that you think would improve any of the items below.
B. Use the comment feature to record clarifying questions that you would like answered to better understand any of the items below.
C. Add new solutions to the list that you think are not reflected in the existing items, but should be considered by the working group.
D. **Email the document to acole@gpisd.net by 10/13** along with a list of the 3 solutions that you think are most worth discussing further within Working Group 2.

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Reminder: Shared Resource Library, hosted via Airtable

VA DER Interconnection Working G... | Use this data

1 hidden field | Filter | Grouped by 1 field | Sort | ...

	Name	Document	Working Group(s)	Additional Notes
RESOURCE TYPE: Meeting Materials	Count 4			
1	Meeting 1, Working Groups 1&2		Both Working Groups	
2	Meeting 2, Working Group 2		Working Group 2	
3	Meeting 2, Working Group 1		Working Group 1	
4	Meeting 3, Working Group 2		Working Group 2	
RESOURCE TYPE: Process Documents	Count 1			
5	DER Interconnection Working Groups Process Summary		Both Working Groups	
RESOURCE TYPE: Resources	Count 4			
6	3/3/2023 Order directing Staff to establish DER interconnection working groups		Both Working Groups	Case No. PUR-2022-00073
7	5/24/2022 Order opening Case No. PUR-2022-00073		Both Working Groups	Case No. PUR-2022-00073
8	9/19/2022 Staff report on DER interconnection issues and questions		Both Working Groups	Case No. PUR-2022-00073
9	1/7/2022 Order directing the Commission to open a separate docket to explor...		Both Working Groups	Case No. PUR-2021-00127

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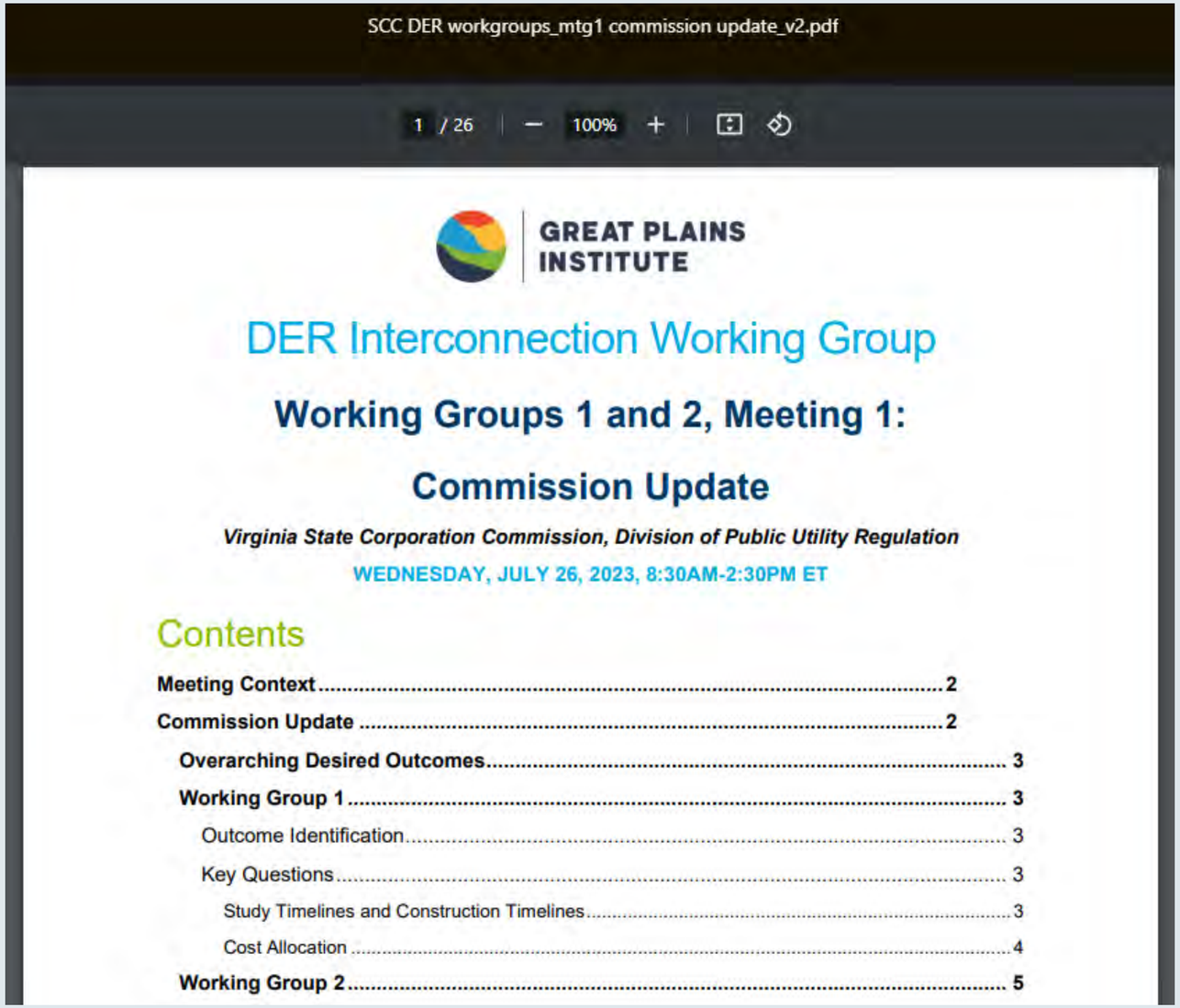
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DER Interconnection Working Group
Working Groups 1 and 2, Meeting 1:
Commission Update
Virginia State Corporation Commission, Division of Public Utility Regulation
WEDNESDAY, JULY 26, 2023, 8:30AM-2:30PM ET
Contents
Meeting Context 2
Commission Update 2
Overarching Desired Outcomes 3
Working Group 1 3
Outcome Identification 3
Key Questions 3
Study Timelines and Construction Timelines 3
Cost Allocation 4
Working Group 2 5

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Presentations and Q&A:

Current cost information availability

- VMDAEC
- Dominion
- APCo/AEP
- KU-ODP

-Break-

Please return at 10:30am.

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Discussion: Interconnection cost challenges and their implications

What challenges have you experienced related to interconnection costs or cost information (transparency, accuracy, timing, etc.)?

What were the implications of those challenges?

-Lunch-

Please return at 1:00pm.

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Discussion: Solutions and recommendations to address cost-related issues

- **Information access & quality:** What solutions/ recommendations should be considered that would improve interconnection cost…

  transparency? granularity?
  accuracy? other issues?

  What are some ways that these solutions could be implemented?

- **Information timing:** What solutions exist that could make cost information available at an earlier stage in the process?

- **Enforcement mechanisms:** What types of enforcement mechanisms are necessary to encourage more accurate interconnection cost estimates?

Next Steps

- Homework 2 due Friday, October 13th
- Feedback on solutions discussed today
- Upcoming meetings:
    - WG1, Mtg 3 – October 25
    - WG2, Mtg 4 – October 30
    - Final meeting – Mid November

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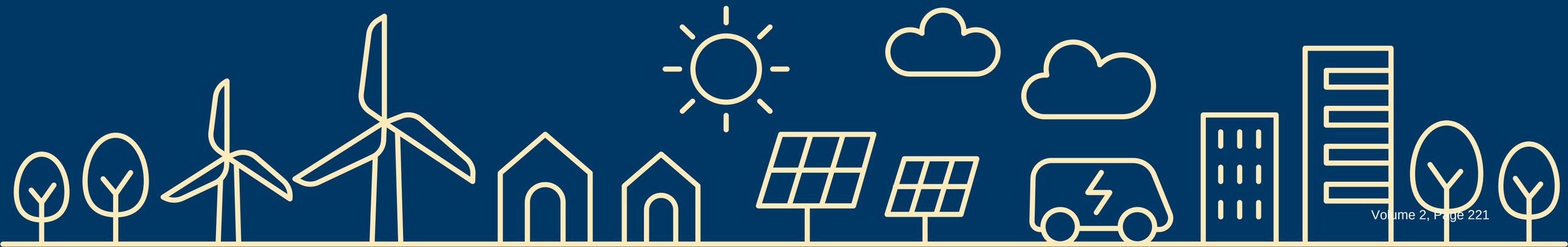
THANK YOU

Betterenergy.org



Working Group 2, Meeting 3
Interconnection Cost Transparency, Accuracy, Granularity

10/10/2023

Richard L LaVigne – Consulting Engineer

What Cost Information Utilities Have Available
Where Is That Information
When In The Process That Information Becomes Available
What Information Utilities Need From Developers

What Cost Information Utilities Have Available? Where Is It?

- **Dominion Energy Virginia / North Carolina**
  Interconnection Parameters for Distributed Energy Resources
- **Generation Interconnections:**
  - Parallel Generation & Interconnection | Virginia | Dominion Energy
- **Parameters Manual:**
  - DER Interconnection Parameters Manual_20220214_R1.0.1 (part 1) - signed.pdf (azureedge.net)
- **APPENDIX D: Estimated facilities costs for typical DER upgrades**

Appendix D:

Distribution Improvements:

1-Mile of Small 1-phase Wire Upgraded to 3-phase 477 AAC	$ 415k - $ 600k
1-Mile 3-phase Re-Conductor from Small Wire to 477 AAC	$ 440k - $ 635k
1-Mile Conversion to 34.5 kV – Same Wire	$ 439k - $ 680k
1-Mile Over-build Existing Line with 477 AAC	$ 515k - $ 780k
1-Mile Conversion and Re-Conductor to 477 AAC	$ 660k - $ 980k
Adder – Distribution Wire Upgrade, Overbuild, or Conversion (Engineering \ Mobilization \ Construction Management)	$ 195k - $ 440k
Install New or Replace Existing Recloser with G&W Unit	$ 100k
Install New 1- 1-phase Regulator	$ 40k
Install New 3- 1-phase Regulators as a bank	$ 100k
Adder – Off-Road Work – 1-Mile – Varies	$ 400k - $ 550k
Adder – Permit/Hours Restrictions – 1 Mile of Work – Varies	$ 80k - $120k
Adder – 2000 Feet of Environmental Matting	$ 200k

Appendix D:

Substation Improvements:

Adding New Circuit Breaker (34.5 kV) in Existing Bay	$ 200k
Adding New Circuit Breaker (34.5 kV) and Adding New Bay	$ 250k
Adding 115/34.5 kV, 20/27/33.6 MVA Transformer	$ 1,200k - $ 1,300k
Adding 230/34.5 kV, 20/27/33.6 MVA Transformer	$ 1,300k - $ 1,400k
Adding 230/34.5 kV, 33.6/44.8/56 MVA Transformer	$ 1,400k - $ 1,500k
Adding 230/34.5 kV, 50.4/67/84 MVA Transformer	$ 1,500k - $1,600k
DG Relay Panel Only	$ 250k
Additional Typical Protection – Varies	$ 150k - $ 250k
10-Foot Control Enclosure Expansion	$ 250k
New Control Enclosure	$ 500k
Adder – TX Engineering \ Mobilization \ Construction Mngt	$ 200k - $ 1,200k

When In The Process That Information Becomes Available.

- Pre-Application (Informal – Formal)
- Scoping Call
  - Preliminary Engineering Involvement – A or B (TX/Circuit Verification)
  - High level overview of potential upgrades
  - Interdependency, Available TX capacity, Distances, Other Conditions
- Feasibility Study
  - Distribution Upgrades: Detailed Engineering – Ballpark Costs
- Facility Study
  - Combine the Feasibility and System Impact Requirements
  - Substation Engineering / Costs
- SGIA

What Information Utilities Need From Developers, and When in the Process.

- Complete Application with Fee
  - IR Form with $1,000 Fee – Creates Queue Number
  - Site Control, Site Plan, GPS coordinates of POI Location
  - Equipment Specifications and (Inverter) Certifications
  - Single Line Diagram
    - Utility / Developer Demarcation
    - Appropriate GSU Transformer Specifications
  - DER Use Purpose (BESS Operating Conditions, etc.)
- Study Approval with Deposit
  - Individual or Combined
  - $10,000+$1/kW (individual or Combined)
- SGIA with Appropriate Construction Payment
  - After the Construction Meeting
- (Withdraw Notice)

Questions?

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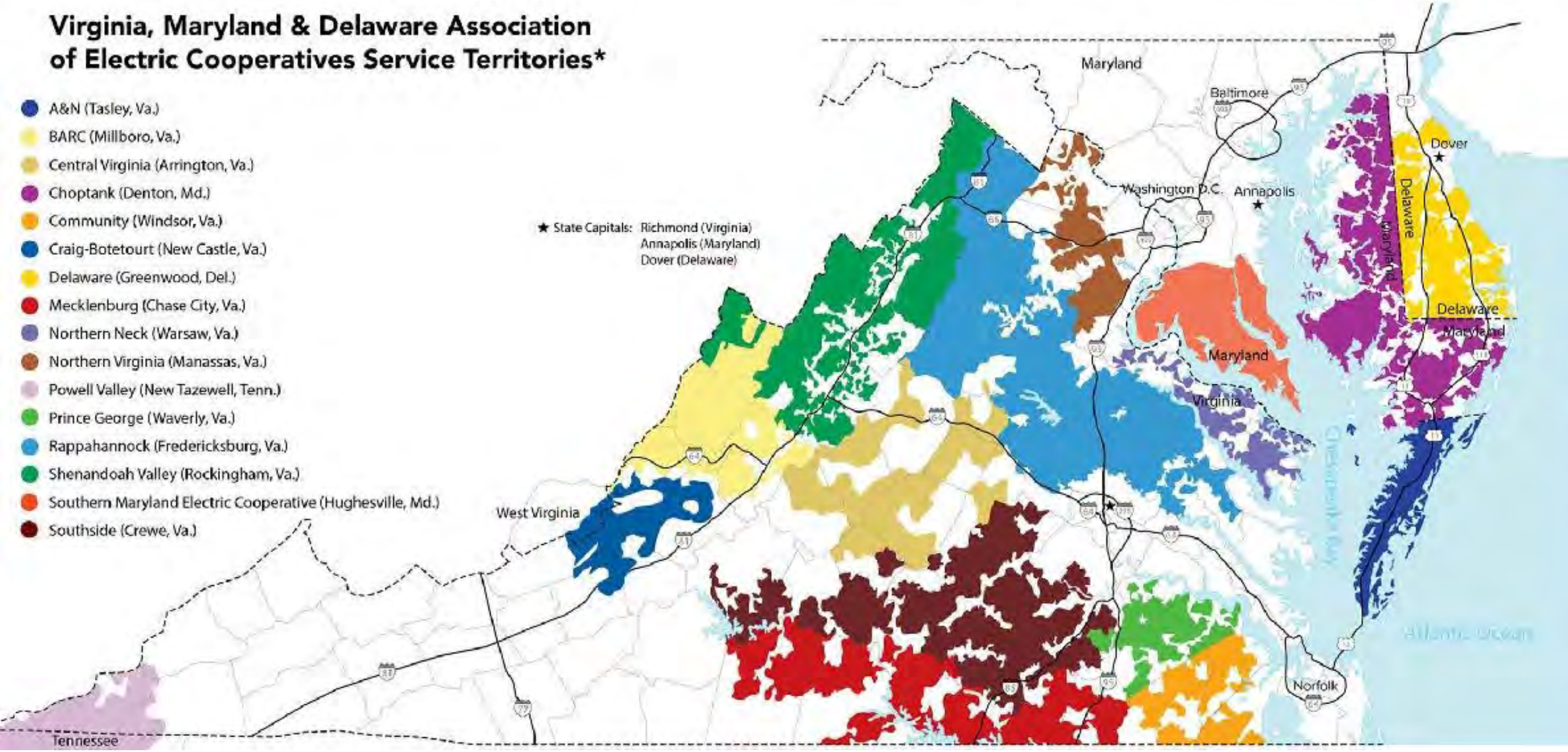
How Are Cooperatives Different?

Virginia, Maryland & Delaware Association of Electric Cooperatives

Virginia, Maryland & Delaware Association of Electric Cooperatives Service Territories*



Cooperatives 101

- Owned by the Consumer Members
- Unity of Interests Because the Ratepayers are the Shareholders
- Not For Profit
- Tax Exempt (Income and Recordation Tax)
- Cost-of-Service, “Traditionally” Regulated
- Operated Using the Seven Cooperative Principles
- Financing Sources:
  - U.S. Government—Rural Utilities Service
  - CoBank and Cooperative Finance Corporation
- Old Dominion Electric Cooperative - Generation & Transmission Cooperative supplies wholesale power to most Virginia Cooperatives

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Cost Difference - Outsourcing Studies

- Electric cooperatives typically do not conduct interconnection studies in-house because:
  - Resource Constraints
  - Sparse and Irregular Demand for Interconnections
  - Scalability
- Accordingly, there may be additional costs for interconnecting customers in cooperative territories since these studies are outsourced.

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Timing Difference - Transmission Dependence

- Most distribution cooperatives in Virginia rely on Dominion Energy for transmission service.
- Due to this dependence, there will almost always be an “affected system” that will need to study the interconnection request

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Bulk Electric System ("BES") – NERC Standards

- Under NERC standards, if a generating facility with an aggregate nameplate rating greater than 75 MVA is interconnected to the grid, then the affected utility must adhere to expansive additional NERC requirements.
- Most distribution cooperatives do not own BES assets 75 MVA and above on any circuit, so they are not registered as a Generator Owner or Generator Operator for NERC purposes.
- If an IC proposed to interconnect a project that would subject the affected cooperative to these additional requirements, the IC will be responsible for the cost of compliance.

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Cost Information

- Determining DER interconnection costs on a project-by-project basis is essential because it allows for tailored approaches that account for the unique characteristics and requirements of each DER in relation to the specifically affected circuit.
- Project-specific cost assessments also ensures that the "cost causer" bears the financial burden of interconnection, protecting cooperative member-consumers.
- For project-specific cost information, the IC can contact the affected electric cooperative or submit a pre-application.

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Comments & Questions

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DER Overview – Appalachian Power

October 9, 2023

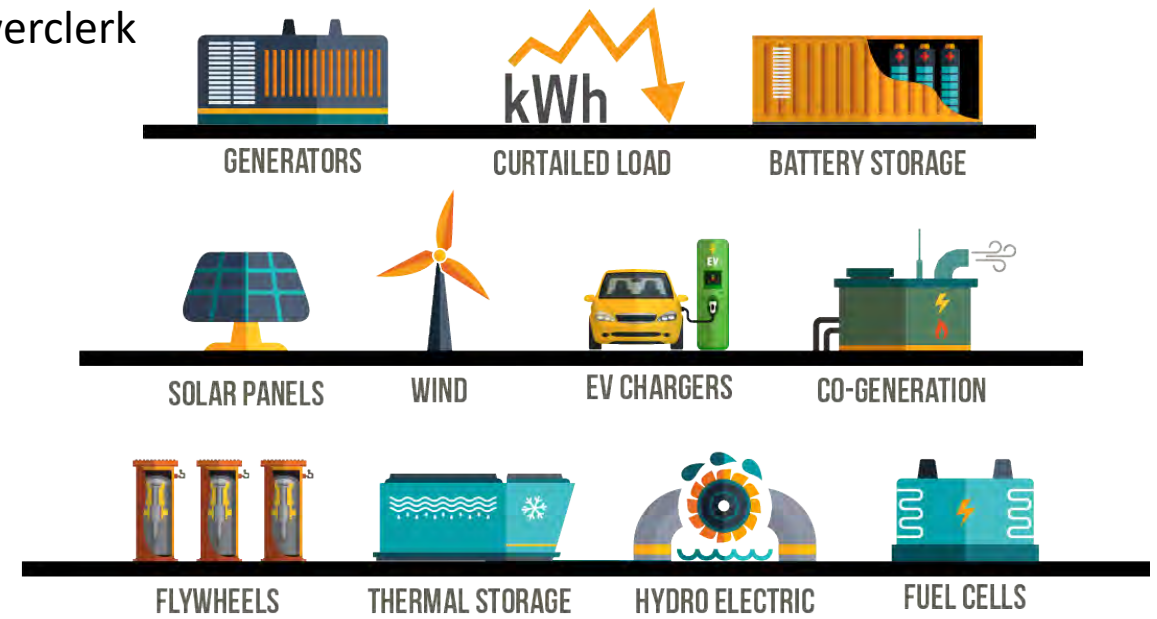
Agenda

1. Virginia DER Interconnection Location for Cost
2. DER Technical Requirements
3. Eleven Step Process alignment

AEP – Appalachian Power

DER Interconnections Virginia

- Installing Generation Equipment – Customer Guides
- Virginia – Level 1, 2, 3 request forms, NEM guides, etc.
- Costs for applications listed on forms
- Costs for applications listed within User Interface tool Powerclerk



https://www.appalachianpower.com/business/builders/generating-equipment

Technical Requirements

DISTRIBUTION

https://www.appalachianpower.com/clean-energy/renewable/solar/

Distribution DERs as Load Reducer

- DER must be properly interconnected to the distribution system, including state IA & EDC procedures

Distribution DERs as Supply Resource

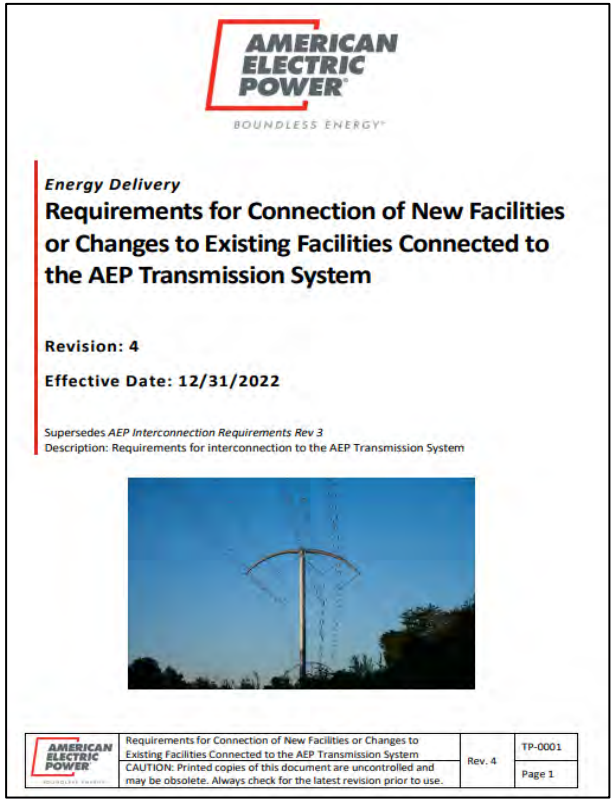
- DER must be properly interconnected to the distribution system, including state IA and EDC procedures
- DER may need to follow Transmission/RTO and TO procedures

Future:

DISTRIBUTION: DER Aggregator registers DERs with RTO

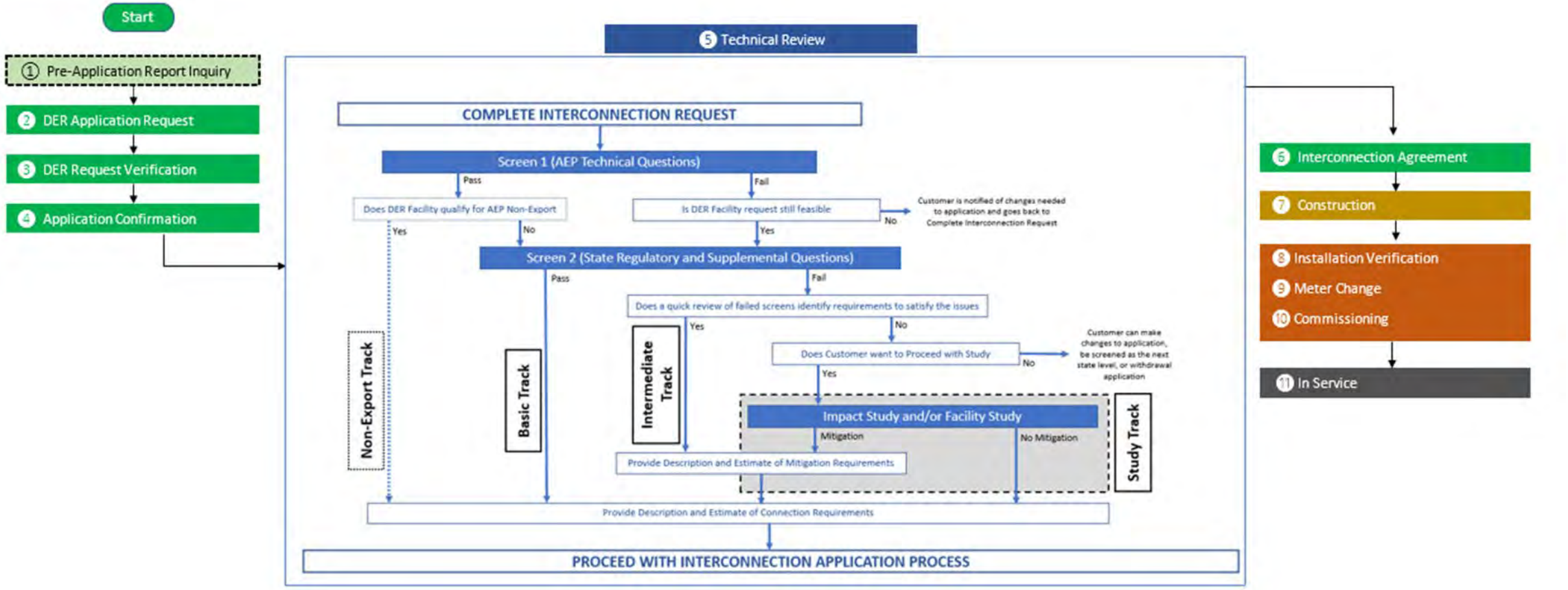
- DERA prepares the required information for each DER and enters it into the RTO's application

TRANSMISSION



https://www.aep.com/assets/docs/requiredpostings/TransmissionStudies/Requirements/AEP_Interconnection_Requirements_Rev4.pdf

AEP – Appalachian Power



https://www.appalachianpower.com/business/builders/generating-equipment

Volume 2, Page 241

Challenges

Distributed Energy Resource (DER)

- Application and Study fees
- Grid reliability
- Safety
- Cybersecurity
- Capacity reliance
- Technology costs – transformation from manual to automated
- Queue process review – existing DERs, aggregations, new DERs, etc.
- Cost recovery

Working Group 2, Meeting 4 Presentation Materials

Working Group 2, Meeting 4 (October 30, 2023): *Combined initial kick-off meeting for both working groups*

- GPI guidance/overview slides **(Volume 2, Page 244–Volume 2, Page 258)**

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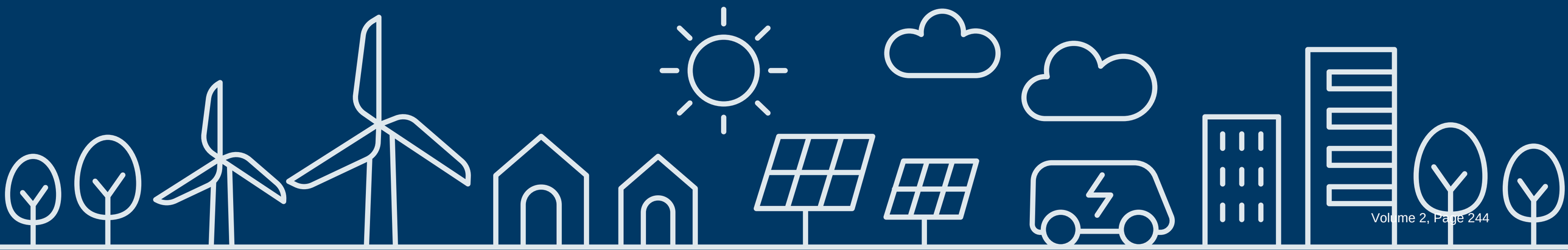
Virginia DER Interconnection Working Groups

Working Group 2, Meeting 4

October 30, 2023

-Virtual meeting-



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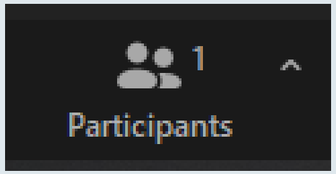

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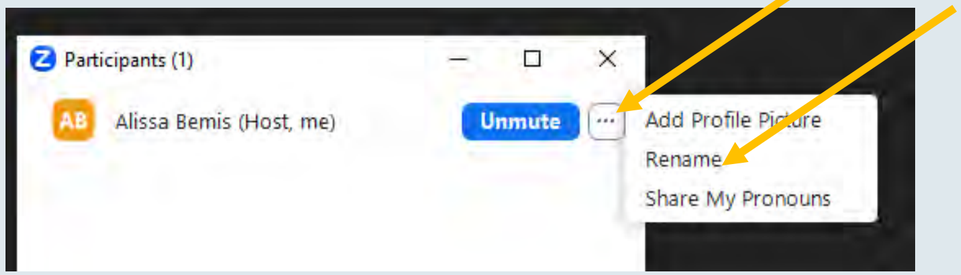
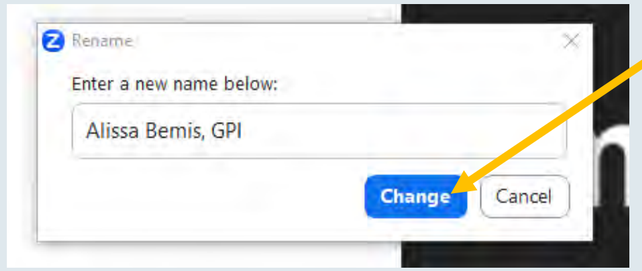


3) Add your organization to your name and click “Change”



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Agenda

8:30am	**Welcome and Introductions, Process Update & Agenda Review**
8:40am	**Discussion: Potential utility-led (Commission-directed) solutions**
	Discuss solution #7: Overview, Q&A, and discussion of Dominion's pilots to date and participant-suggested technologies
10:00am	**Break**
10:30am	**Continued Discussion: Potential utility-led (Commission-directed) solutions**
	Discuss and assess support for solutions #4–6
11:30pm	**Discussion: Potential Commission-led solutions**
	Discuss and assess support for solutions #1–3
12:00pm	**Lunch Break**
1:00pm	**Discussion: Refining proposed solutions to DTT/dark fiber issues**
2:25pm	**Wrap up and next steps**
2:30pm	**Adjourn**

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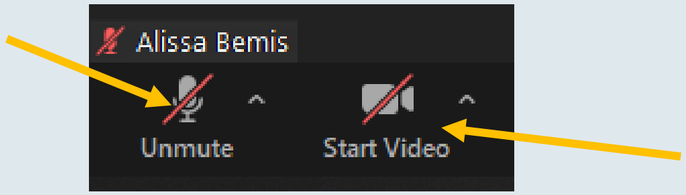
Zoom 101

Mute/Unmute and Turn on/off camera

1) Mute/unmute: Click on the microphone icon on the menu on the bottom of your screen.

1) Click on the video icon to turn your camera on and off.

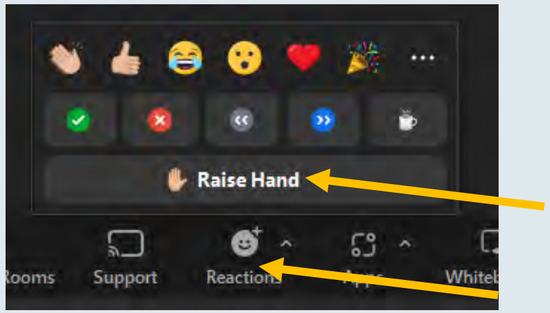


Turn on closed captions

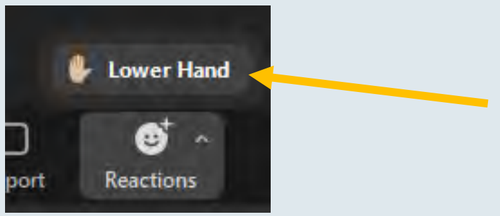
1) Click on the “Show Captions” icon at the bottom of your screen. Select the language you would like the captions in and click “Save.”

Raise your hand

1) Click on the “reactions” icon at on the menu at the bottom of your screen. Then click “Raise Hand.”



2) Once you are done speaking, click “Lower hand” to lower your hand.



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Meeting Goals

1. Level-set on which potential solutions to the DTT/dark fiber issue in Virginia have/have not been explored to date through **pilots, studies or other research initiatives**.
2. Refine and discuss support for potential **utility-led (Commission-directed) solutions** to the DTT/dark fiber issue.
3. Refine and discuss support for potential **Commission-led solutions** to the DTT/dark fiber issue.
4. Discuss what **would be needed to make potential solutions viable** paths forward for addressing the DTT/dark fiber issue in Virginia.

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Ground Rules

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2. **Respect the time.** Our time together is limited and valuable, so please be mindful of the time and of others' opportunity to participate.
3. **Share your perspective and help others share theirs.** We need everyone's wisdom to achieve better understanding and develop robust solutions.
4. **Enable honesty through non-attribution.** Outside of this group, you may share what was said, who was present, and perspectives shared at an organizational level, but please refrain from attributing perspectives to individual participants without first obtaining that individual's permission. All meeting notes and materials will also adhere to this.

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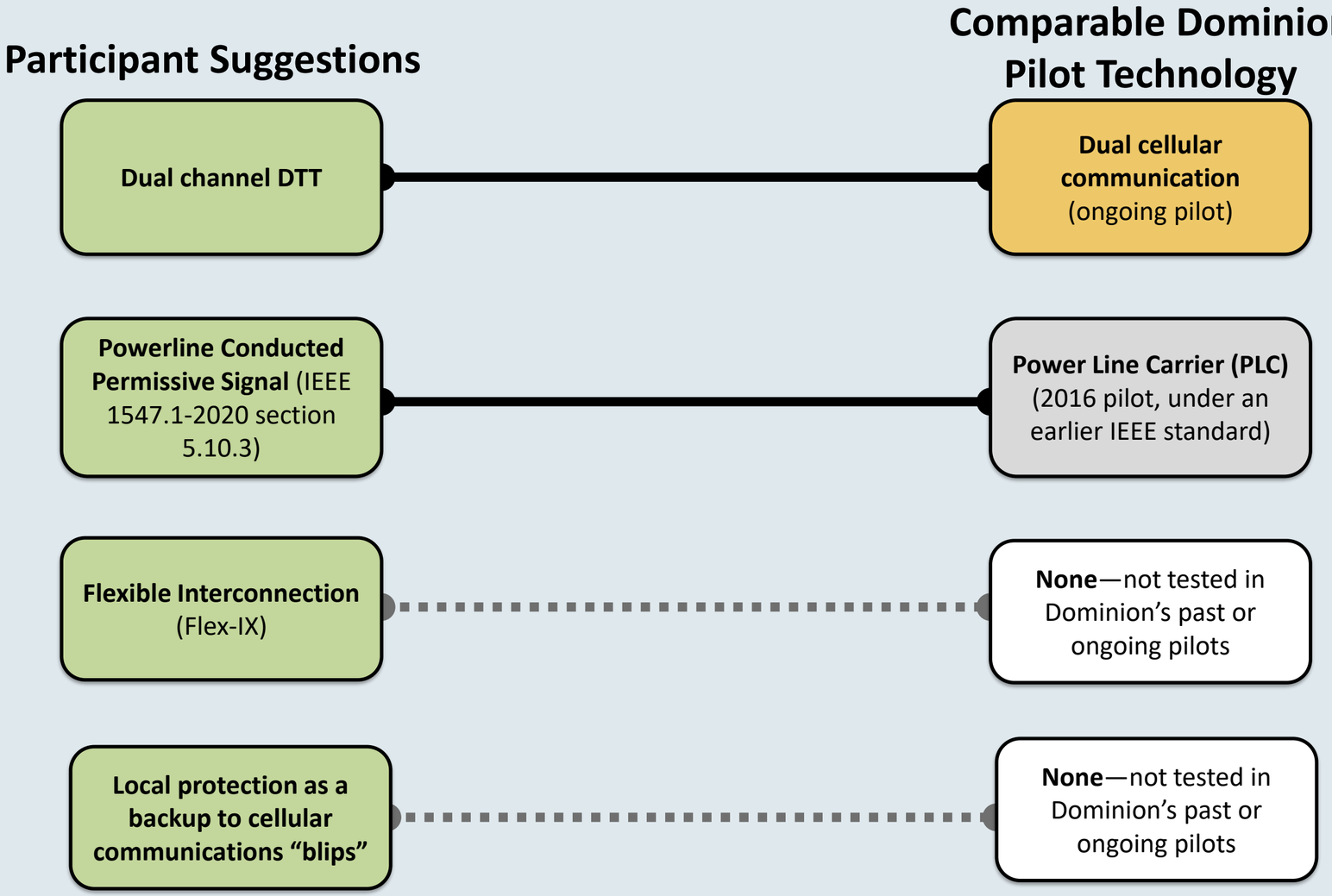
Overview of Dominion Energy's Pilots

Past Pilots		
Pilot Technology, Year	**Summary**	**Findings**
1. Power Line Carrier (PLC), 2016	High frequency signal injected onto power line, similar to PLC used on transmission systems	Underground and single-phase taps attenuated the high frequency signal, so signal regenerators had to be installed to maintain signal strength. The signal regenerators delayed response time—**did not meet Dominion's 160 millisecond timing criteria**.
2. Parallel cellular DTT w/ existing telephone line, 2019	Cellular path installed parallel to existing telephone; aim to improve communication signal reliability	Telecom companies are phasing out telephone lines; existing lines often have maintenance/reliability issues—**cellular signal was dropped more frequently than the telephone line signal.**
3. Ethernet-based Communication, 2021–2022	Installed ethernet-based communication schemes on four circuits	Network switching and maintenance activities on the third-party communication system led to **all four circuits experiencing significant communications signal dropout rates**.
Current Pilots		
Pilot Technology, Year	**Notes**	
4. Dual cellular communication, 2022–present	Dual cellular DTT system consists of two cellular signals, with each signal provided by a separate cellular carrier. **Goal is to identify if redundant cellular communication paths improve the overall signal reliability.**	
5. Ground switch recloser, 2023	Ground switch on a recloser deliberately grounds the system after the recloser has tripped for a sensed fault condition. **Deliberate system grounding should reduce voltage on the circuit and will ideally trip all DERs offline within the faulted zone.**	
6. Min. Import Requirement for NEM sites, 2023	Utilize high speed reverse power relaying at the point of interconnection for NEM sites to prevent those sites from injecting power back onto the system. Requires that the inverter throttle power produced by the DER site to meet a minimum import threshold. **If this threshold is not met, the site would be tripped by utility owned, maintained, and operated protective relaying.**	

Source: Dominion Energy's response to Question 5 from Working Group 2, Homework 1 (*Clarifying Questions on DTT/Dark Fiber for Dominion Energy*).

Question 5 text: *If Dominion has considered alternatives to DTT/dark fiber through pilots or dedicated studies, could Dominion provide a list of such pilots and/or studies and share the results?*

Participant-Suggested Technologies for Further Study



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-Break-

Please return at 10:25am.

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Discussion: Potential Utility-Focused Solutions (Solutions #4–7)

For **each** potential utility-focused solution…

- Are any parts of this potential solution already in progress or have any parts already been addressed? If so, what parts?
- Should this potential solution be pursued?
- If the Commission elects to direct utilities to pursue this potential solution, through what process(es) or formats would the solution be best executed?

Discussion: Potential Commission-Focused Solutions (Solutions #1–3):

For **each** potential Commission-focused solution...

- Are any parts of this potential solution already in progress or have any parts already been addressed? If so, what parts?
- Should this potential solution be pursued?
- If the Commission elects to pursue this potential solution, through what process(es) or formats would the solution be best executed?

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-Lunch-

Please return at 1:00pm.

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Discussion: Refining Proposed Solutions to DTT/Dark Fiber Issues

- What would need to be done to make the discussed solutions work?
- What should be included as part of these solutions?

Next Steps

- Final meeting scheduled for **Monday, December 4th**.
  - Combined meeting for both Working Groups
- GPI to send out draft report in coming weeks
  - Participant feedback on report due mid/late November
  - More details to follow

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THANK YOU

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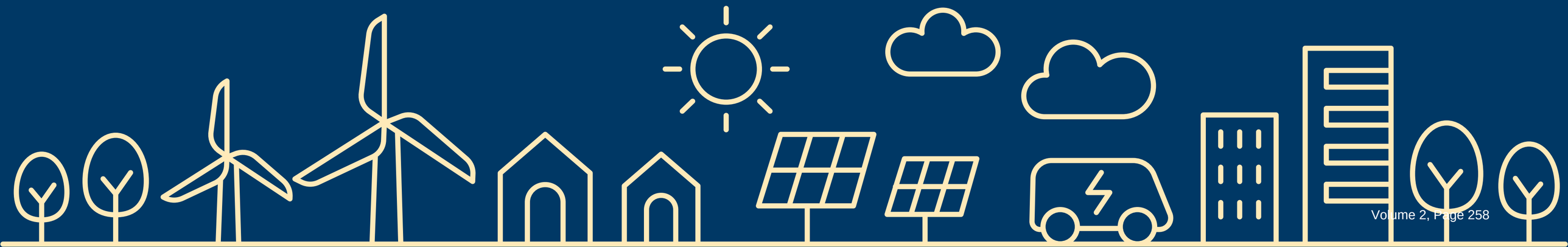

Combined Final Meeting Presentation Materials

Combined Final Meeting (December 4, 2023): *Refining solutions developed throughout the working group process (to be included in the final report) and identify consensus where it exists*

- GPI guidance/overview slides **(Volume 2, Page 260–Volume 2, Page 267)**

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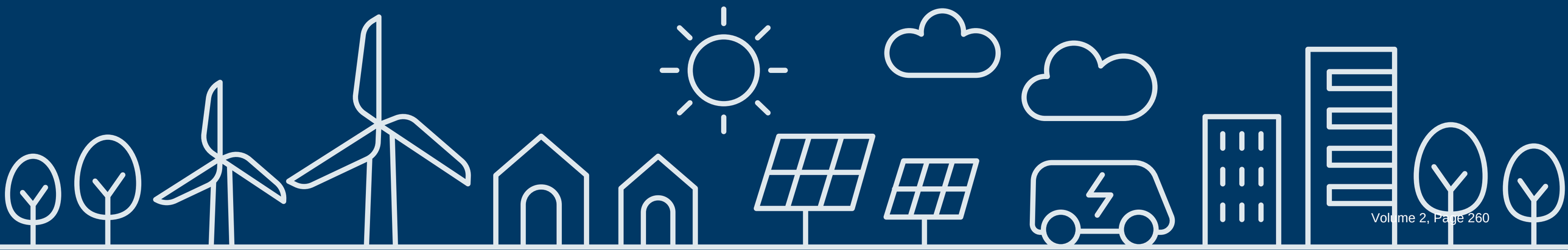
Virginia DER Interconnection Working Groups

Final Meeting—Both Working Groups

December 4, 2023

-Virtual meeting-

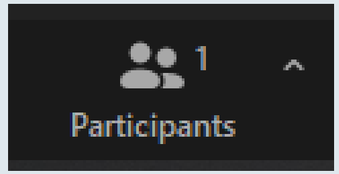


Welcome!

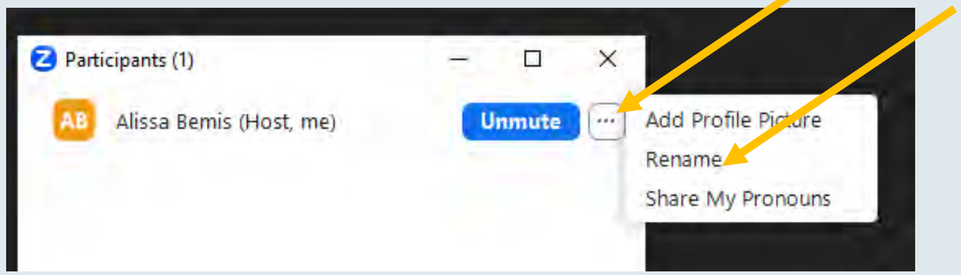
Please share your name and organization in the chat.

Add your organization to your name:

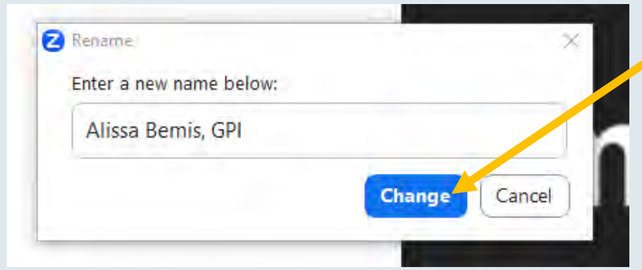
1) Click on the “Participants” icon at the bottom of your screen



2) Hover over your name in the participants list and click the three dots that appear and click on “rename”



3) Add your organization to your name and click “Change”



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Agenda

8:30am	**Welcome and Introductions, Process Update & Agenda Review**
8:40am	**Discussion: Section A, *Overarching Considerations***
8:45am	**Discussion: Potential solutions from Sections B & C**
	8:45 Section B, *Study and Construction Timelines*
	9:30 Section C, *Interconnection Costs and Information Transparency*
10:15am	**BREAK**
10:30am	**Discussion: Potential solutions from Sections E, D, & F**
	10:30 Section E, *Approaches to Meeting Safety and Reliability Requirements*
	11:15 Sections D, *Cost Allocation* and F, *High-level Regulatory Changes*
12:00pm	**LUNCH BREAK**
1:00pm	**Additional discussion as-needed on potential solutions from Sections B–F**
1:45pm	**Final discussion & next steps**
2:30pm	**ADJOURN**

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Meeting Goal

Work through the draft potential solutions section-by-section, seeking to clarify areas of agreement and disagreement for the final report, and making adjustments to enable agreement where beneficial.

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Section A: *Overarching Considerations*

Overarching Considerations: Items that are not necessarily potential solutions, but that should be considered throughout the working group process or during potential solution evaluation and/or implementation.

A.6: Pursued solutions should enable compliance with Virginia's energy policy goals and legislative requirements, such as those established under the VCEA.	• Combined Meeting 1 • Working Group 1, Meetings 2 and 3 • Working Group 2, Meetings 3 and 4
A.7: Recommendations, potential solutions, and procedures under consideration should consider the similarities, differences, and variable needs/requirements of all utilities, cooperatives, etc. under SCC jurisdiction. Any potential solution being pursued should be developed with these factors in mind and should consider how interconnection processes and needs differ among utilities in terms of service territory and business model.	Working Group 1, Meeting 2

LUNCH BREAK – Please return at 1:00PM ET

THANK YOU

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