



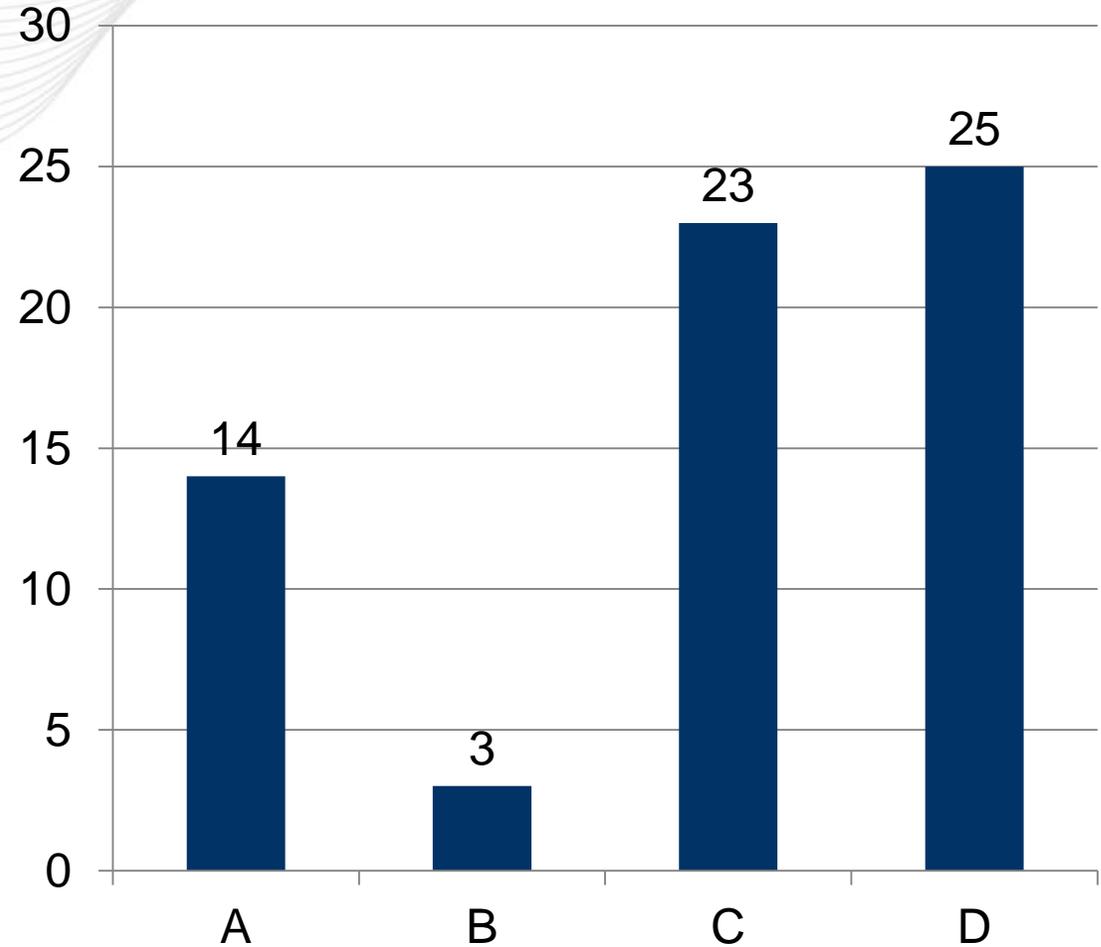
# DER Ride Through Polling Results

May 21, 2019

- Poll open May 9 through May 16, 2019
- 24 responses covering 65 members
- Results will drive discussion for stakeholders to develop the solution package
- Ranking questions will not include “Other” unless the respondent provided a comment.
- All questions were mandatory. If a comment clearly stated the respondent had no opinion, the count was omitted.

## Please indicate your preference for the output of this Task Force

- A. PJM “standard” settings that should be used consistently for all DER facilities across the PJM footprint
- B. PJM “standard” settings that should be used for all FERC-jurisdictional DER facilities across the PJM footprint
- C. PJM “recommendation” that can be used when the local EDC does not have a standard
- D. Other (please specify)

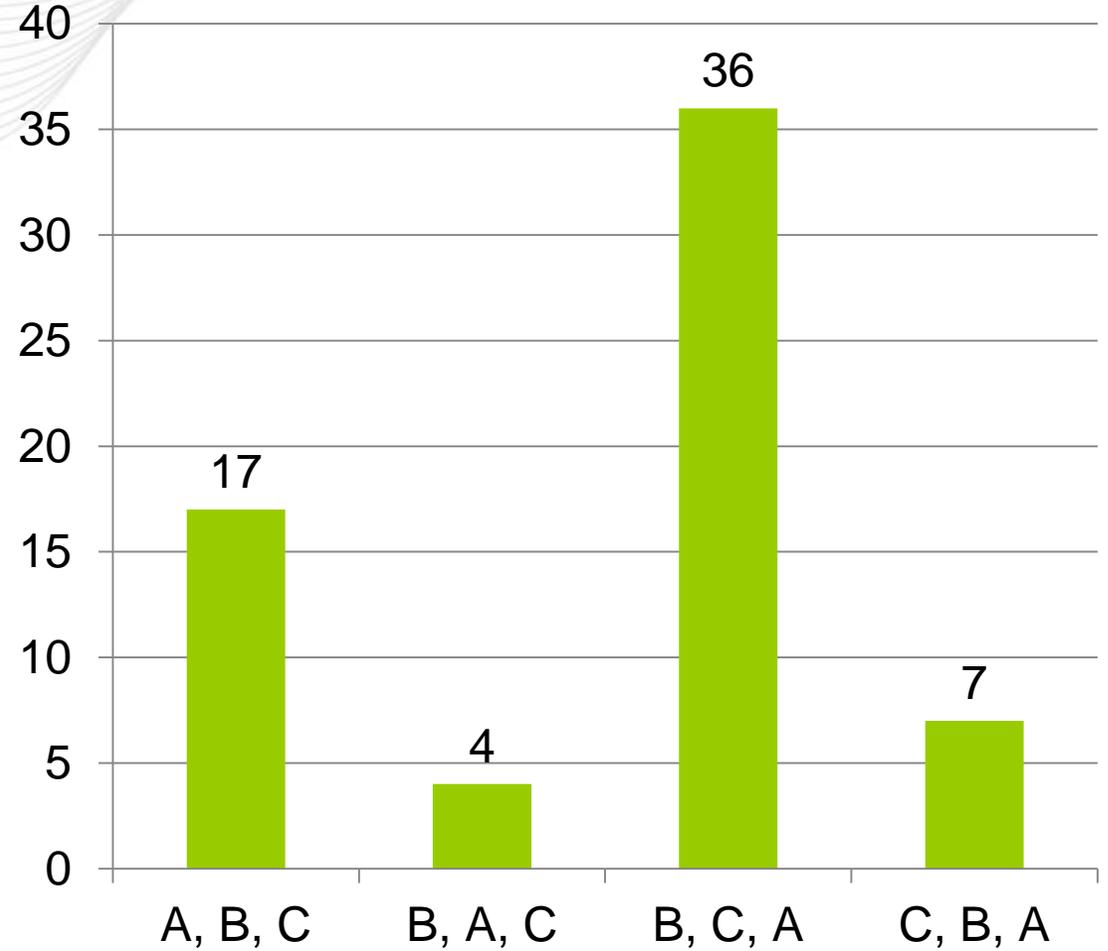


## Comments

- We support a PJM "recommendation" that can be used when the local EDC does not have a standard (3rd answer). We are answering this survey as if PJM is only discussing PJM jurisdictional DERs. Answers from a retail jurisdictional DER standpoint can and will differ, and thus the survey results should not be applied to create or suggest retail jurisdictional DER standards. We believe that there are no "one-size fits all" settings that can be used consistently for all DER facilities, and that ultimately the local EDC should be responsible for creating and implementing DER standards.
- A "standard" ride-through setting should be adopted within the PJM footprint that should not be deviated from unless a study, following good utility practice, is performed that indicates a more optimal setting should be used.
- PJM "standard" settings that should be used consistently for all DER facilities across the PJM footprint where local EDC reserves the right to supersede as they deem necessary
- PJM to use the output of this Task Force to develop a technical guidance document that utilities and states can, but are not required to, use in their implementation of the ride through and trip requirements of IEEE 1547
- Technical work product for local EDCs to consider

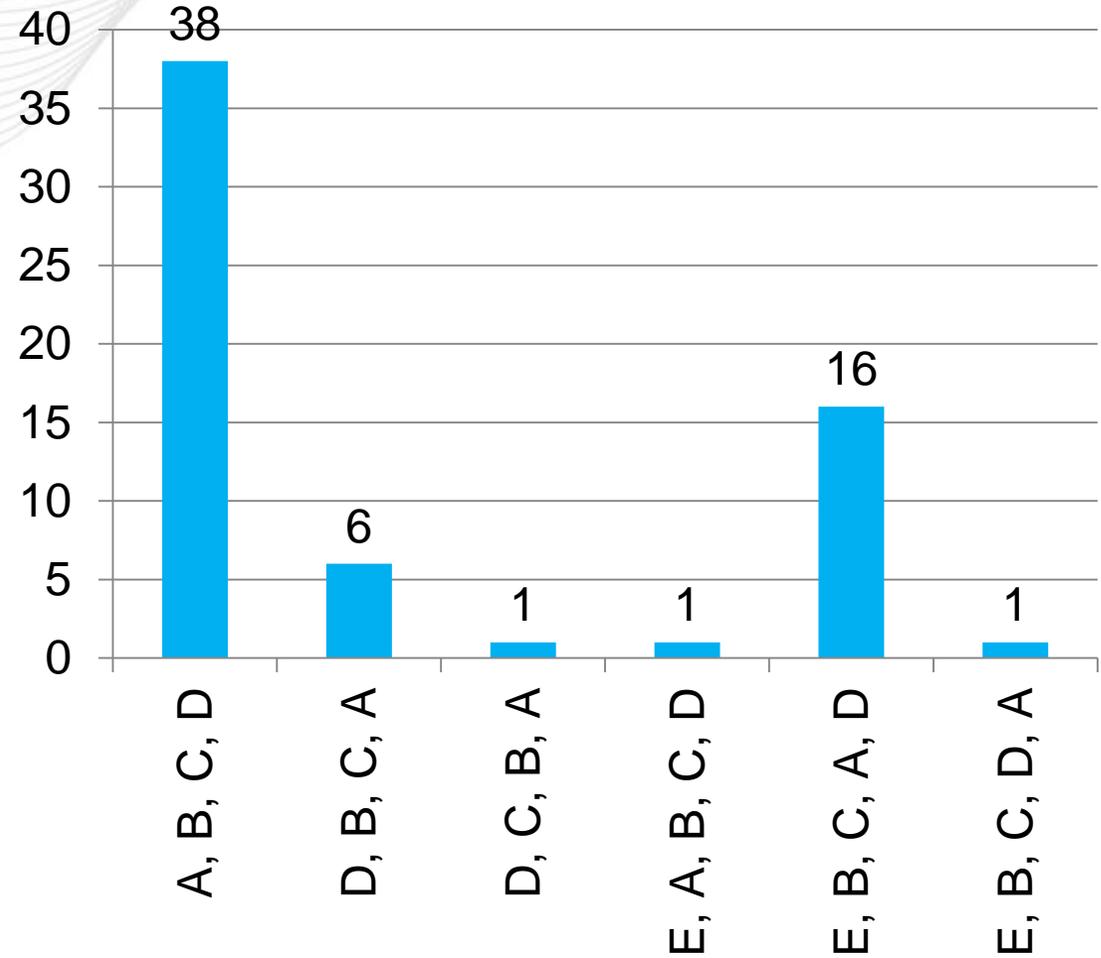
Rank your preference for the IEEE  
1547-2018 Abnormal Conditions  
Category

- A. Category 1
- B. Category 2
- C. Category 3



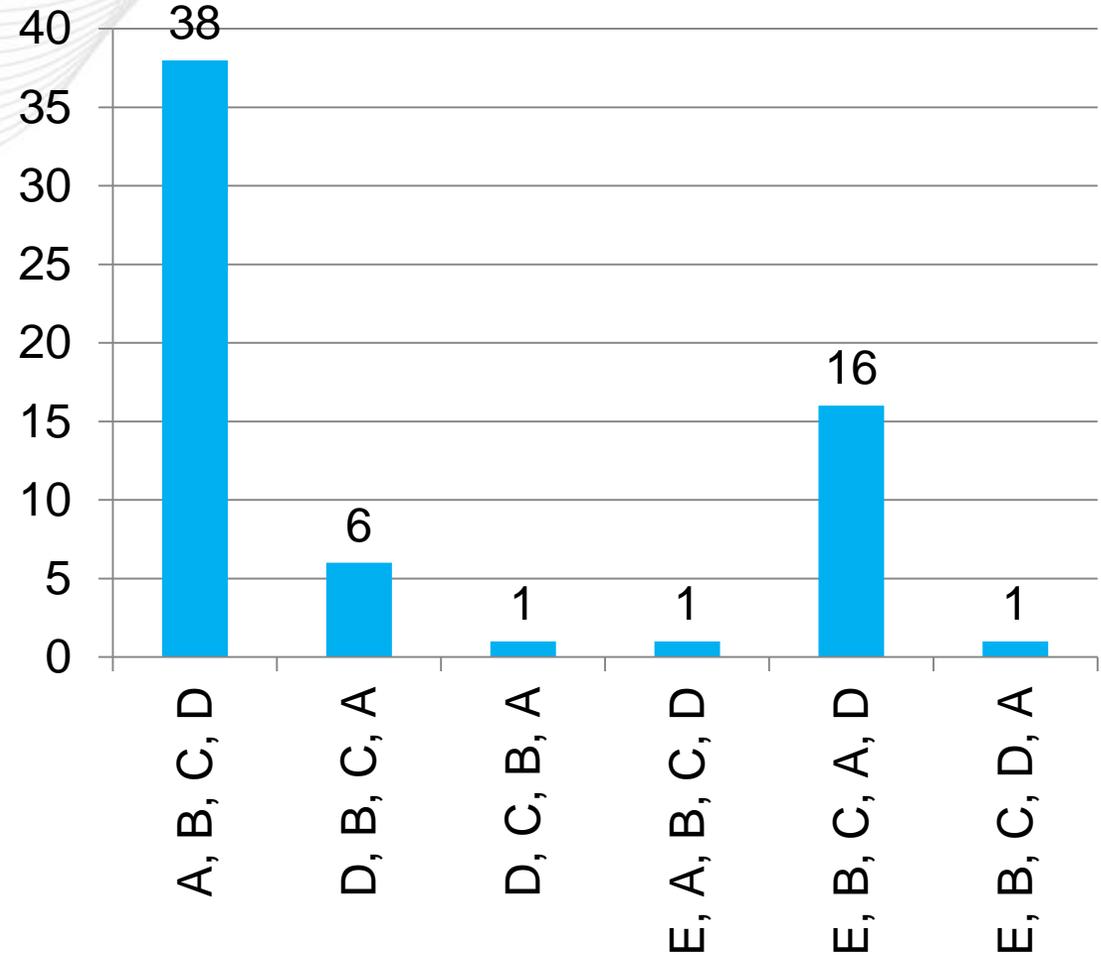
## Rank your preference for the under voltage 1 (UV1) intermediate low voltage trip

- A. Trip within 2 seconds at  $V < 0.88$  p.u. (implies 1.84 second ride through as specified in Cat II)
- B. Trip within 10 seconds at  $V < 0.88$  p.u. (ride through between 3 - 5s as specified in Cat II)
- C. Trip within 11 seconds at  $V < 0.88$  p.u. (ride through between 3 - 5s as specified in Cat II)
- D. Trip within 21 seconds at  $V < 0.88$  p.u. (ride through for 10s or 20s as specified in Cat III)
- E. Other



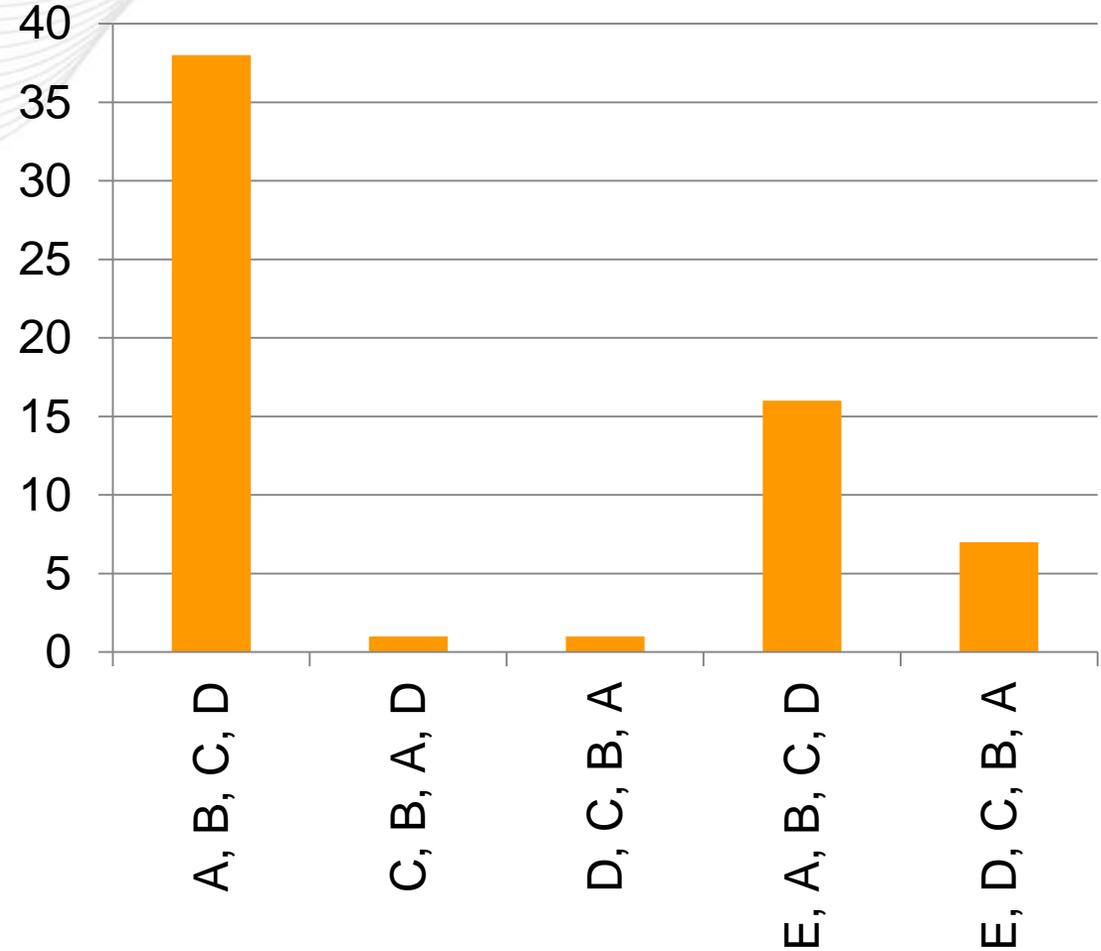
## Comments from those ranking E (“Other”) as the top choice

- We are answering this survey as if PJM is only discussing PJM jurisdictional DERs. Answers from a retail jurisdictional DER standpoint can and will differ, and thus the survey results should not be applied to create or suggest retail jurisdictional DER standards.
- Trip within 3 seconds at  $V < 0.88$  p.u.
- Our preferences for UV settings (for this question and subsequent questions) were chosen to reflect NERC PRC 24, with settings that allow DER to ride through slightly longer than NERC-jurisdictional generation. UV1 should be  $V < 0.9$  p.u. and should trip at 4 seconds.



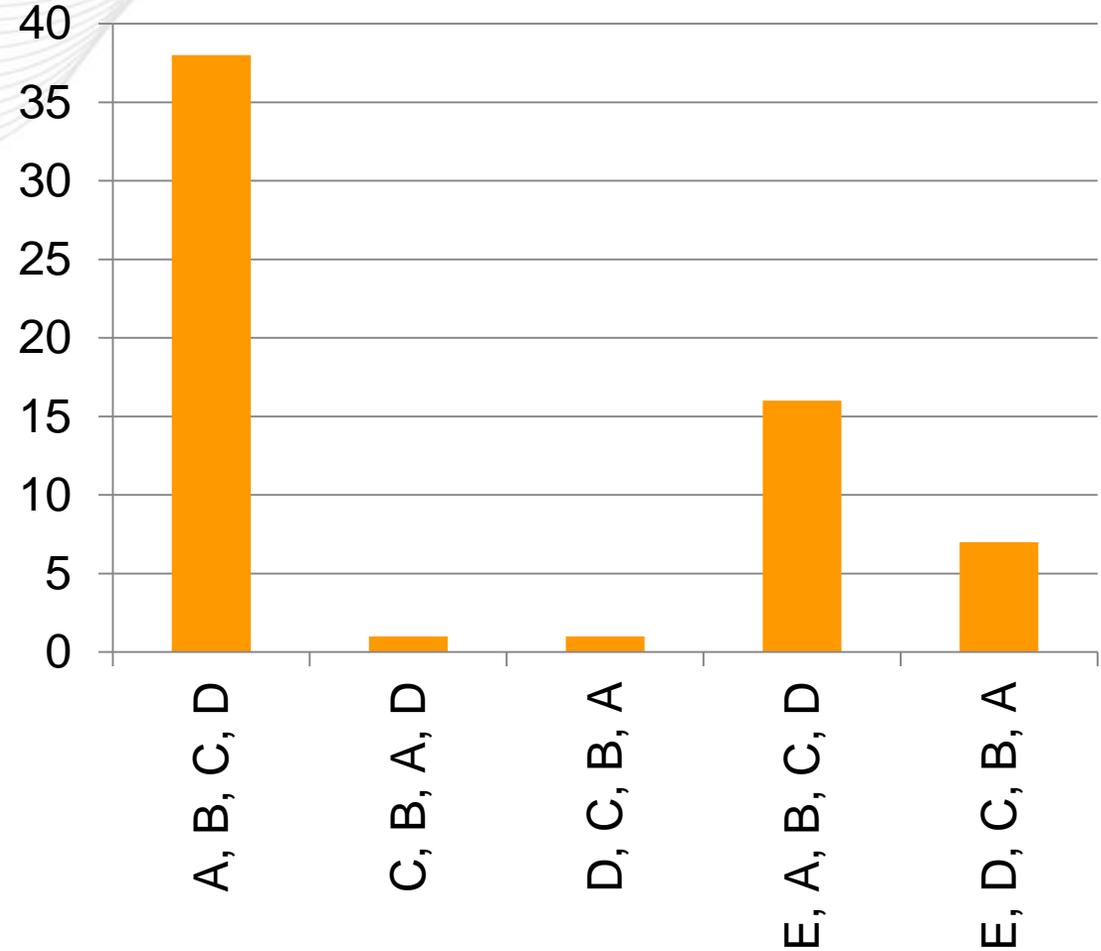
## Rank your preference for the under voltage 2 (UV2) severe low voltage trip

- A. Trip within 0.32 seconds at  $V < 0.45$  p.u. (implies 0.16 second ride through in "permissive operation" mode down to 0.30 p.u. as specified in Cat II)
- B. Trip within 1.1 seconds at  $V < 0.45$  p.u. (implies 0.16 second ride through in "permissive operation" mode down to 0.30 p.u. as specified in Cat II)
- C. Trip within 1.5 seconds at  $V < 0.5$  p.u. (implies 0.16 second ride through in "permissive operation" mode down to 0.30 p.u. as specified in Cat II)
- D. Trip within 2 seconds at  $V < 0.5$  p.u. (with 1 second of ride through in "permissive operation" mode down to 0.0 p.u. as specified in Cat III)
- E. Other



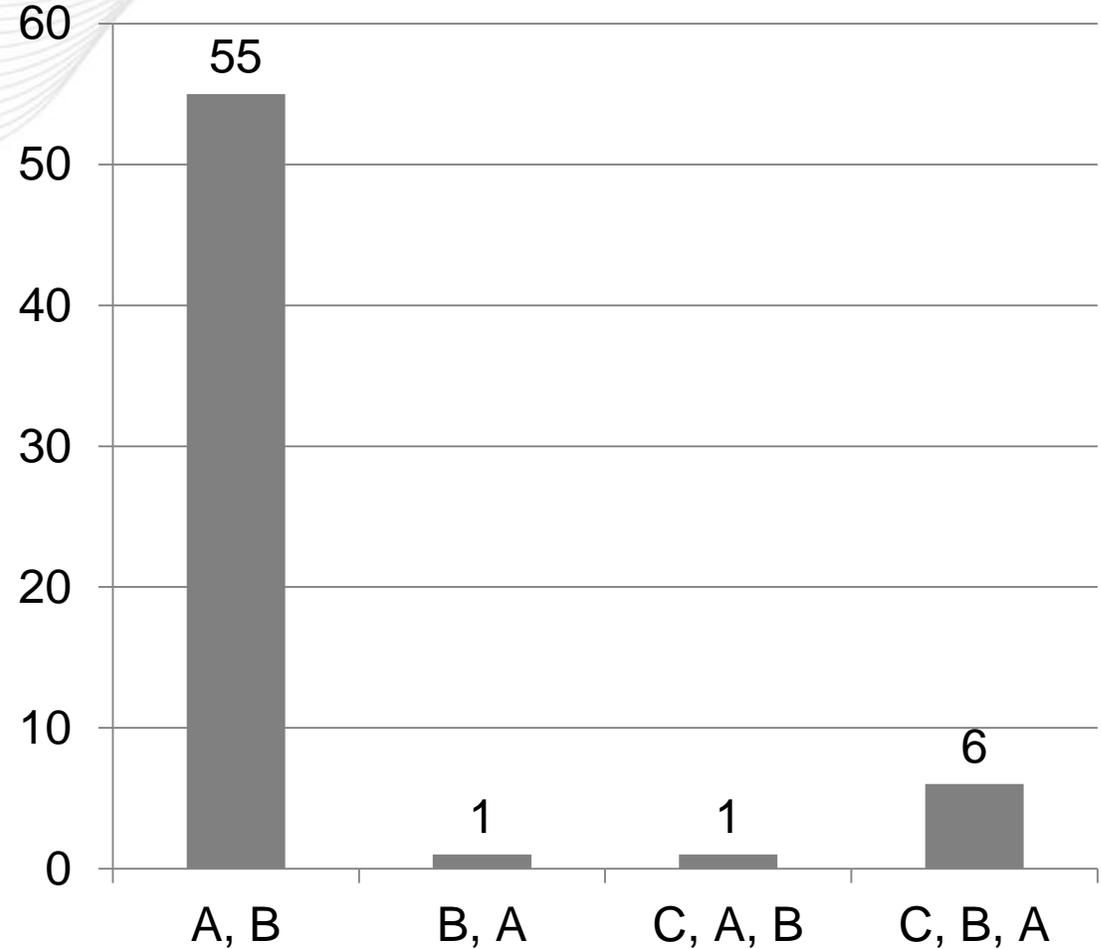
## Comments from those ranking E (“Other”) as the top choice

- Trip within 0.32 seconds at  $V < 0.45$  p.u. with momentary cessation
- Please define what is meant by "permissive operation": is it mandatory operation or momentary cessation. If momentary cessation is what was meant, our choice will be from 4 through 1. Responder wants momentary cessation to be the operating mode.
- UV2 should be  $V < 0.6$  p.u. and should trip at 2.5 seconds. UV3 should be  $V < 0.5$  p.u. and should trip at 0.5 seconds.
- Cat III - Mandatory Operation for  $V \geq 0.5$  p.u. with trip at 11 seconds, and Momentary Cessation for  $V < 0.5$  p.u. with trip at 1.5 seconds



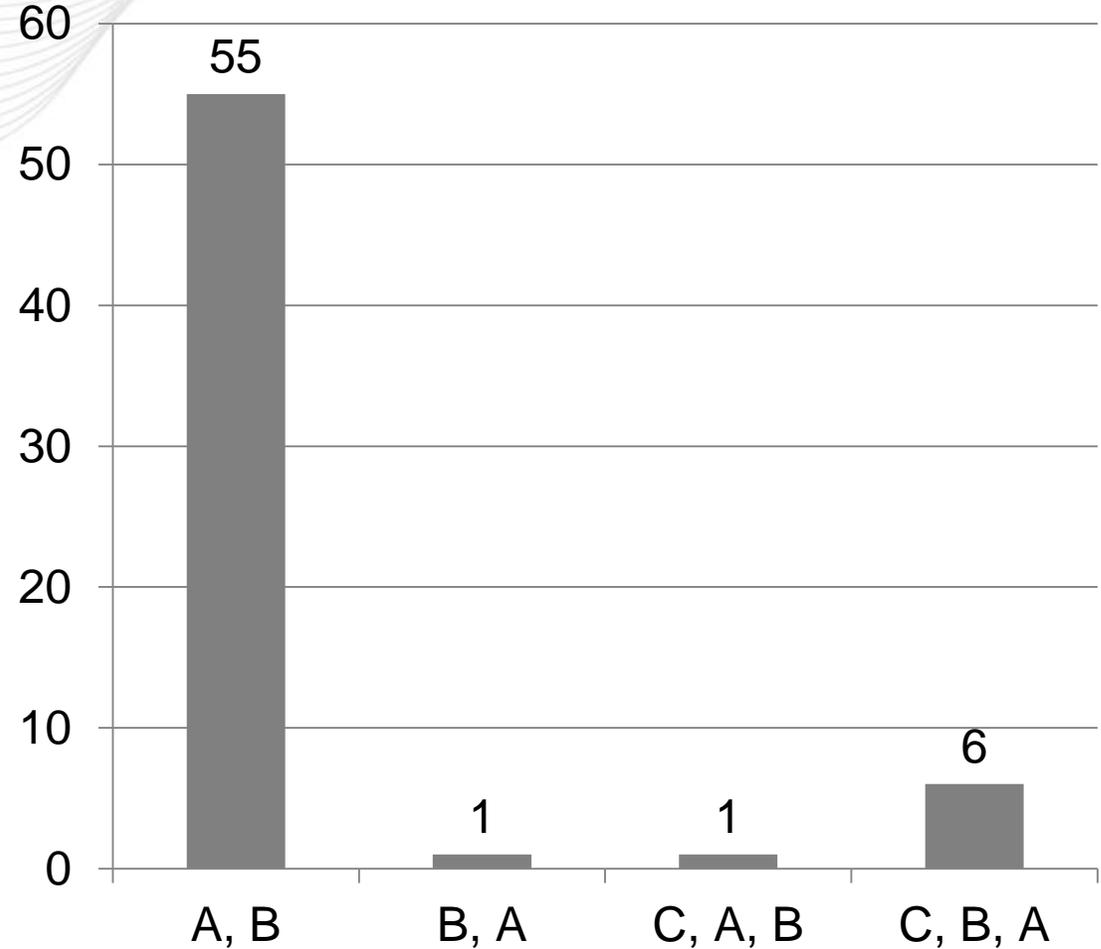
## Rank your preference for the overvoltage 1 (OV1) intermediate high voltage trip

- A. Use IEEE 1547-2018 Cat II default: trip within 2 seconds for  $V > 1.1$  p.u. (with stepped ride through between 0.20 and 1 seconds, as specified in Cat II)
- B. Use IEEE 1547-2018 Cat III default: trip within 13 seconds for  $V > 1.1$  p.u. (with ride through in momentary cessation for 12 seconds, as specified in Cat III)
- C. Other



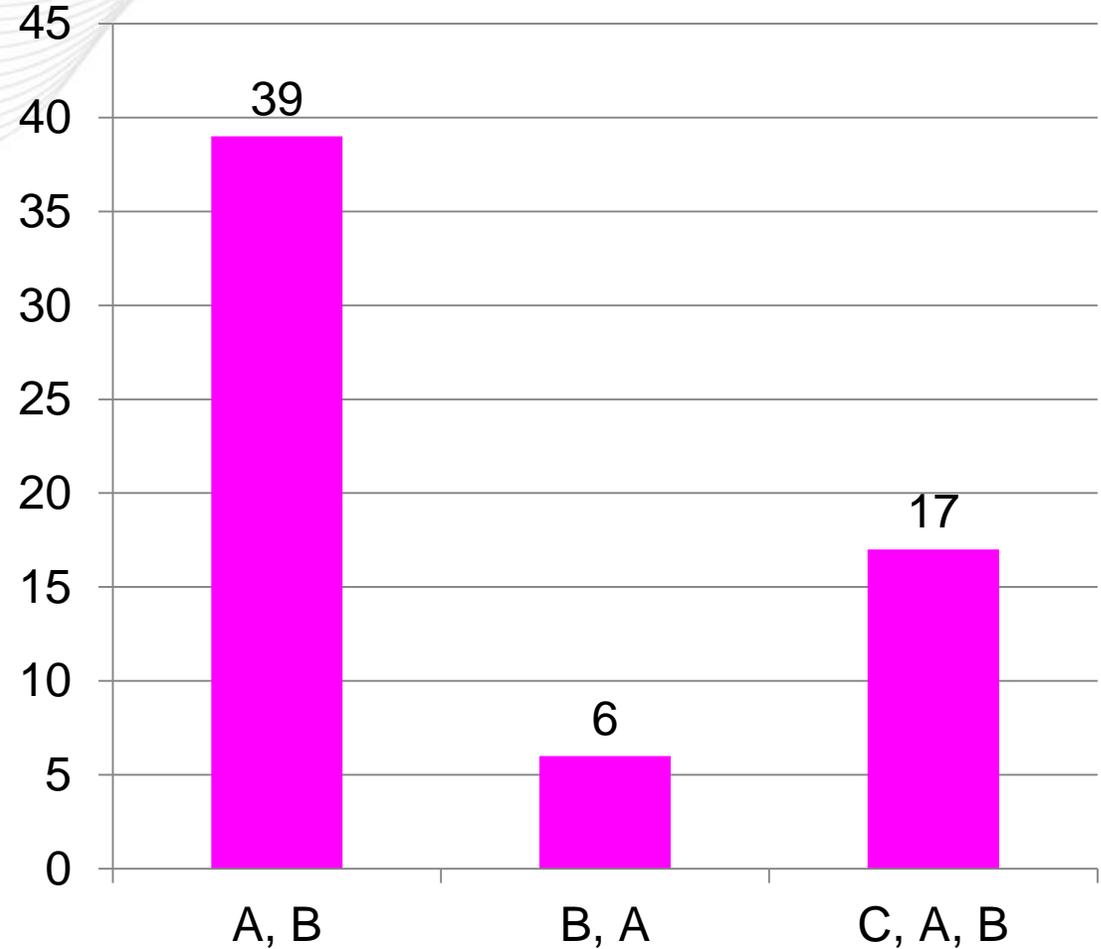
## Comments from those ranking C (“Other”) as the top choice

- Our preference is to have a step function as shown in the Category II, with momentary cessation capability, to conform to PRC-024
- OV1 should be: at  $V > 1.1$  p.u., immediately enter permissive operation; after 1 second at  $V > 1.1$  p.u., enter momentary cessation.



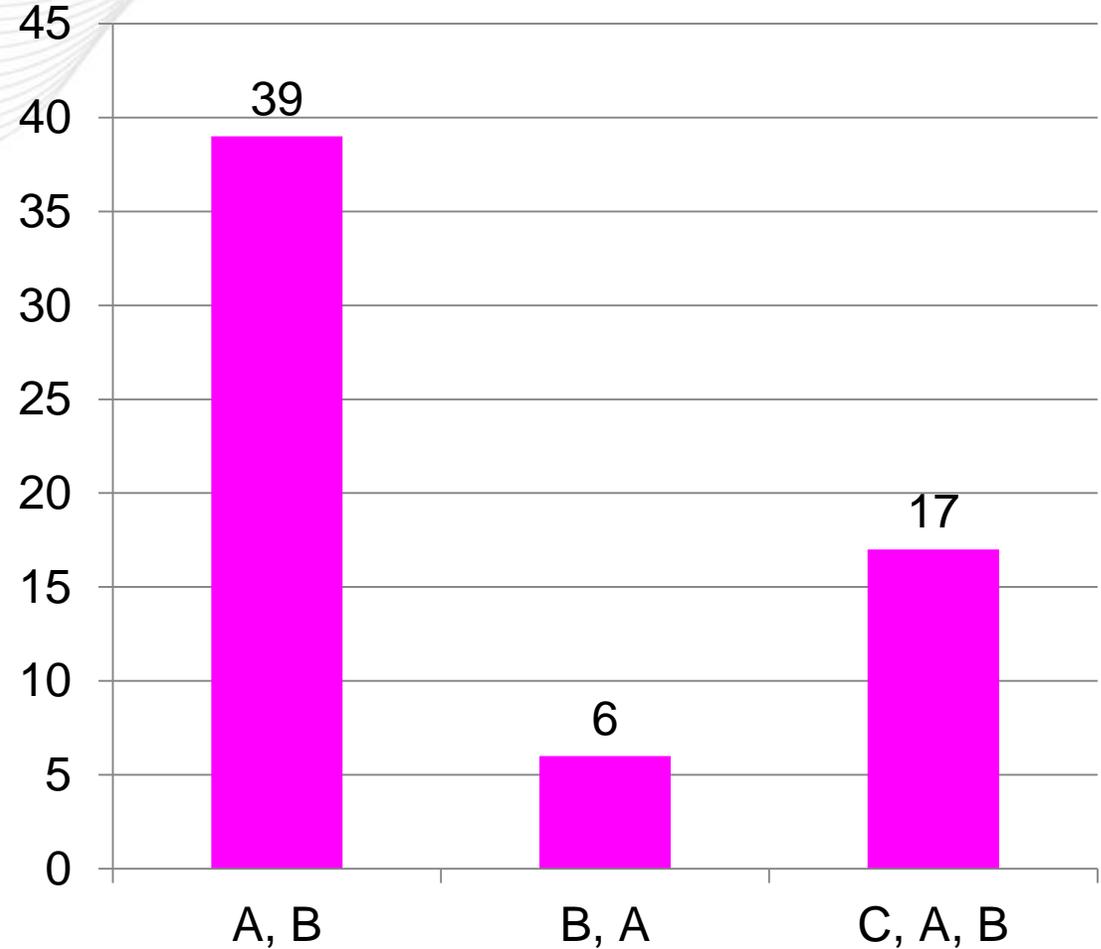
## Rank your preference for the overvoltage 2 (OV2) severe high voltage trip:

- A. Use IEEE 1547-2018 Cat II default: trip within 0.160 seconds for  $V > 1.2$  p.u., with implication of no ride through as specified in Cat II
- B. Use IEEE 1547-2018 Cat III default: trip within 0.160 seconds for  $V > 1.2$  p.u., with implication of no ride through as specified in Cat III
- C. Other



## Comments from those ranking C (“Other”) as the top choice

- We are answering this survey as if PJM is only discussing PJM jurisdictional DERs. Answers from a retail jurisdictional DER standpoint can and will differ, and thus the survey results should not be applied to create or suggest retail jurisdictional DER standards.
- At  $V > 1.2$  p.u., immediately enter momentary cessation

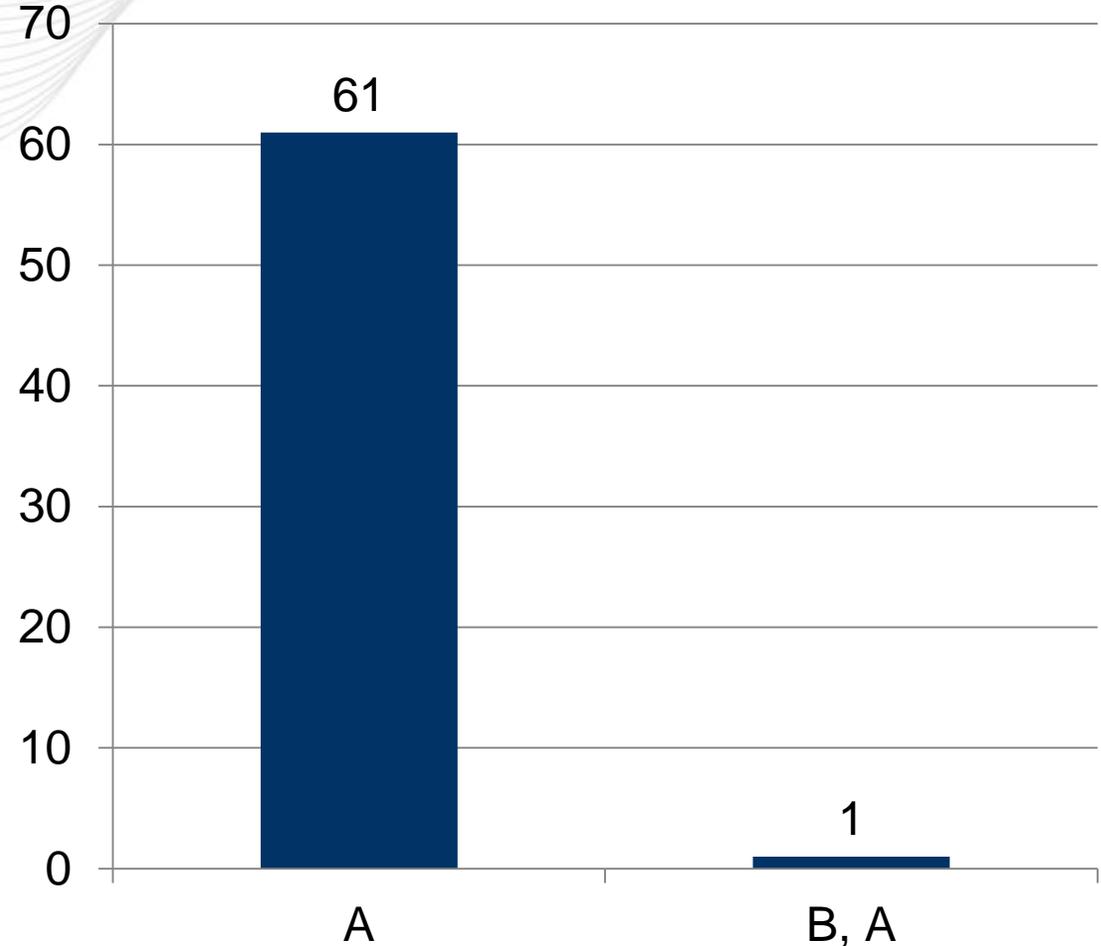


Rank your preference for the under frequency 1 (UF1) intermediate low frequency trip

- A. Use IEEE 1547-2018 default: trip within 300 seconds at  $f < 58.5$  Hz (with 299 seconds of ride through)
- B. Other

Comments from those ranking B (“Other”) as the top choice

- All of the following UF and OF settings were chosen to reflect the Eastern Interconnection (per NERC PRC 24), with settings that allow DER to ride through slightly longer than NERC-jurisdictional jurisdiction. Between 59.5 Hz and 58 Hz, clearing time  $> 700$  sec

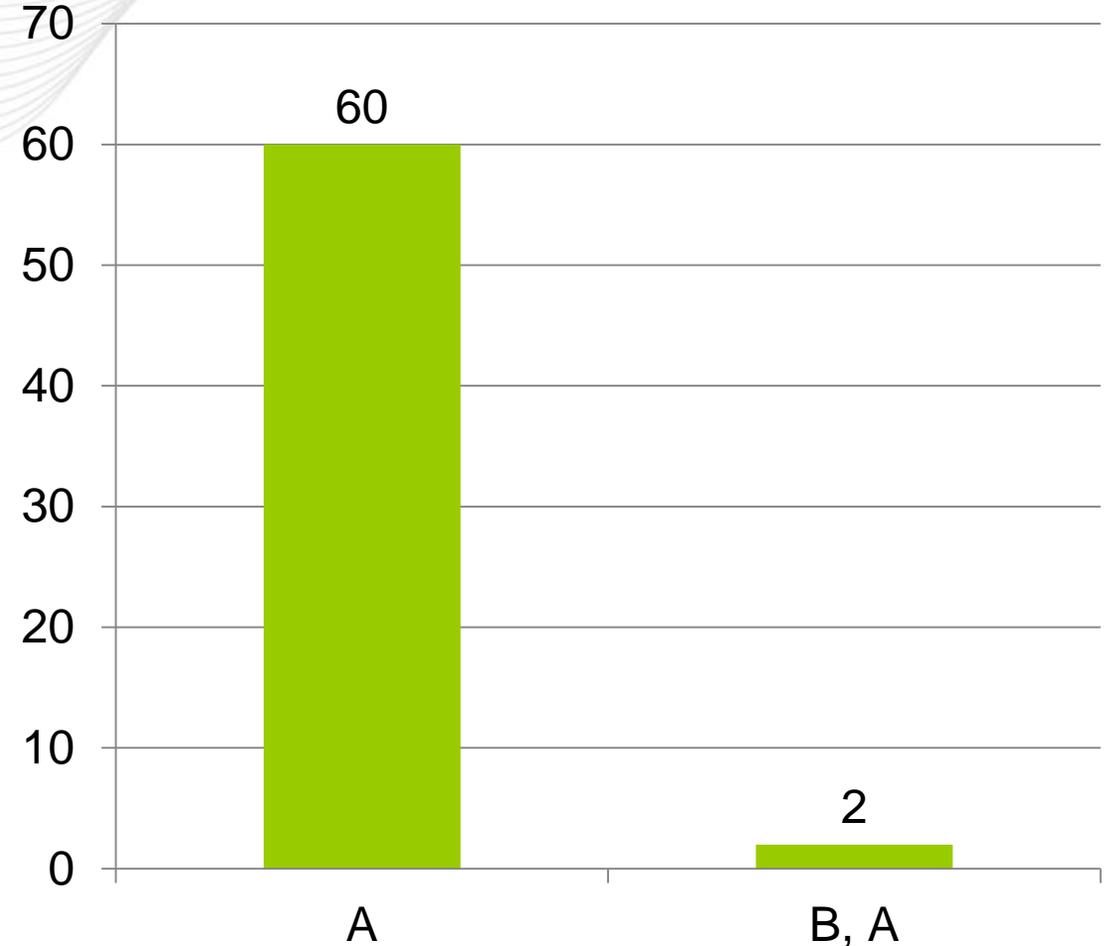


## Rank your preference for the under frequency 2 (UF2) severe low frequency trip

- A. Use IEEE 1547-2018 default: trip within 0.160 seconds at  $f < 56.5$  Hz (with no ride through below 57 Hz)
- B. Other

## Comments from those ranking B (“Other”) as the top choice

- Between 58 Hz and 57 Hz, clearing time > 10 sec. Below 57 Hz, clearing time = 0 sec.
- Trip within 0.16 seconds at  $f < 57.0$  Hz (with no ride through below 57.0 Hz)



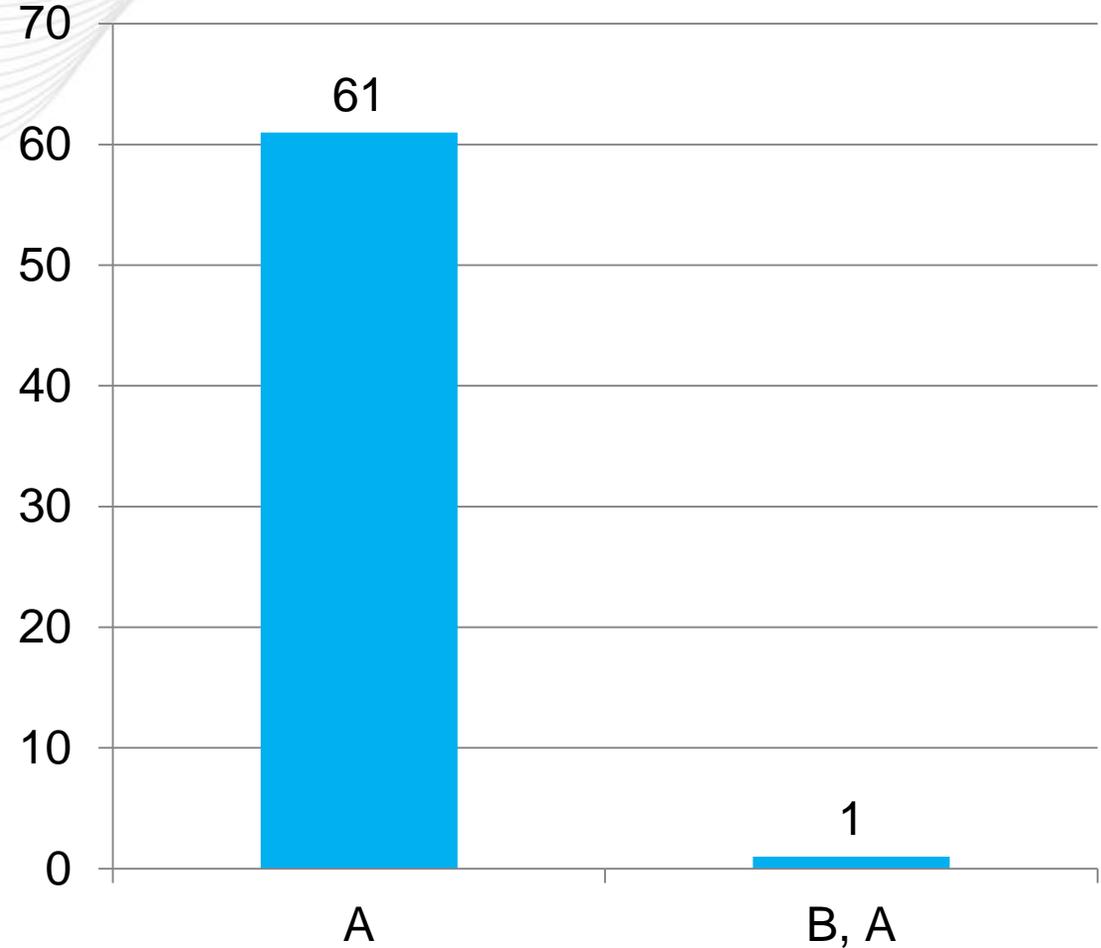
Rank your preference for the over frequency 1 (OF1) intermediate high frequency trip

A. Use IEEE 1547-2018 default: trip within 300 seconds for  $f \geq 61.2$  Hz (ride through for 299 seconds for  $f \leq 61.8$  Hz as specified in IEEE 1547-2018)

B. Other

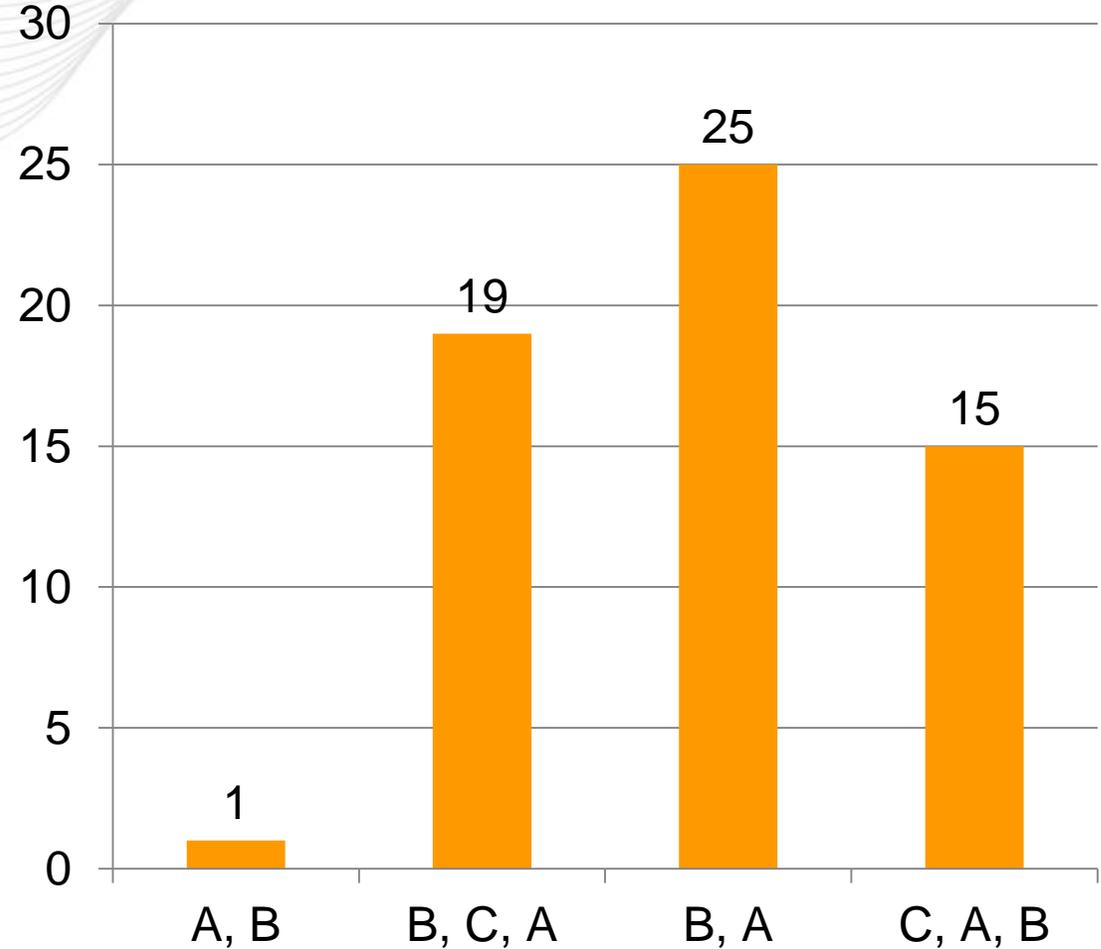
Comments from those ranking B (“Other”) as the top choice

- Trip within 300 seconds for  $f > 60.5$  Hz (ride through for 299 seconds for  $f \leq 62.0$  Hz)



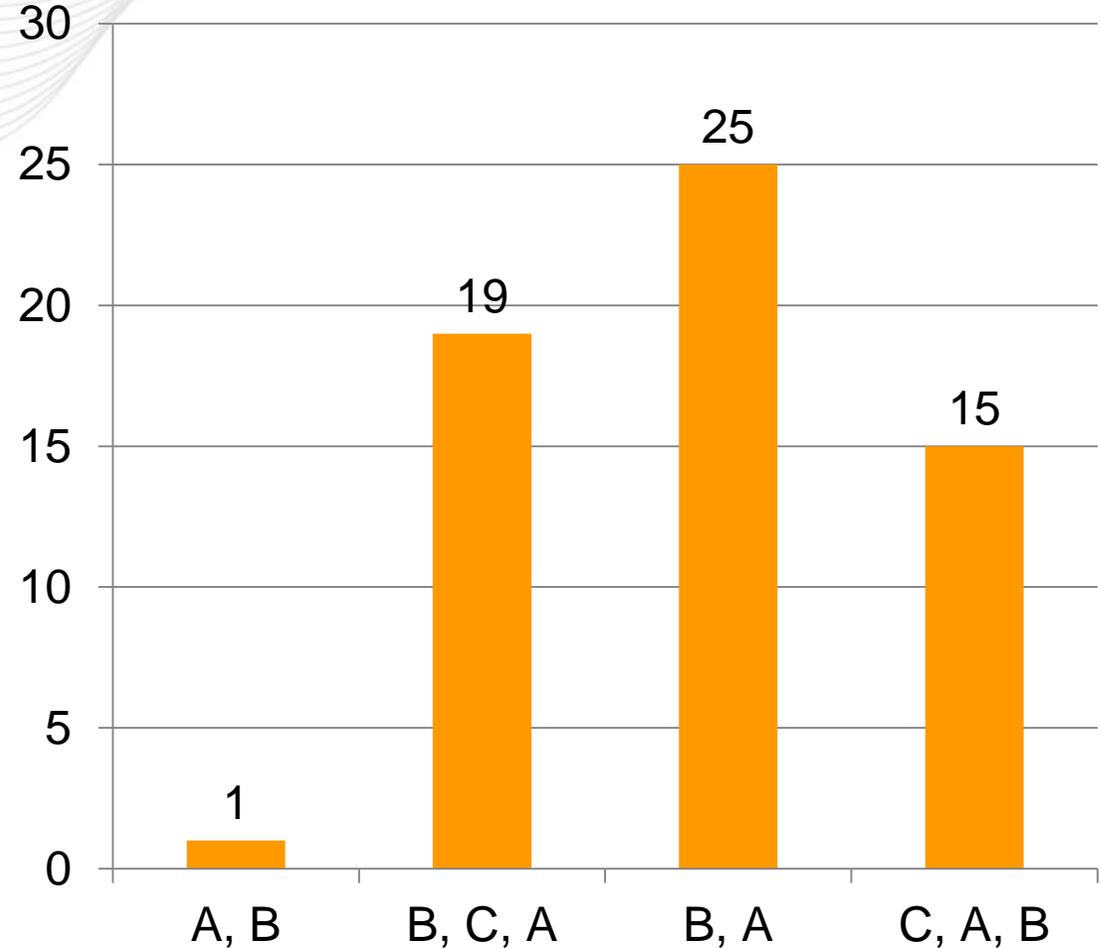
## Rank your preference for the Additional Requirements

- A. "Mandatory operation" mode required in Cat II "permissive operation" regime, and for  $V < 0.30$  p.u., add "ride through in momentary cessation" for 0.160 seconds followed by "momentary cessation" until trip at 0.320 s.
- B. Within Cat II "Permissive Operation" regime, Mandatory Operation mode required for  $V > 0.50$  p.u., and Momentary Cessation mode required for  $V < 0.50$  p.u.
- C. Other



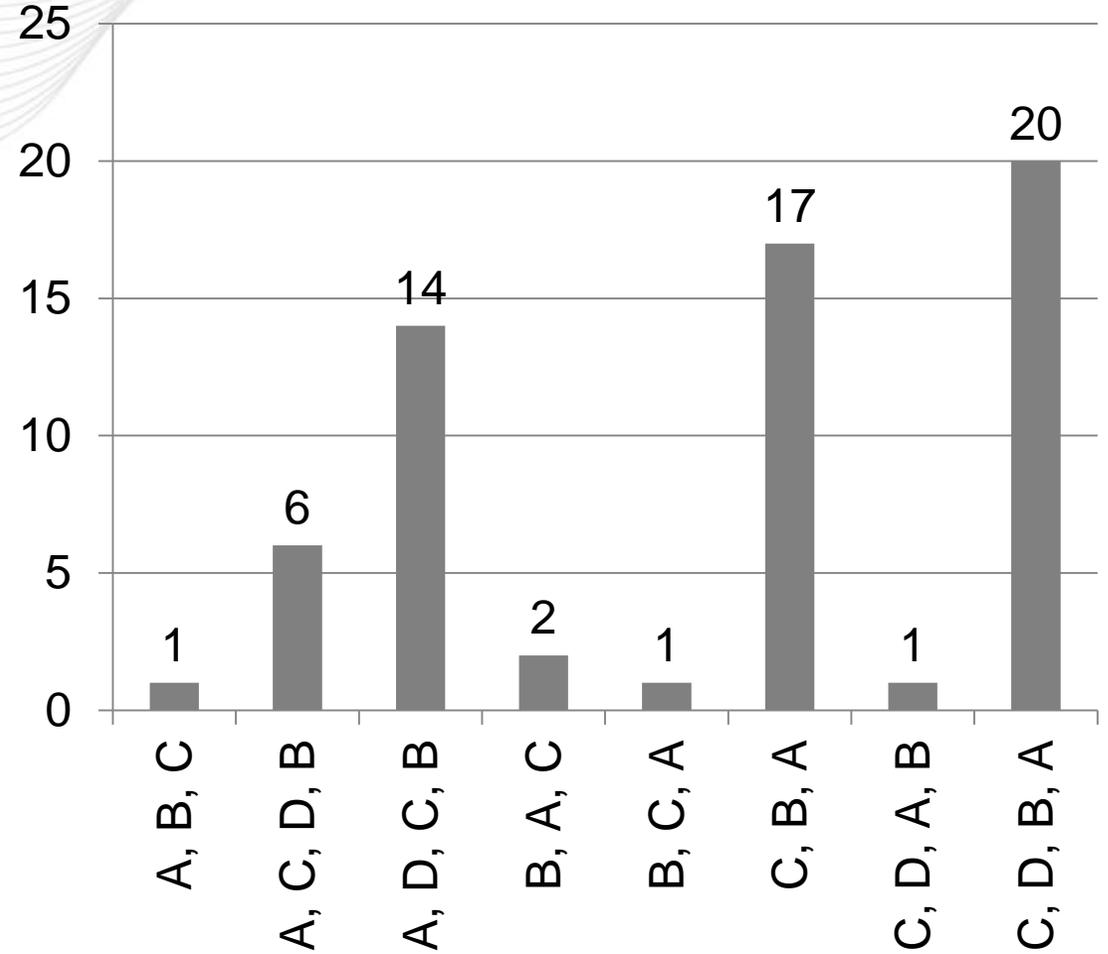
## Comments related for option C (“Other”)

- “Permissive Operation” and “may ride-through or may trip” regions shall be Momentary Cessation.
- DER should ride through at least as long as NERC PRC 24.
- Cat III - Mandatory Operation for  $V \geq 0.5$  p.u. with trip at 11 seconds, and Momentary Cessation for  $V < 0.5$  p.u. with trip at 1.5 seconds



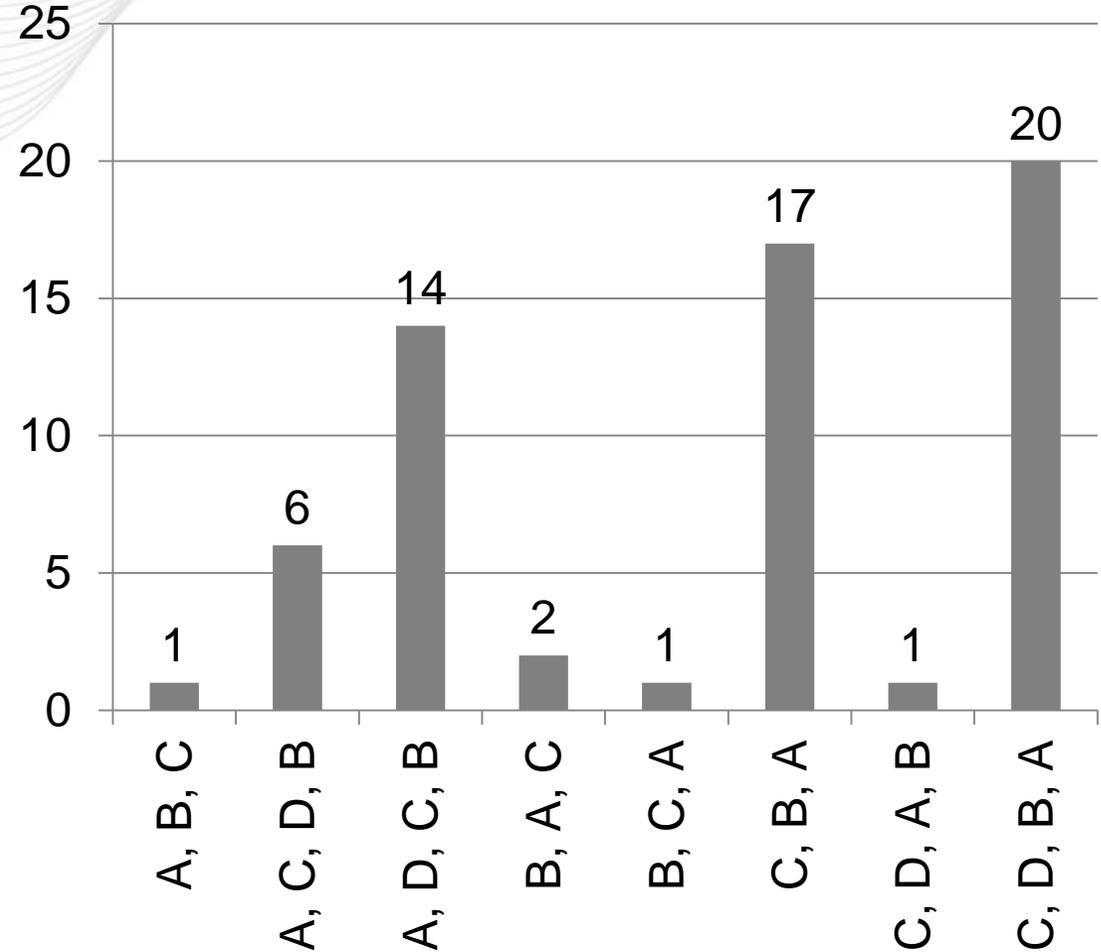
Rank your preferred method for handling DER that are physically incapable of meeting the recommended requirement

- A. IEEE 1547-2018 Cat I
- B. IEEE 1547-2018 Cat II but without the addition of momentary cessation etc.
- C. Up to utility discretion
- D. Other



## Comments related for option D (“Other”)

- Do not allow connection of DER
- PJM voluntary recommendation
- Any legacy DER can meet category I, but new interconnect must comply with PJM Ridethrough requirements
- DER should ride through at least as long as NERC PRC 24.
- Further evaluation of protection schemes and work practices (for example) will be required before Respondent makes a final determination on any ride through settings.



- 1 of ~50 concurrent PJM stakeholder activities...hard to give this topic too much attention.
- We are answering this survey as if PJM is only discussing PJM jurisdictional DERs. Answers from a retail jurisdictional DER standpoint can and will differ, and thus the survey results should not be applied to create or suggest retail jurisdictional DER standards. We believe that there are no “one-size fits all” settings that can be used consistently for all DER facilities, and that ultimately the local EDC should be responsible for creating and implementing DER standards. PJM should wait until the results from the PJM/NJ modeling project is complete to determine the effects of ride through. PJM should consult industry experts (such as EPRI) on what are good settings from a Transmission and Distribution perspective or at what times can they be different. We are concerned about every EDC/ISO having different settings and the installers/manufacturers keeping track of them. Why is PJM looking at different settings than ISO-NE? There is no easy way for the utility to review settings on an inverter.

- DER should be required to comply with the protection practices of the utility relating to worker safety. This may mean the DER needs to trip instantaneously for any disturbance or proactively disconnect from the Area EPS when workers have configured the protection of the Area EPS for instantaneous tripping while performing live line work.
- For UV1 requirements: Ongoing studies show that there is a potential for ridethrough to interfere with anti-islanding. Our preference is to have flexibility to require a trip time below 10 seconds until further studies are performed and other ongoing studies completed. For UV2 Requirements: More specification need to be given when referring to "Ridethrough" as it relates to what operating mode the DER is in during Ridethrough. For a local faults or event, not due to a BES event, if voltage stays within 0.88, depending on how the DER is operating it could impact Safety of personnel or public. A high impedance fault can be an example or a wire down issue. When defining ridethrough, specify if IEEE 1547-2018 default settings will determine the trip time A clear distinction between ridethrough and trip time is needed.

- What is missing from the body of knowledge about DER is the effect of DER units on each other. Particularly in cases where there is a mix of units, some supplying inertia, rotating machines may serve as proxies for the larger utility system during island conditions. De-energizing these islands during fault conditions requires extensive communications and protection infrastructure, and adds risk to the operation of the local utility. While they are compensated for the costs of initial installation, local utilities are not presently compensated for the costs associated with the added risk of hosting DER on their systems.
- Further evaluation of protection schemes and work practices (for example) will be required before Respondent makes a final determination on any ride through settings. Currently there is an initiative among all operating companies in the corporation that may modify these recommendations

- DER should ride through at least as long as NERC PRC 24. When developing our ride-through settings, PPL Engineering reviewed and incorporated the Voltage and Frequency Ride-Through requirements for Bulk Electric System generators under PRC-024-2: Generator Frequency and Voltage Protective Relay Settings. PPL developed the DER ride through settings to ride-through system disturbances slightly longer than the requirements in the NERC Standard. The reasoning for this is to maintain the stability of the Bulk Electric System by allowing the centralized generators to ride through system disturbances before DER trip offline. DER tripping offline before the BES Generators will exacerbate the system disturbance and jeopardize the stability of the grid when DER penetration levels are significant. Also taken into consideration was the operation of the distribution system. With the proliferation of automated devices on the PPL Distribution system, ensuring that the DER ride through settings do not conflict with reclosing cycles is imperative to ensure reliability is maintained.