

System Protection Working Group (SPWG)

Update to ROS

DECEMBER 2ND, 2021

CHAIR: VINCENT ROBERTS, P.E.



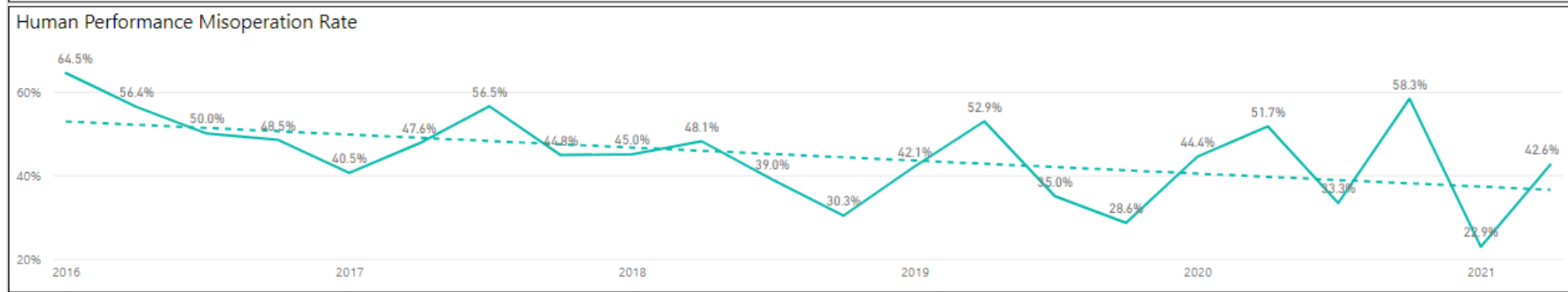
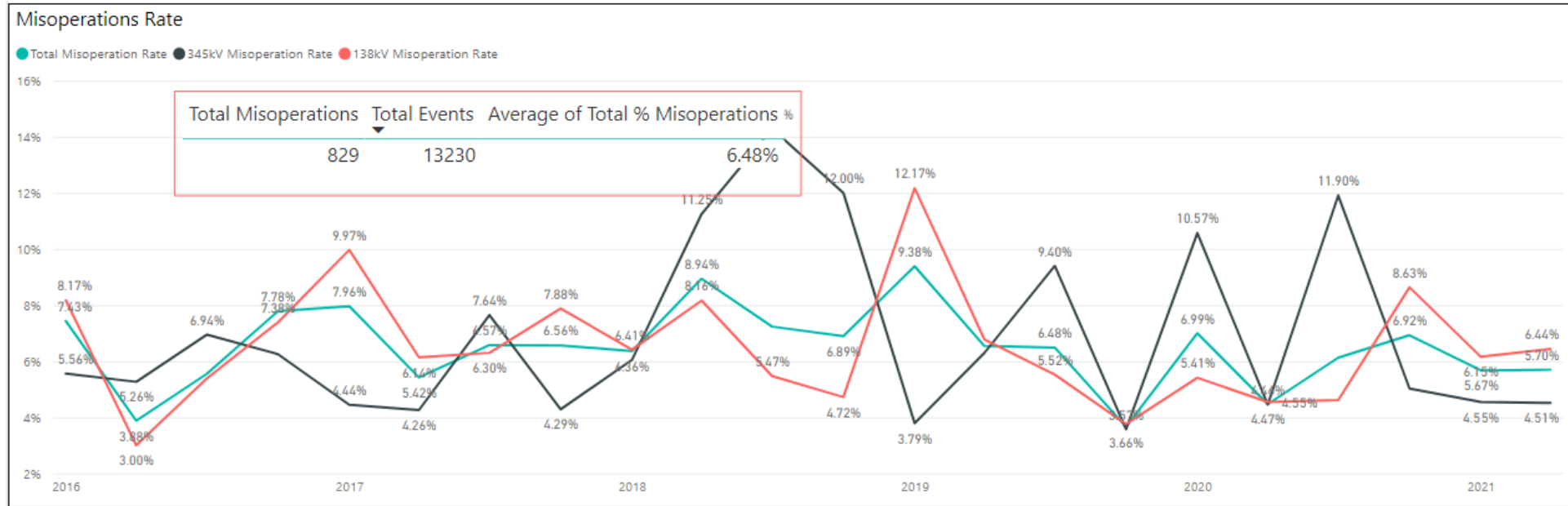
SPWG Meeting Overview

- 3rd SPWG Meeting of 2021 was held on November 10th, 2021
- Topics Discussed:
 - 2021 Q2 Misoperation Data
 - May 9th Loss of Solar Event
 - PUCT Equipment Weatherization Vulnerability Assessment
 - Annual SPWG Document Review
 - 2022 Calendar Development
 - 2022 SPWG Chair Nominations
- Next Meeting Scheduled for March 2nd & March 3rd, 2022

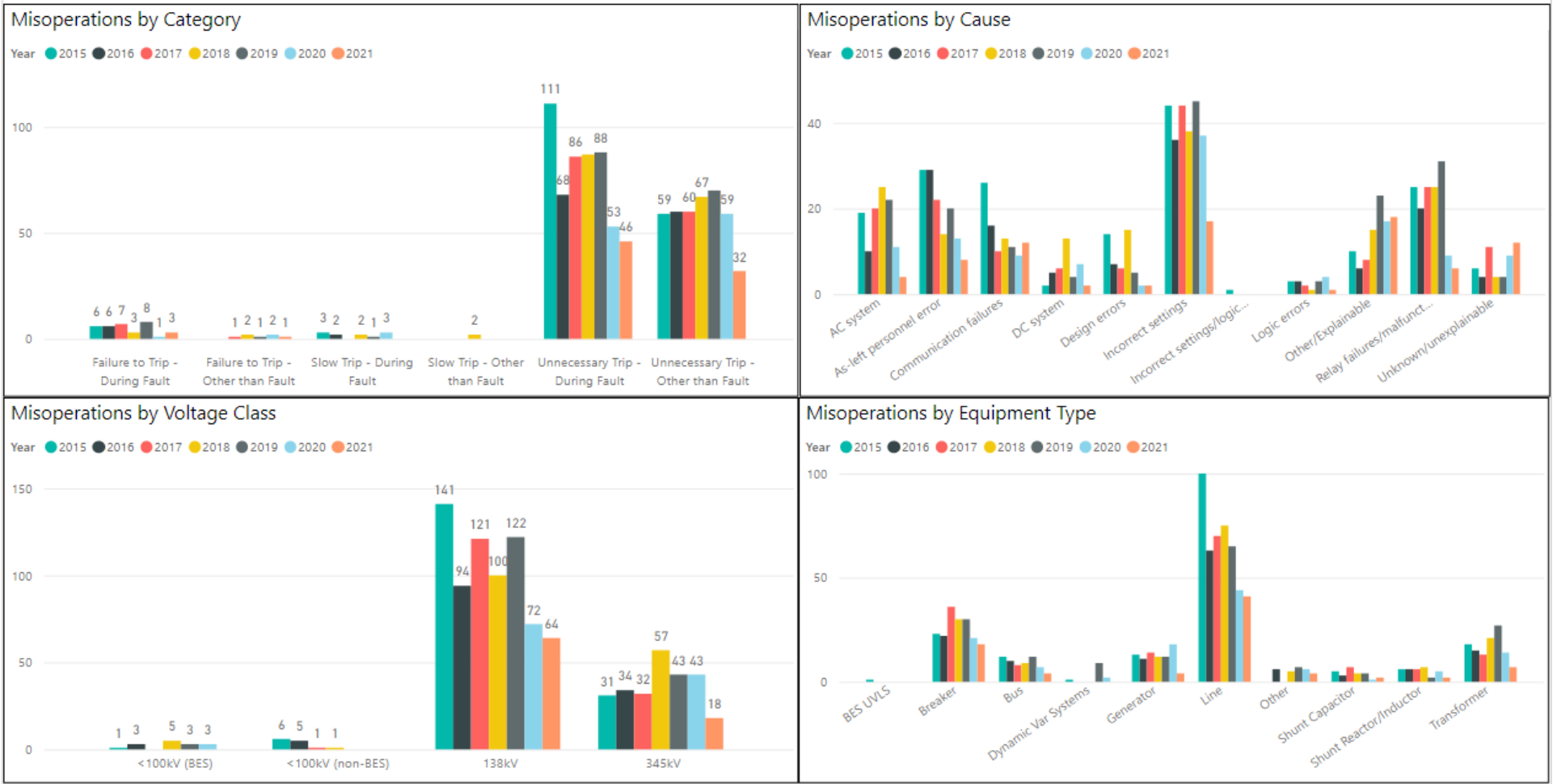
Protection System Misoperations

2021 Q2

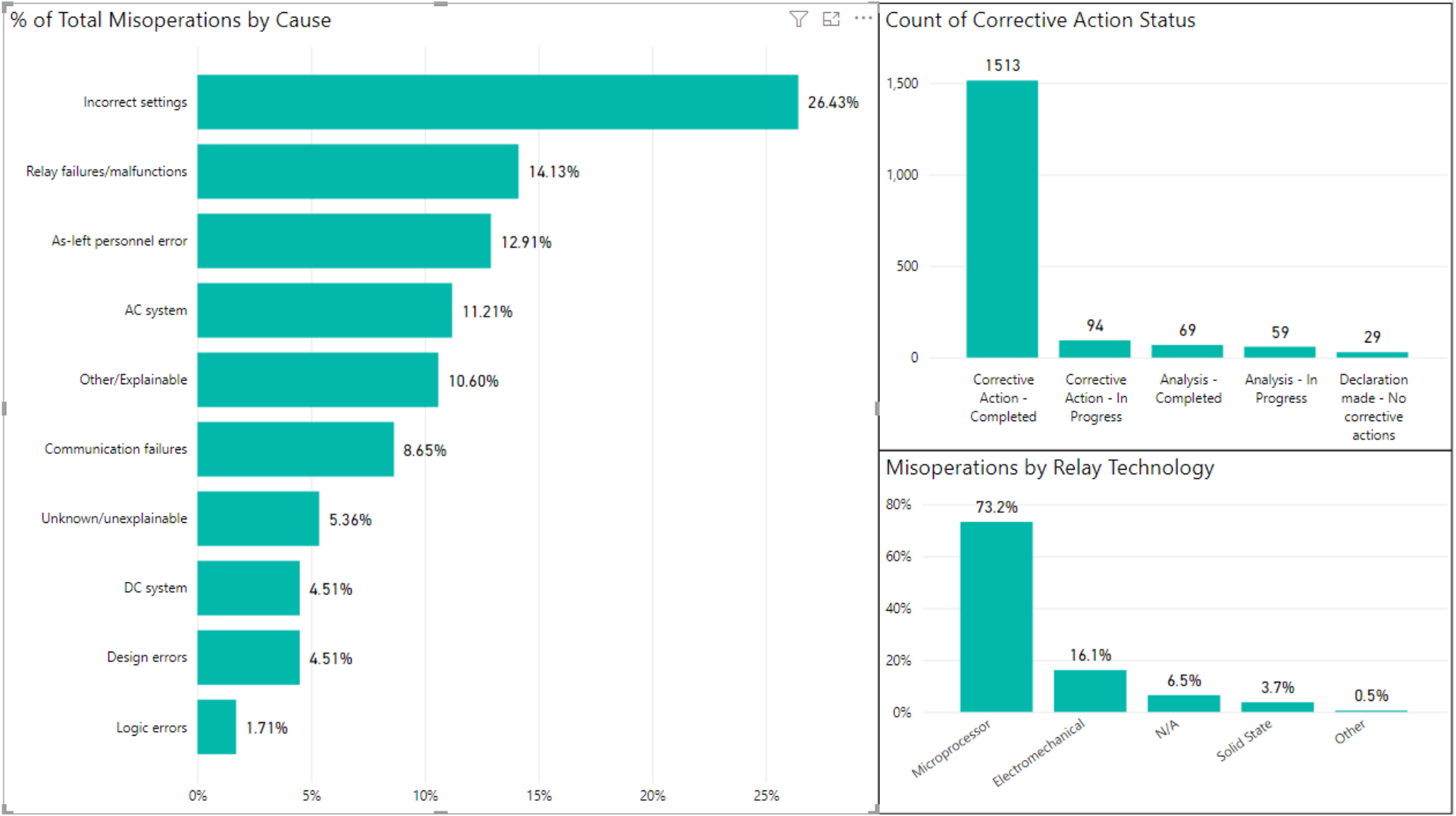
Protection System Misoperations: 2016-2021 Q2



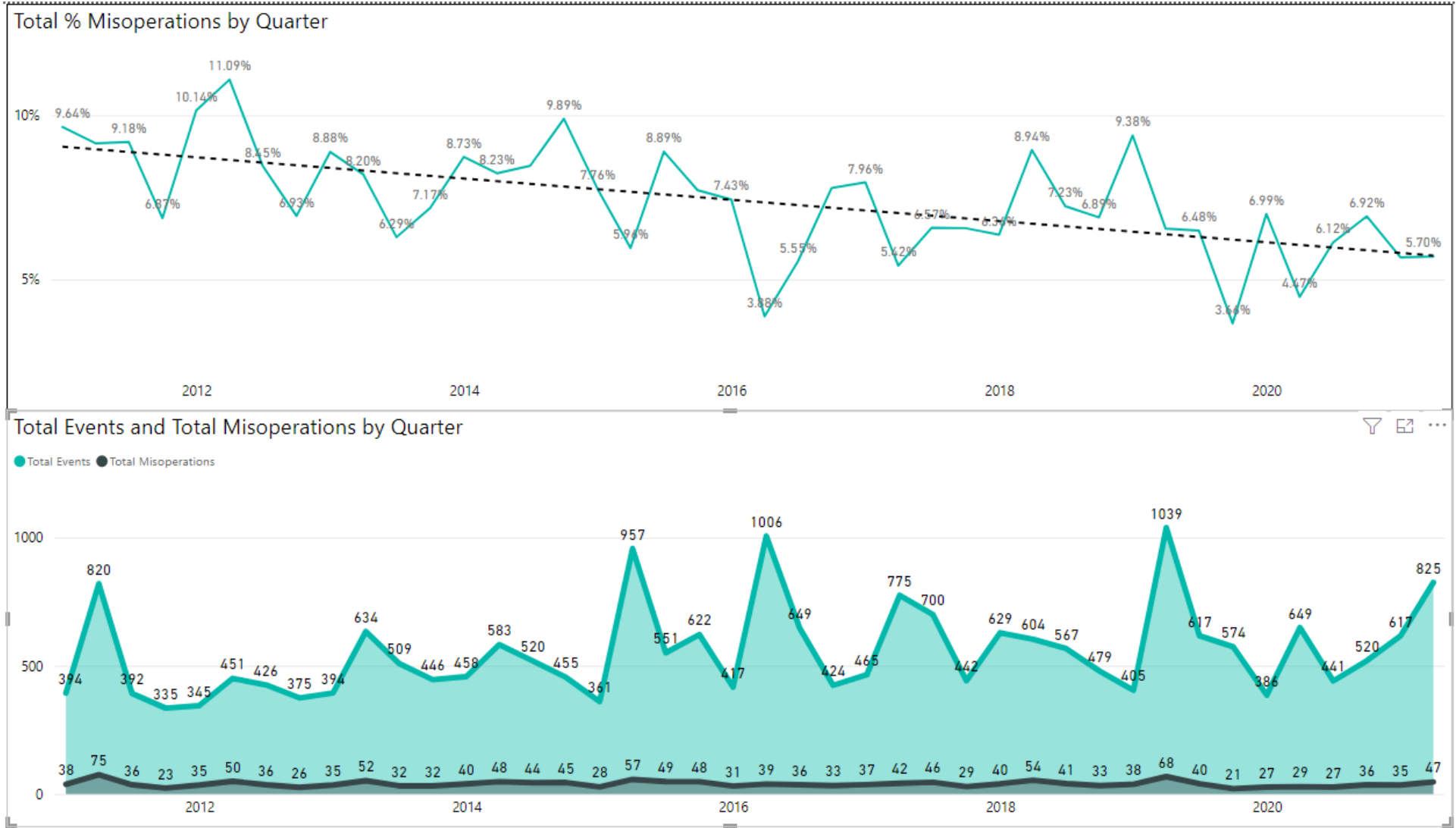
Protection System Misoperations: 2016-2021 Q2



Protection System Misoperations: 2016-2021 Q2



Protection System Misoperations: 2016-2021 Q2



Protection System Misoperations – 2021 Q2

		Q2	2021 YTD
# of Misoperations	Total	47	82
	345 kV	11	18
	138 kV	36	64
	< 100 kV	0	0
By Category	Failure to Trip	1	4
	Slow Trip	0	0
	Unnecessary Trip during Fault	27	46
	Unnecessary Trip – Non Fault	19	32
	SPS	0	0
By Relay System Type	Electromechanical	3	9
	Solid State	0	0
	Microprocessor	39	61
	Other/ N/A	5	12
By Equipment Protected	Line	27	41
	Transformer	6	7
	Generator	2	4
	Shunt/Series Capacitor	1	2
	Shunt/Series Reactor	2	2
	Dynamic VAR system	0	0
	Bus	2	4
	Breaker	6	18
	Other	1	4

Protection System Misoperations 2021 Q2

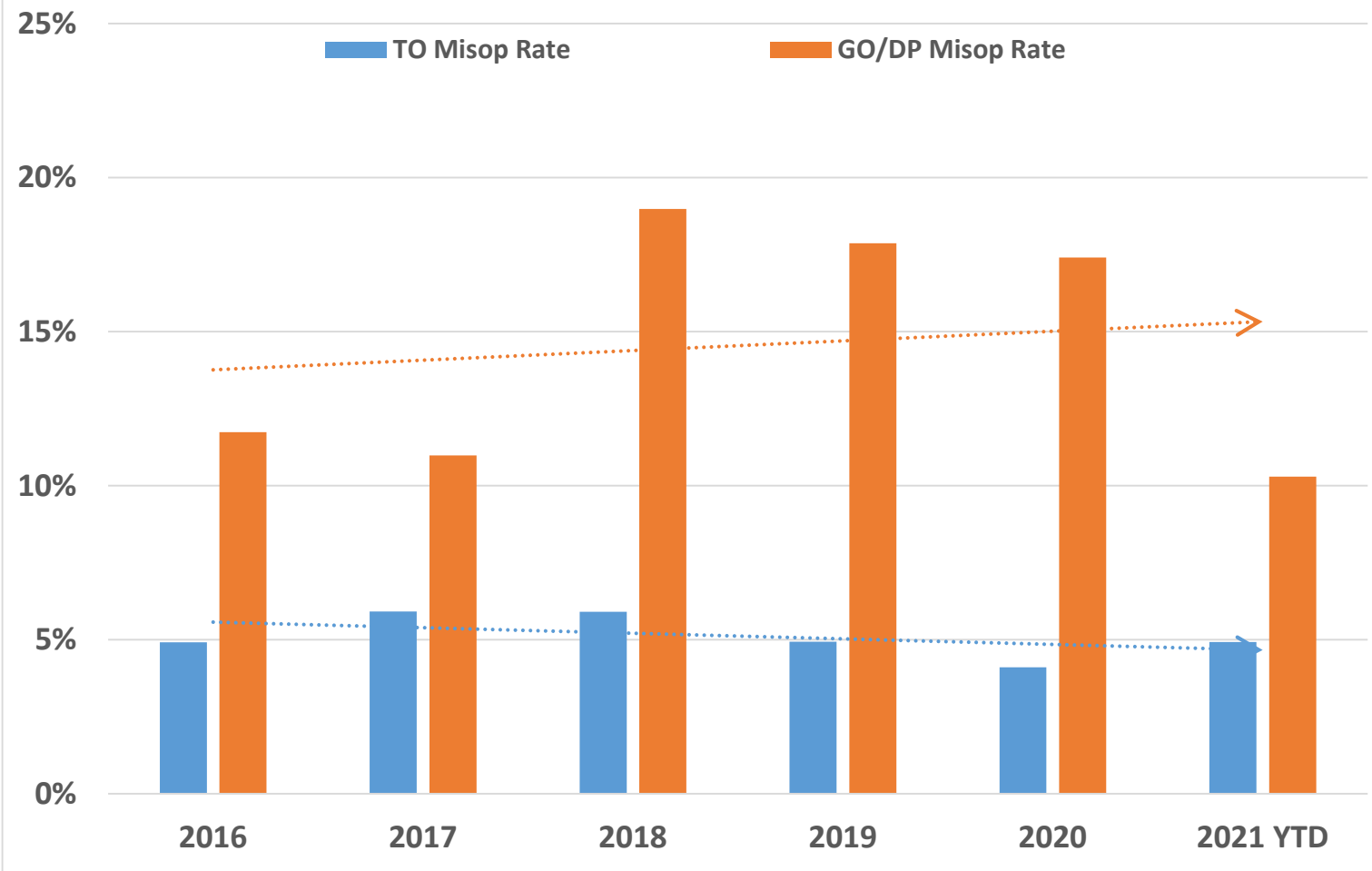
Summary of Human Performance Issues noted for 2021 Q2:

- 138kV capacitor bank tripped due to incorrect setting of ground fault element
- 138kV breaker overtripped for a fault due to incorrect CT secondary wiring
- 138kV bus differential tripped for a non-fault event. Bus differential scheme was inadvertently enabled when a 138kV breaker was bypassed for construction.
- 138kV DCB scheme misoperated due to an unplugged coax cable from the line tuner
- 138kV DCB scheme misoperated due to TC10 carrier jumper set to 2-wire instead of 4-wire scheme
- 138kV breaker overtripped due to a wiring issue from a decommissioned carrier circuit that was never removed
- 138kV breaker overtripped due to outdated relay settings
- 345kV auto tripped due to incorrect CT wiring in the transformer differential
- 345kV bus tripped due to incorrect logic in the breaker failure scheme from relays at an interconnected generator
- 345kV GSU tripped due to miscoordination of transformer and collector system ground overcurrent elements

Failure to Trip/Slow Trip Misoperations in 2021 Q2:

- 138kV breaker failed to trip due to a failed trip coil #1 and a loose wire to trip coil #2

Comparison of TO and GO Misoperation Rate



Definitions

Protection System –

- Protective relays which respond to electrical quantities,
- Communications systems necessary for correct operation of protective functions
- Voltage and current sensing devices providing inputs to protective relays,
- Station dc supply associated with protective functions (including station batteries, battery chargers, and non-battery-based dc supply), and
- Control circuitry associated with protective functions through the trip coil(s) of the circuit breakers or other interrupting devices

Definitions

Composite Protection System - The total complement of Protection System(s) that function collectively to protect an Element. Backup protection provided by a different Element's Protection System(s) is excluded.

Misoperation – The failure a Composite Protection System to operate as intended for protection purposes. Any of the following is a Misoperation:

- 1.** Failure to Trip – During Fault – A failure of a Composite Protection system to operate for a Fault condition for which it is designed.
- 2.** Failure to Trip – Other than Fault - A failure of a Composite Protection system to operate for a non-Fault condition for which it is designed, such as a power swing, undervoltage, overexcitation, or loss of excitation.

Definitions

Misoperation – *The failure a Composite Protection System to operate as intended for protection purposes. Any of the following is a Misoperation:*

3. Slow Trip – During Fault – A Composite Protection system that is slower than required for a Fault condition if the duration of its operating time resulted in the operation of at least one other Element's Composite Protection System.
4. Slow Trip – Other than Fault - A Composite Protection system that is slower than required for a non-Fault condition, such as a power swing, undervoltage, overexcitation, or loss of excitation, if the duration of its operating time resulted in the operation of at least one other Element's Composite Protection System.

Definitions

Misoperation – *The failure a Composite Protection System to operate as intended for protection purposes. Any of the following is a Misoperation:*

5. Unnecessary Trip – During Fault – An unnecessary Composite Protection system operation for a Fault condition on another Element.
6. Unnecessary Trip – Other than Fault - An unnecessary Composite Protection system operation for a non-Fault condition. A Composite Protection System operation that is caused by personnel during on-site maintenance, testing, inspection, construction, or commissioning activities is not a Misoperation.

NERC and Texas RE Report on Odessa Disturbance

- Widespread reduction of solar photovoltaic resource output (1,112 MW) in the Texas Interconnection occurred on May 9th, 2021 after a SLG fault on a generator step-up transformer at a combined-cycle plant near Odessa, TX.
- SPWG discussed the Joint NERC and Texas RE Staff Report on the Odessa Disturbance that was released in September 2021.
- Key findings and recommendations reviewed by SPWG
- Disturbance report is available for download on NERC's website

PUCT Project Number 51840: Winterization

- SPWG reviewed the new Texas Administrative Code (TAC) 25.55 related to weather emergency preparedness that was adopted on 10/26/2021
- SPWG members shared interpretation of cold weather critical component scope, evaluation criteria, procedures, and component checklists.
- Members discussed application to protective relaying and associated equipment
- Reminder of upcoming ERCOT TSP Workshop that took place after SPWG meeting on November 15th, 2021.
- Compliance and response due date of 12/1/2021 was communicated

End of SPWG Presentation

Next Meeting Scheduled for March 2nd & March 3rd, 2022

ERCOT ROS Update will be Provided on April 7th, 2022

Thank You

Any Questions?