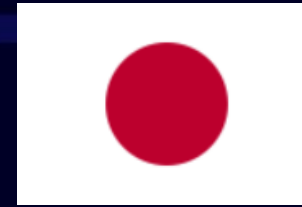


Paris Session  
2022



# Key Consideration for Ensuring Effect of Proposed Control Method using RoCoF Relay

SC B5 PS1 Q 1.04

Are there any key considerations for securing the ROCOF protection against maloperation?

Hayato SATOH (JAPAN)



## - Key Consideration to avoid RoCoF relay malfunction - Logic of Anti-islanding RES Protection Relay that should be Considered

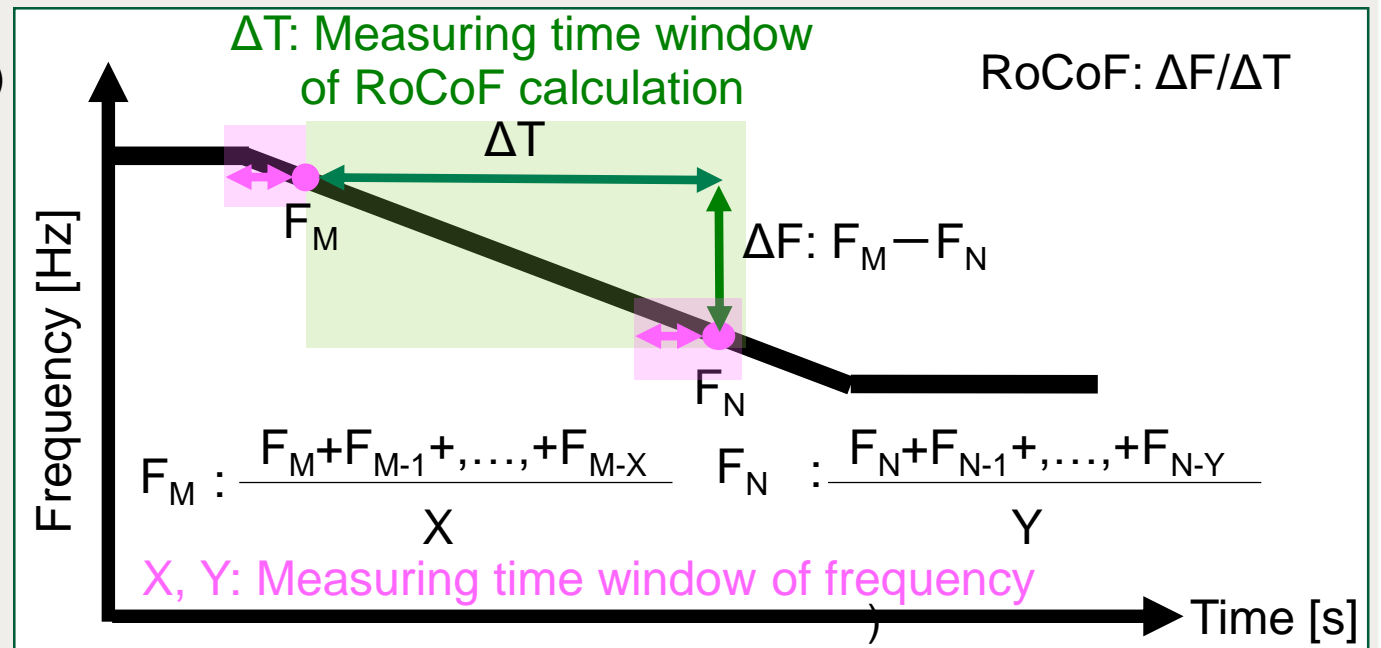
•It is important to use **the RoCoF calculation method equivalent to the anti-islanding RES protection relay** for the RoCoF relay to **ensure both accuracy and fast-response of the RoCoF relay that detects RES self-disconnection.**

•In the logic of RoCoF relays, the RoCoF is calculated as  $df/dt$  at a certain measuring time window.

•The main elements and parameters that characterize the characteristics of the anti-islanding protection relay are as follows.

- Frequency detection method (Zero-crossing, etc.)
- **Measuring time window of frequency**  
(: How many cycle averages are used)
- **Measuring time window of RoCoF calculation**
- Operating condition  
(Operate with a single logic, or under the OR condition of multiple logics, etc.)
- Note: The difference in these parameters among RES manufacturers is large.

Group Discussion Meeting



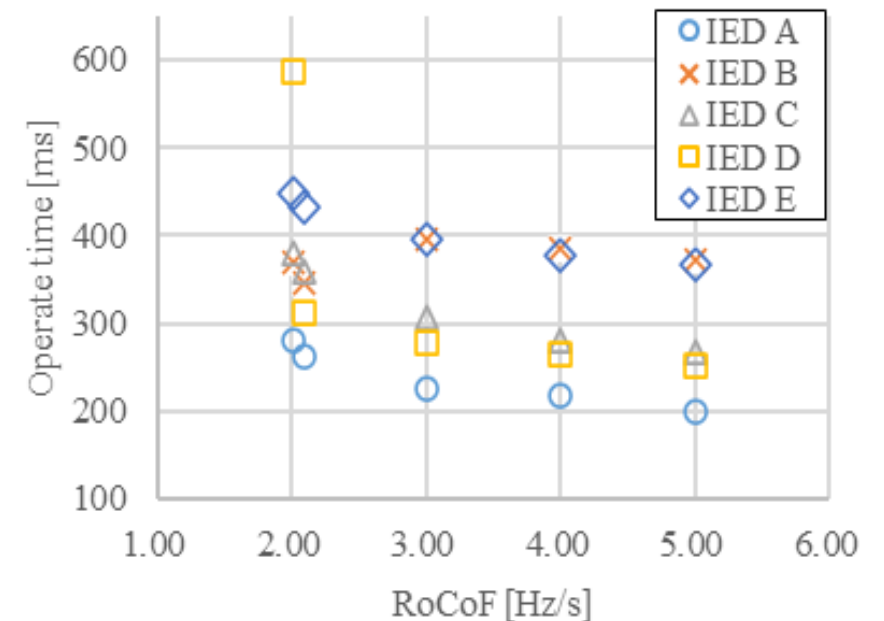
# Current Performance of RoCoF Relay with Built-in Commercial IEDs

• The difference in **the operate time** among manufacturers was quite large. It is assumed that the differences is due to differences in the **Measuring time window of frequency**.

• The measuring time window of RoCoF and frequency calculation (: how many cycle averages are used) are considered the main parameters.

- However, the calculation method is manufacturer-specific, and **these parameters cannot be changed**.
- It is preferable to be able to use **arbitrary calculation method equivalent to the anti-islanding protection relay**. (Note: anti-islanding protection relay characteristics can be emulated by combining multiple RoCoF relays)

Measured operate time of RoCoF relay with built-in IEDs



\* Threshold level was 2.0 Hz/s, and time delay was 0.1 s.

Specification	IED A	IED B	IED C	IED D	IED E
Measuring time window of RoCoF calculation [cycle or s]	6 cycle	5 cycle	5 cycle	5 cycle	0.1 s
Measuring time window of frequency calculation [cycle]	5 cycle	15 cycle	12 cycle	10 cycle	5 cycle

# - Key Consideration to avoid excess/deficiency load shedding – Adjustment of RoCoF Relay Setting Appropriately According to System Status

• Adjustment of the relay setting flow to **maintain the accurate amount of the load shedding for RES self-disconnection is as follows.**

To estimate accurately, it is important to thoroughly keep track of or share information on the characteristics of each RES anti-islanding protection relay.

- 1) Estimate the output of RESs.
- 2) **Estimate the amount of RES self-disconnection (≡load shedding) vs. RoCoF.**
- 3) Adjust the settings of each RoCoF relay.
- 4) Send setting change command to each RoCoF relay.

Adjustment of control setting of UFR considering RES output, etc. in each area

