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Easy and affordable installation of IoT technology in existing substation assets

SC B3
PS3 / Q.1
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Question and our contribution

- *Question PS3.1*
- What are the benefits of digital solutions like IoT-sensors, machine learning, artificial intelligence, drones, robots etc. for substation life cycle from planning to maintenance? Which measures are necessary to increase the acceptance of intelligent IoT-based power equipment in substations?

- *Answer*
- Easy and affordable installation of IoT technology in existing substation assets provides significant benefits for management of substation assets.

Installation of DC current monitoring system

•We have developed and installed the DC current monitoring system for Condition-Based-Maintenance using IoT technology.

•The use of commercially available clamp-type sensors enables affordable, easy, vender lock-in free, and power outage-free installation in existing assets.

•This system enables real-time condition monitoring remotely.

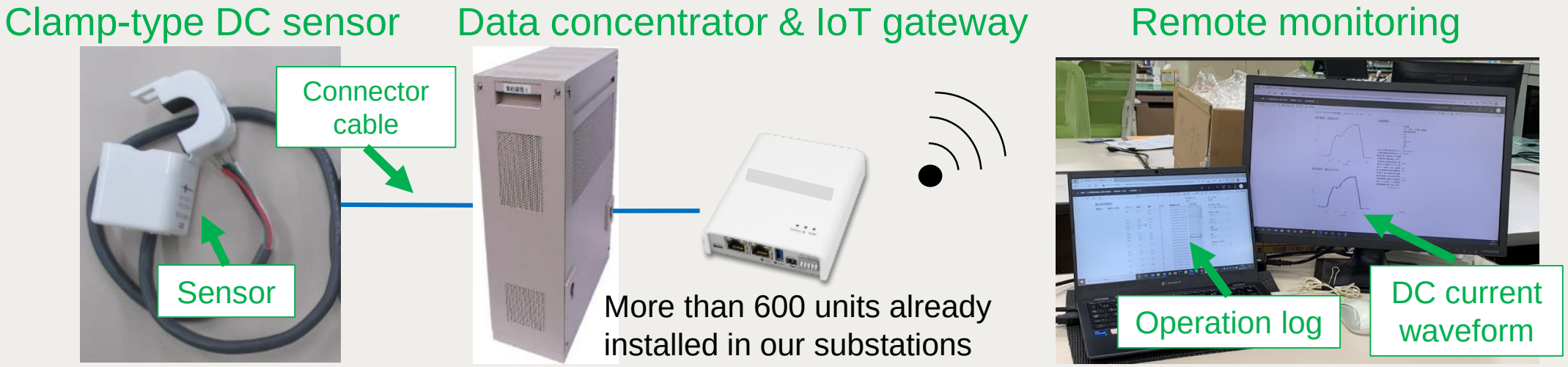

Fig.1 Overview of our monitoring system

Results and benefits from DC current monitoring system

•DC current waveform data can be used to detect signs of abnormality and prevent serious failure.
(Right figure shows motor load increasing before failure.)

To date, more than 100,000 data collected .

↳ At least dozens of temporary inspections planned by data analysis.

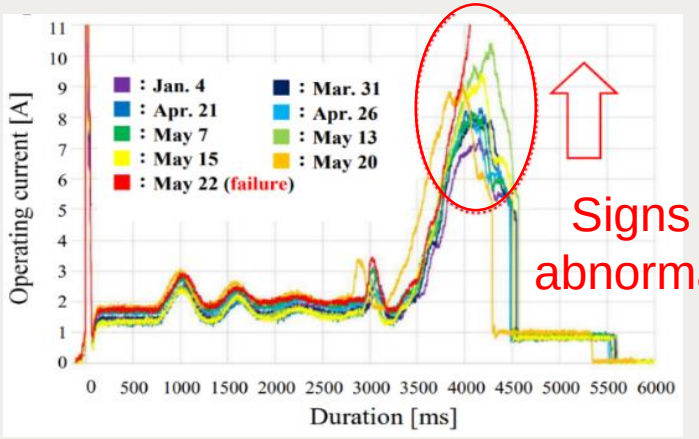

Fig.2 Current waveforms on a disconnector

•With the benefits of the monitoring system, the previous inspection cycle was revised.

<u>Example:</u>
Circuit breaker inspection with power outage

Previous
1 time / 6 years

⇨

Present
As necessary
(depending on condition)

Our future strategy

- Development of the automatic data analysis system using AI
- Expansion of monitoring items and CBM of the entire substation as below.

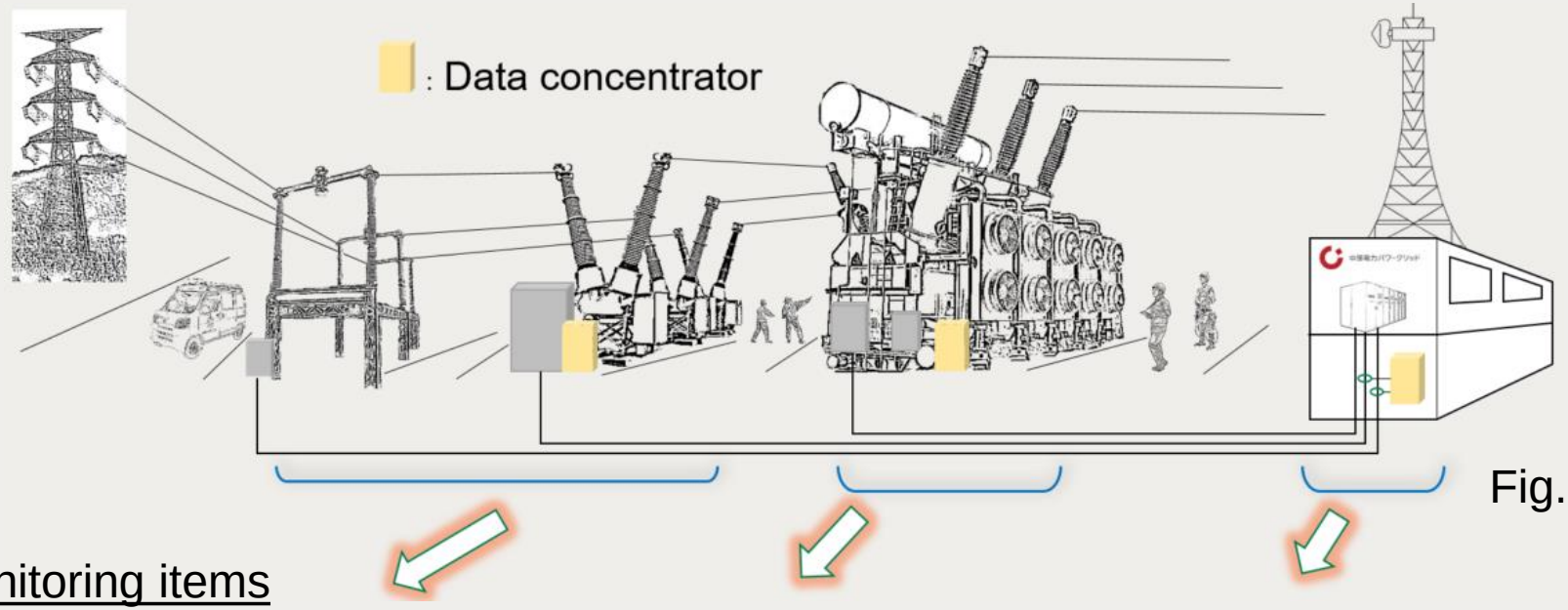

Fig.3 Overview of Substation Monitoring Items

Monitoring items

- Number of times hydraulic & pneumatic pumps operate

- Air & oil temperature
- Tap position of LTC
- DC & AC current
  (Motor load for LTC and oil filters)
- Gas in oil (hydrogen)

- Operation current (Motor load on CB & DS)
- Control current (CB & DS)

Conclusion

- We have benefited significantly from easy and affordable monitoring of existing substation assets.
- In the future, we will conduct more advanced and practical data analysis to optimize substation management strategy for sustainable energy supply.

Thank you for your attention !!