CIGRE SC D2 Colloquium
October 2015
LIMA - PERU

D2-02_05

Undertakings to utilize Satellite Line to enhance Communications Network Disaster Resistance

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Presenter Yuta Hotokebuchi

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Presenter Satoko Mano

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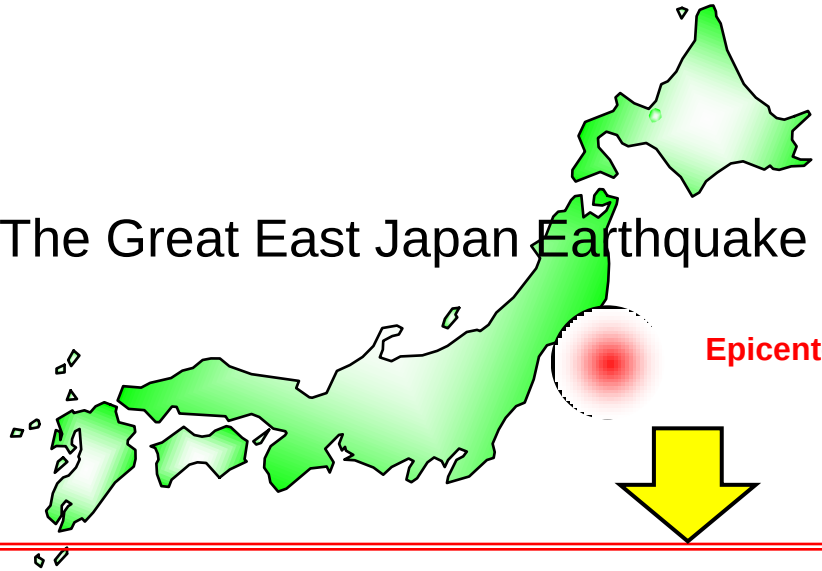
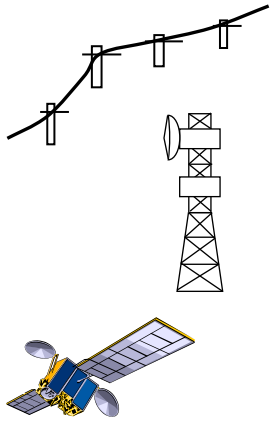
1. Initiatives by Japanese Electric Power Companies to realize Robust Networks



The Great East Japan Earthquake of March 11, 2011

Demands for **diversification** and **multiplexing** of networks

- fiber-optic lines
- microwave radio links



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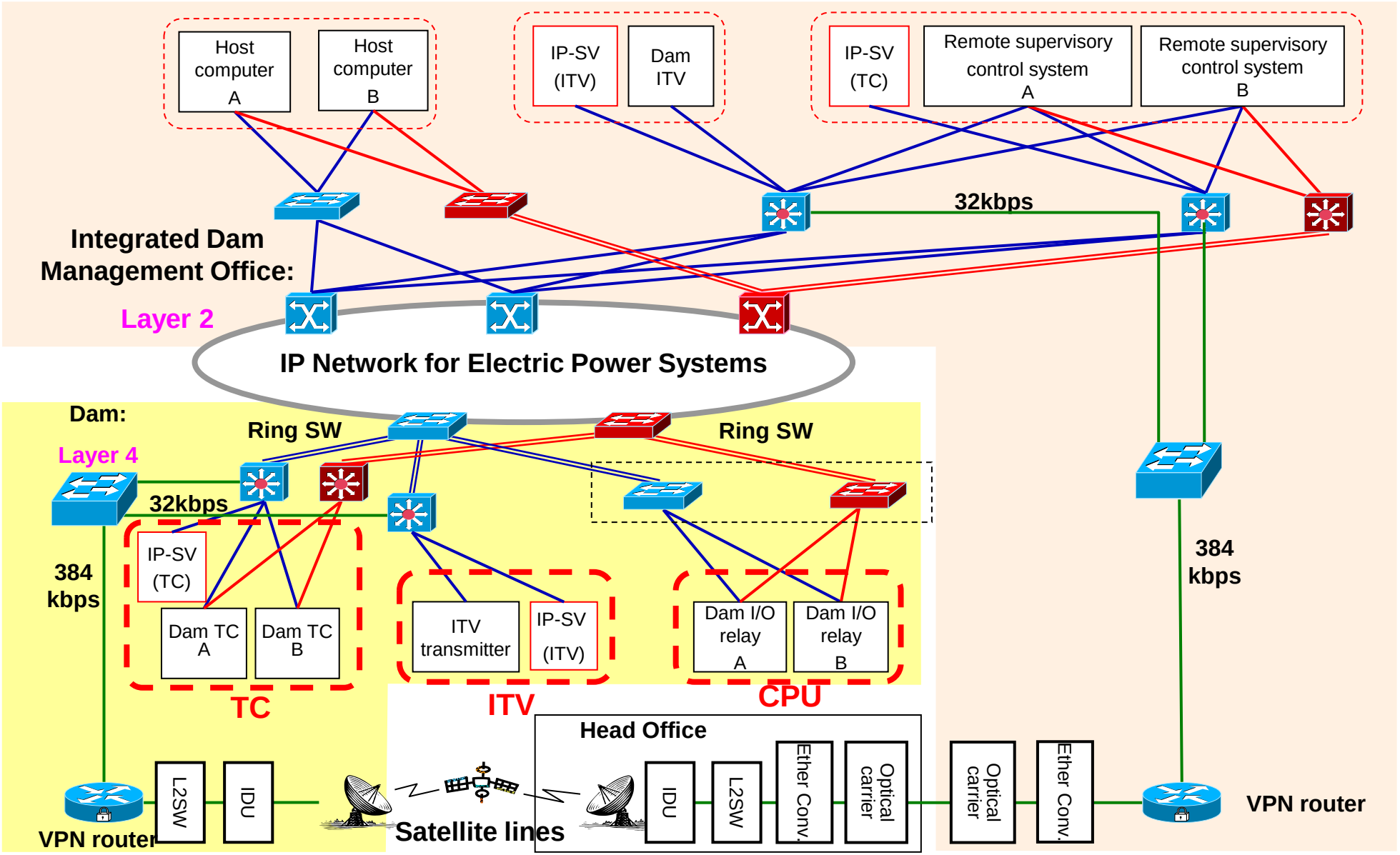
- **Satellite lines**
- **use new communication media**

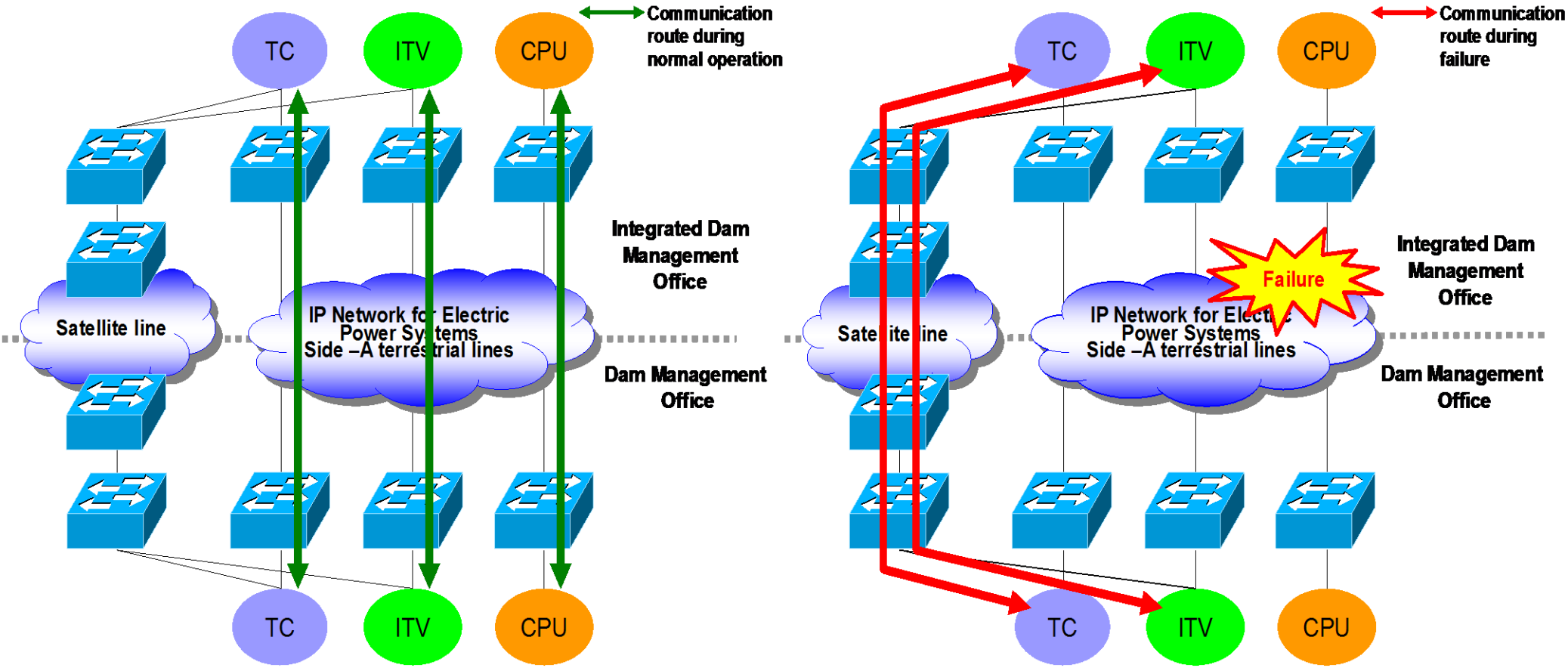
2-1. Strengthening of IP Network for Integrated Dam Management System



2-2. Requirements for Integrated Dam Management System

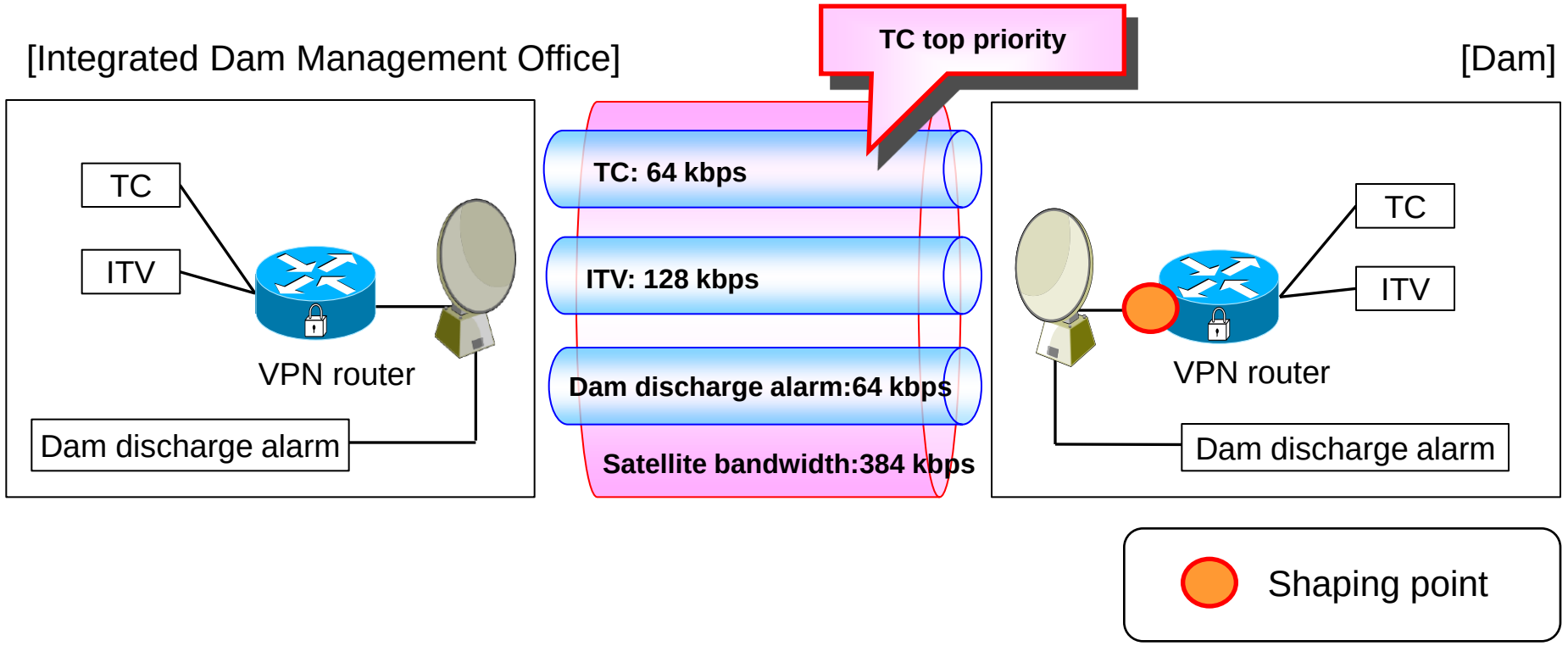
System	TC	ITV	CPU
Communication section	Between the integrated dam management office and the dam		
Information transmitted	(1) Control information including gate opening and closing operations (2) Monitoring information including gate opening angles and water levels	Video monitoring of the dam status	(1) Results of calculations of dam outflow and inflow rates, etc. (Side-A) (2) Distribution of weather information on the web (Side-B)
Required bandwidth（per dam）	64kbps (Terrestrial line) 64kbps (Satellite line)	10Mbps (Terrestrial line) 128kbps (Satellite line)	2Mbps
Maximum allowable information disruption time	2 seconds	—	—
Transmission delay time	0.25 seconds or less	1.5 to 2 seconds or less	1.5 to 2 seconds or less
Connecting side/Backup	(1) Both sides-A and B (2) **Satellite line available**	(1) Side-A (2) **Satellite line available**	Both sides-A and B

2-3. Communication Routes using Terrestrial Lines during Normal Operation and Satellite Line as Backup



2-4. QoS Control in Satellite Line

➢ QoS Control in the Satellite Line



- Since the satellite link uses a narrow bandwidth, QoS control is implemented with top priority on the TC that transmits control information.
- 64 kbps of the satellite link bandwidth of 384 kbps is used for dam discharge alarms.

  This means that a bandwidth of about 300 kbps is available for use by the TC and ITV.

  The bandwidth is shaped to 260 kbps by the port for the VPN router.

2-5. Results of Testing

➢ Testing of Switching when Failure occurs

Item	Details	Results
① Measurement of communication disruption time	For redundancy, network switching was achieved within the time required by the system. - HSRP - MMRP - LAG	Good
② Verification of System equipment operation	The TC and ITV operated with no problems using the satellite line even at the time of failure in the terrestrial lines.	Good
③ Checking the route control	Route control was implemented normally when a failure occurred. - MPLS - OSPF - Floating static routes	Good

➢ QoS Testing (TC-priority Control in the satellite line)

	Dummy load	Measured value
TC	10 Mbps	260 kbps
ITV	10 Mbps	**0 kbps**

[Results]

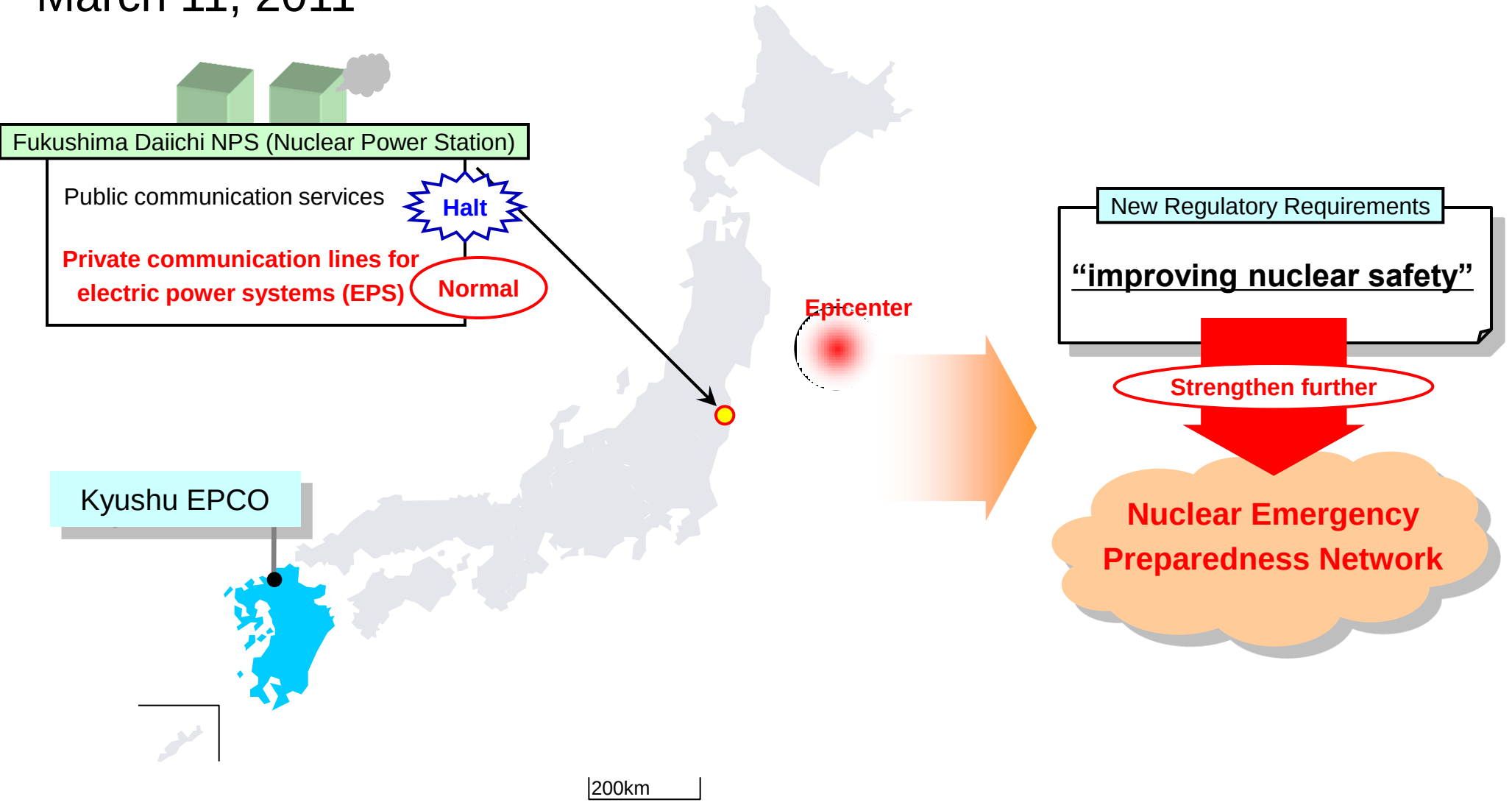
(1) The TC was prioritized in the satellite line.

(2) The total value of the TC and ITV traffic was shaped to 260 kbps in the satellite line.

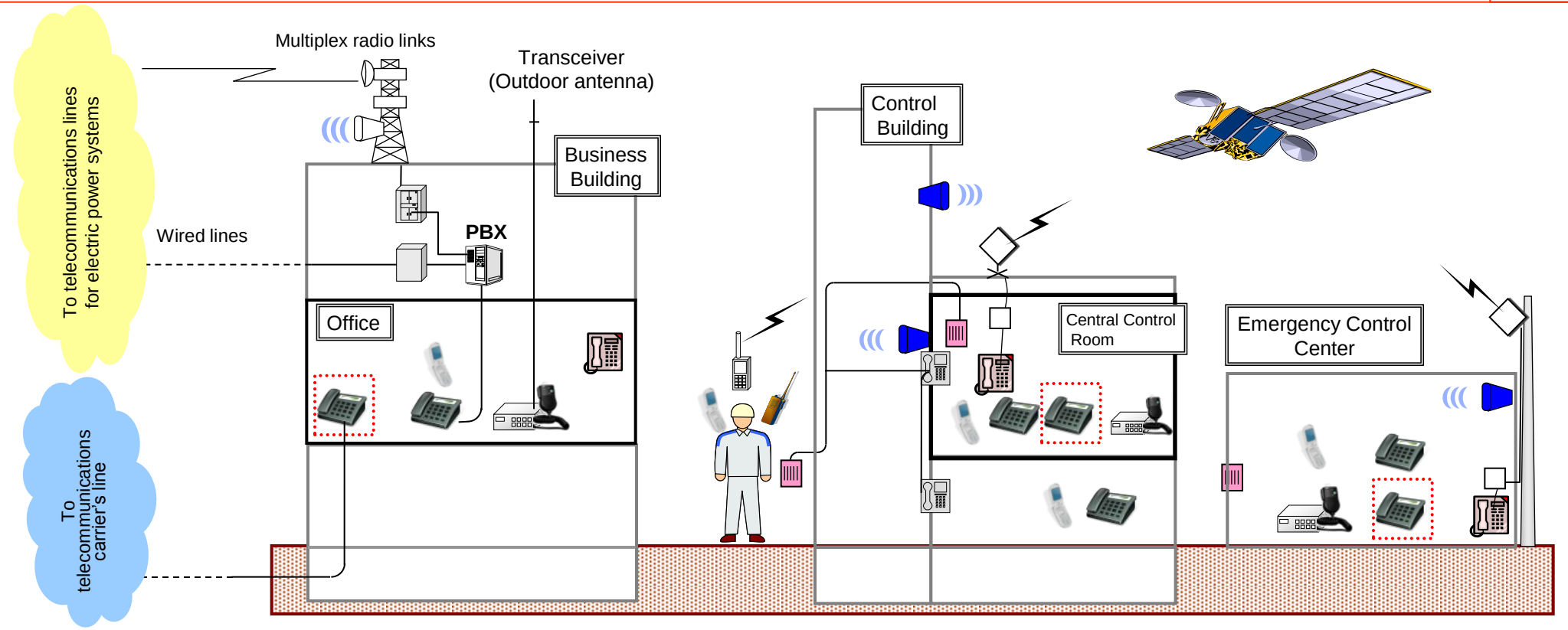
Good

3. Strengthen of Nuclear Emergency Preparedness Network

March 11, 2011



3-1. Telecommunications Facilities for inside NPS of Kyushu EPCO



Subscribed telephone

Phone over dedicated network

Mobile Fixed

Transceiver

Satellite phone

Outdoor antenna Fixed Mobile

Portable phone over metal cables

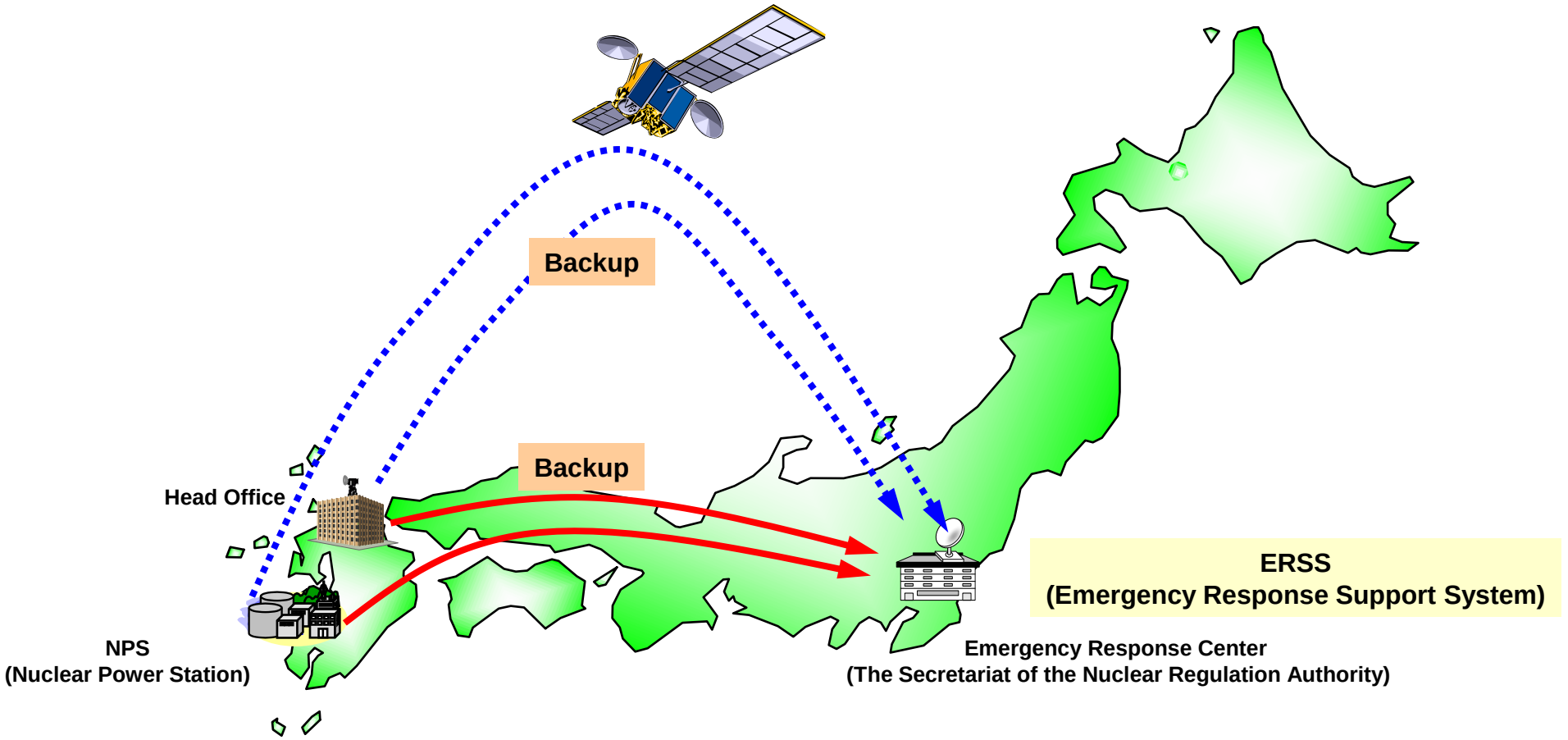
Paging system

Speaker Receiver

Emergency siren

: External communication
: Internal communication

3-2. Telecommunications Facilities outside Kyushu EPCO for Communications outside NPS



[Legends]

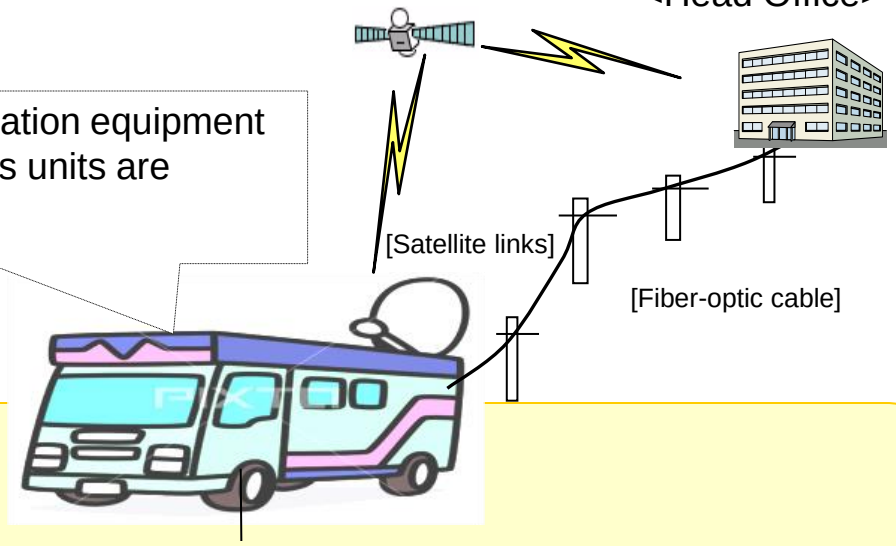
Integrated Nuclear Emergency Preparedness Network-dedicate line (Terrestrial line)

Integrated Nuclear Emergency Preparedness Network-dedicate line (Satellite line)

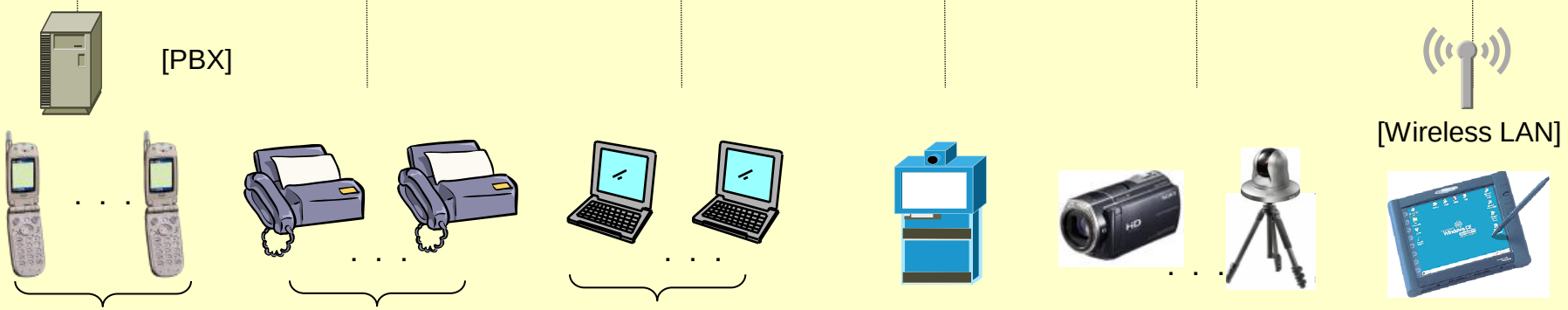
3-3. Emergency Communications Vehicle under Consideration by Kyushu EPCO

<Head Office>

Various types of communication equipment such as a PBX and wireless units are mounted on the vehicle.



Various types of communication equipment



4. Conclusion & Future Outlook

(1)Conclusion

Kyushu EPCO has successfully strengthened telecommunications network by diversifying means of communication. Specifically, connecting to telecommunications lines for EPS by wired lines and multiplex radio links, and also satellite line.

(2) Future Outlook

We continue working to further strengthen and improve the telecommunications network in the future. For example, we are introducing an emergency communications vehicle.

Thank you !

Next:
Answers to the Special Report Questions

Special Report Q2.18

Q2.18

- The paper mentions that vibration tests were executed in antennae and rack-mounted telecommunications equipment. Please detail test results and the effects caused by them. Were all of them in accordance to new regulatory requirements? Was it necessary to involve equipment or rack vendors to improve their resilience to vibrations?

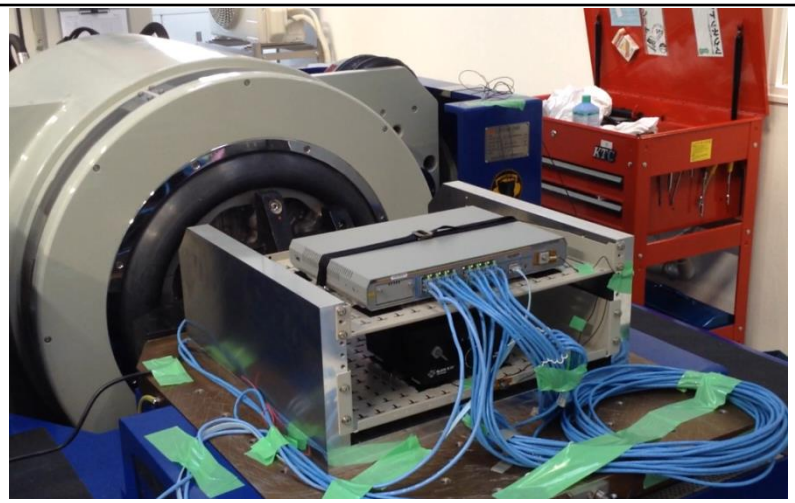
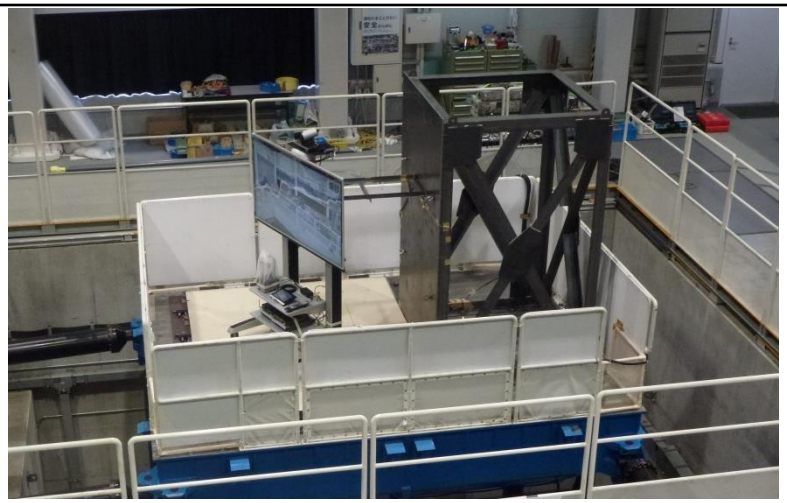
A2.18

- **At the new regulation, the method and equipment of the vibration tests are not specified.**
- **The vibration tests are executed based on Earthquake-proof design technology guide (JEAG:Japan Electric Association Guide).**
- **Electrical function was maintained for the design-basis earthquake ground motion Ss of new regulation of the Sendai NPS.**
- **It was unnecessary to involve equipment and rack vendors for improvement.**

Special Report Q2.18

Examples of Countermeasures for Telecommunications Facilities

Photos showing Vibration Testing

Antenna	Rack and Telecom Equipment
	
Network Equipment	**Terminal Equipment**
	

Special Report Q2.19

Q2.19

- ALL: What is the current state of regulation in your country regarding requirements of telecommunication systems to withstand natural disasters?

A2.19

- **In Japan, the regulation is depending on the weather and geographical characteristics.**
- **Estimation of the probability of the occurrence of tornadoes in areas where they may have an impact on the Sendai NPS from a meteorological standpoint.**
- **Although the estimated maximum wind velocity is 92m/s, the maximum wind velocity has been set at 100m/s based on the Design Basis Tornado to ensure an ample of margin of safety.**

Thank you again !

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