Implementation of necessary measures on fire prevention in relation to overhang-type high-voltage breakers at nuclear power stations (report)

June 2011

The Tokyo Electric Power Company, Incorporated

１．Introduction

Following the fire at Onagawa Nuclear Power Station (hereafter “Onagawa NPS”) Unit 1 high voltage normal distribution panel 6-1A of the Tohoku Electric Power Co., due to Tohoku - Pacific Ocean Earthquake on 11th March 2011, and based on “Implementation of necessary measures on fire prevention in relation to overhang-type high-voltage breakers at nuclear power stations” (*) from Nuclear and Industrial Safety Agency (NISA), Ministry of Economy, Trade and Industry, we are reporting the existence of overhang-type high-voltage breakers at our nuclear power stations and the implementation plan on necessary measures on fire prevention.

２．Instructed matters

（１）Existence of overhang-type high-voltage breakers

To check the existence of overhang-type high-voltage breakers in nuclear power stations.

（２）Necessary measures for fire prevention

With regard to the above （１） breakers, to draft an implementation plan on necessary measures on fire prevention such as upgrading to a high-voltage breaker with highly seismically-resistant design / installing a seismic trestle on the lower part of the overhang-type breaker.

３．TEPCO’s action status regarding the directed matters

（１）Existence of overhang-type high-voltage breakers

As a result of research for the use of overhang-type high-voltage breakers at our nuclear power stations, we confirmed that, in Fukushima Daiichi Nuclear Power Station, there are 37 breakers at Unit 1, 45 breakers at Unit 2, 42 breakers at Unit 3, 27 breakers at Unit 4, 38 breakers at Unit 5, and at Fukushima Daini Nuclear Power Station, there are 53 Magnetic Blast Breakers (hereafter “MBB”). We confirmed that there are no overhang-type high-voltage breakers at Kashiwazaki Kariwa.

（Attachment-1）

（２）Necessary measures on fire prevention

The cause of fire at Onagawa NPS Unit 1 high voltage normal distribution panel due to Tohoku - Pacific Ocean Earthquake is presumed to be the effect of heat discharged as the result of the following process: due to the earthquake, seismic motion caused an overhang-type high-voltage breaker

of the distribution panel to swing, connected point of the panel side and breakers side to be damaged, and creating a short or a ground, which in turn caused an arc to discharge heat sufficient to torch off a fire. Therefore, it is possible to reduce the risk of fire by limiting the range of swings of overhang-type high-voltage breaker. Either of the following measures will be implemented to achieve this:

a. we will install a fixed trestle at the lower space of the MBB, which will reduce the swing of MBB at earthquakes, and will endeavor to reduce the risk of fire.

b. we will upgrade the breakers to transverse mounted vacuum circuit breakers (hereafter “VCB”), which has high quake resistance

Also, in cases where the above a. nor b. is implemented, the following measure will be implemented.

c. switching off the breakers and positioning in disconnected position

（Attachment-2, 3）

○Unit 1-4 of Fukushima Daiichi Nuclear Power Station

Currently, the reactors of Unit 1-4 of Fukushima Daiichi Nuclear Power Station are out of service, and due to the damage caused by the Tohoku - Pacific Ocean Earthquake, there is no plan of MBB receiving power, and receipt of power at high voltage normal distribution panel has been ceased. We will implement either of the above a. or b. if it restarts receiving power.

○Unit 5 of Fukushima Daiichi Nuclear Power Station

We will take following measures to the 38 MBBs extracted from the research.

・Currently, the reactor of Unit 5 of Fukushima Daiichi Nuclear Power Station is out of service, and regarding the 20 MBBs which has no plan of receiving power, we will implement the above c. measure (already implemented).

We will implement either of the above a. or b. if it restarts receiving power.

・Among the 18 MBBs in position to be in connection, 6 of them has trestles implemented. Therefore, we will carry out the above a. measure for the other 12 MBBs without trestles. (It is planned to be

implemented by July 15, 2011)

○Fukushima Daini Nuclear Power Station Unit 1

We will take following measures to the 53 MBBs extracted from the research.

・Currently, the reactor of Unit 1 of Fukushima Daini Nuclear Power Station is out of service, and regarding the 16 MBBs which has no plan of receiving power, we will implement the above c. measure (already implemented). We will implement either of the above a. or b. if it restarts receiving power.

・Among the 37 MBBs in position to be in connection, 4 of them has trestles implemented. Therefore, we will carry out the above a. measure for the other 33 MBBs without trestles. (It is planned to be implemented by July 15, 2011)

（Attachment-4）

END

Attachment-1

Research result of overhang-type high-voltage breakers

	Number of corresponding breakers		Location of breakers
1F Unit1	37	10	high voltage normal distribution panel 1B
		9	high voltage normal distribution panel 1C※
		8	high voltage normal distribution panel 1D※
		10	high voltage normal distribution panel 1S
1F Unit 2	45	12	high voltage normal distribution panel 2B
		9	high voltage normal distribution panel 2C※
		10	high voltage normal distribution panel 2D※
		8	high voltage normal distribution panel 2SA
		6	high voltage normal distribution panel 2SB
1F Unit 3	42	11	high voltage normal distribution panel 3A
		11	high voltage normal distribution panel 3D※
		8	high voltage normal distribution panel 3SA
		8	high voltage normal distribution panel 3SB
		4	RPT breakers
1F Unit 4	27	12	high voltage normal distribution panel 4B
		11	high voltage normal distribution panel 4D※
		4	RPT breakers
1F Unit 5	38	11	high voltage normal distribution panel 5B
		11	high voltage normal distribution panel 5D※
		4	high voltage normal distribution panel 5SB-1
		8	high voltage normal distribution panel 5SB-2
		4	RPT breakers
1F Unit 6	None		—
2F Unit 1	53	8	high voltage normal distribution panel 1A-2
		7	high voltage normal distribution panel 1B-2

		5	high voltage normal distribution panel HPCS※
		10	high voltage normal distribution panel 1SA-2
		8	high voltage normal distribution panel 1SB-1
		11	high voltage normal distribution panel 1SB-2
		4	RPT breakers
2F Unit 2	None		―
2F Unit 3	None		―
2F Unit 4	None		―
KK Unit 1	None		―
KK Unit 2	None		―
KK Unit 3	None		―
KK Unit 4	None		―
KK Unit 5	None		―
KK Unit 6	None		―
KK Unit 7	None		―

※ Emergency system

1F: Fukushima Daiichi

2F: Fukushima Daini

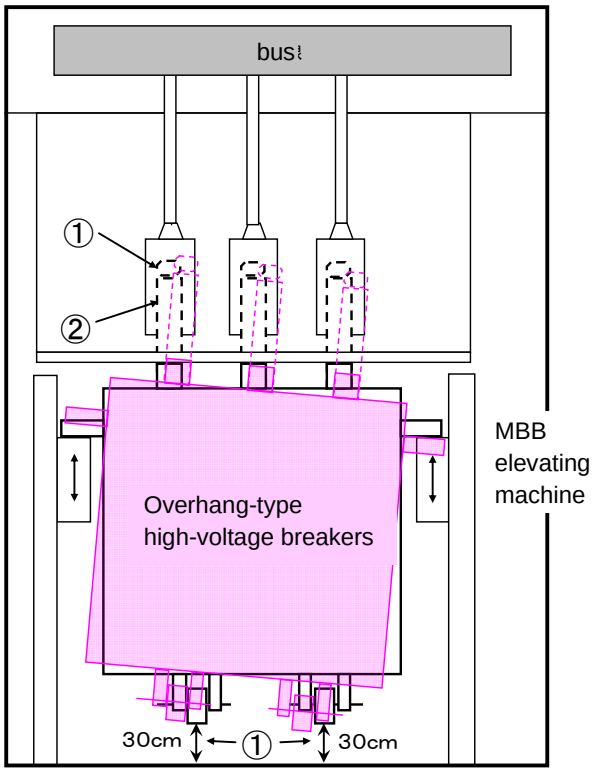
KK: Kashiwazaki Kariwa

Attachment-2

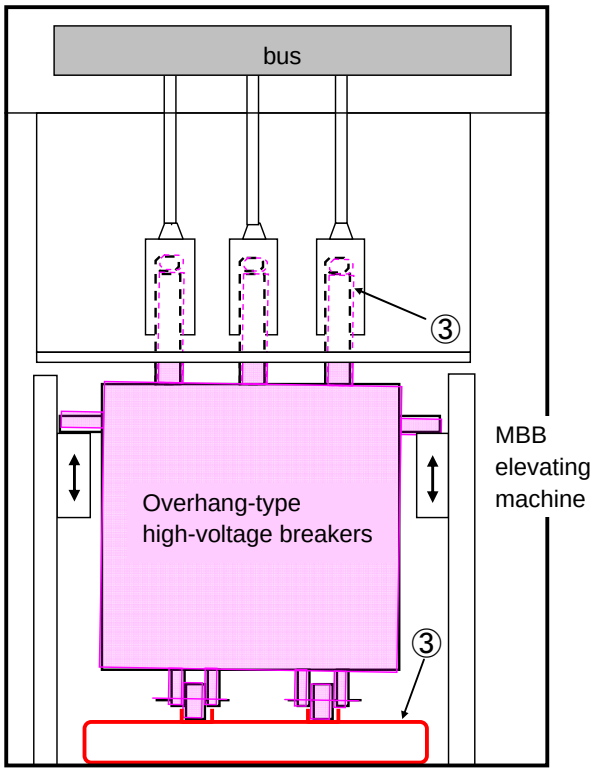
Image of installment of MBB fixed trestles

【Elevation view of high voltage normal distribution panel】

【Before measurement】



【After measurement】



①MBBs with lower space (about 30cm over-hanged) is not fixed, and therefore is swung largely by earthquakes, and connected point is damaged.

②the heat from an arc discharged as a result of damage at connected point, caused the insulating coating of cables to torch fire, and damage the breaker (resulting in igniting fire)

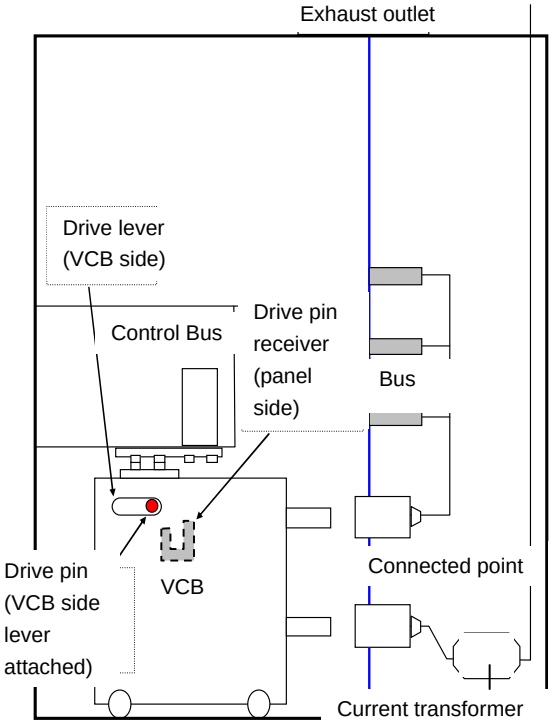
③addition of fixed trestle at the lower space. This prevents MBBs from swinging in wide range, and prevents damage of connected point.

Attachment-3

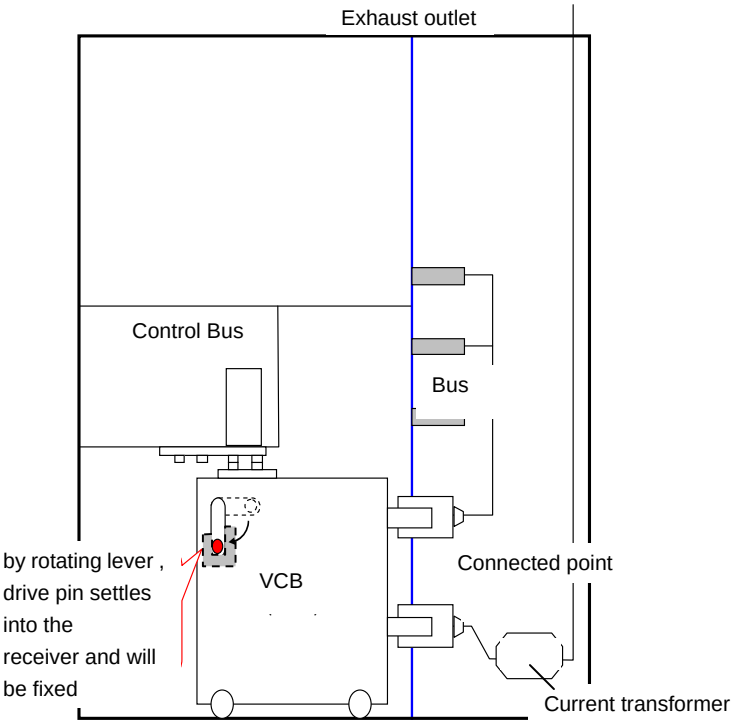
Image of VCB (transverse mounted vacuum circuit breakers)

【Side view of high voltage normal distribution panel】

【Disconnected position】



【Connected position】



High voltage normal distribution panel, which uses vacuum circuit breakers (VCB), is transverse mounted, and by rotating drive lever on the VCB side, the attached drive pin settles into the drive pin receiver on the power panel side, and will be fixed at connected position.

Attachment-4

Implementation plan of necessary measures for fire prevention in relation to overhang-type high-voltage breakers

	Number of corresponding breakers		Location of breakers	Measure（Implementation plan）
1F Unit 1	37		—	Stop receiving power at high voltage normal distribution panel(Already implemented)
1F Unit 2	45		—	
1F Unit 3	42		—	
1F Unit 4	27		—	
1F Unit 5	38	11	high voltage normal distribution panel 5B	a. 4breakers(~7/15) c.7breakers（Already implemented）
		11	high voltage normal distribution panel 5 D※	a. 2breakers（Already implemented） c.9breakers（Already implemented）
		4	high voltage normal distribution panel 5SB-1	a. 3breakers(~7/15) c.71breaker（Already implemented）
		8	high voltage normal distribution panel 5SB2	a. 5breakers(~7/15) c.3breakers（Already implemented）
		4	RPT breaker	a. 4breakers（Already implemented）
2F Unit 1	53	8	high voltage normal distribution panel 1A-2	a. 3breakers(~7/15) c.5breakers（Already implemented）
		7	high voltage normal distribution panel 1B-2	a. 5breakers(~7/15) c.2breakers（Already implemented）
		5	high voltage normal distribution panel HPCS※	c.5breakers（Already implemented）

		10	high voltage normal distribution panel 1SA-2	a. 9breakers(~7/15) c.1breaker（Already implemented）
		8	high voltage normal distribution panel 1SB-1	a. 7breakers(~7/15) c.1breaker（Already implemented）
		11	high voltage normal distribution panel 1SB-2	a. 9breakers(~7/15) c.2breakers（Already implemented）
		4	RPT breaker	a. 4breakers（Already implemented）

※：Emergency system

Measure a. We will install a fixed trestle at the lower space of the MBB, which will reduce the swing range of MBB at earthquakes, and will endeavor to reduce the risk of fire.

Measure b. we will upgrade the breakers to transverse mounted VCB, which has high quake resistance

Measure c. switching off the breakers and positioning in disconnected position