

Factors of fluctuation in plant parameters such as reduction of the pressure in Reactor during operation of High Pressure Coolant Injection System

July 28, 2011

Tokyo Electric Power Company

In the Attachment 1 “The status of cores at Units 1 to 3, Fukushima Daiichi Nuclear Power Station, TEPCO” in the report “Analysis and evaluation of the operation record and accident record of Fukushima Daiichi Nuclear Power Station at the time of Tohoku-Chihou-Taiheiyou-Oki-Earthquake”, submitted to Nuclear and Industrial Safety Agency, Ministry of Economy, Trade and Industry on May 23, 2011, it is stated that “during the operation of HPCI, the pressure is reduced. For example, the analysis result on the assumption that the steam leaks out of Primary Containment Vessel through HPCI is largely consistent with the fluctuation of pressures in Reactor and Primary Containment Vessel” as one of the conditions consistent with the fluctuation in measured parameters.

Based on further continuous analyses and evaluations of the fluctuation, it is estimated that while the pressure in Reactor was reduced by the operation of HPCI, the water from Condensate Storage Pool flowed into the suppression pool through the minimum flow line suppressed the increase of the pressure in Primary Containment Vessel (PCV).

The estimation above doesn't affect the analysis results of the status of the core at Unit 3, since the water level in Reactor was maintained during the operation of High Pressure Coolant Injection System (HPCI).

1. Situation at the site and operations

The following was confirmed later by the inspection of the situation.

○ Situation at the site

-It is estimated that if large volume of the steam had leaked out of PCV through steam pipes, Reactor including HPCI room would have got hot or been filled with the steam hence it'd have been impossible for a man to enter, however, operator(s) entered into RCIC room through HPCI room to try to reactivate RCIC after HPCI was stopped on March 13.

○ Operation of HPCI

-After HPCI was activated, the flow rate of HPCI was adjusted* checking the water level in Reactor to prevent repeating start and stop of HPCI due to high water level in Reactor.

- During this time, HPCI used the water in Condensate Storage Pool for the injection to Reactor.

*: Operation procedures state that continuous operation of HPCI shall not be inhibited by repeating start and stop of HPCI due to low (L-2)/high (L-8) water level in Reactor.

2. Possibility of the fracture of HPCI pipes from the perspective of designing equipments
Analyses state the leak of the steam out of PCV through steam pipes of HPCI as one of the conditions consistent with the fluctuation in the measured pressures in Reactor and PCV, however, as stated below, from the perspective of designing equipments it is unlikely that HPCI pipes were fractured and a large volume of the steam was leaked.

-The water level in Reactor was maintained during the operation of HPCI, the steam generated in Reactor was supplied to HPCI and the water was injected to Reactor.

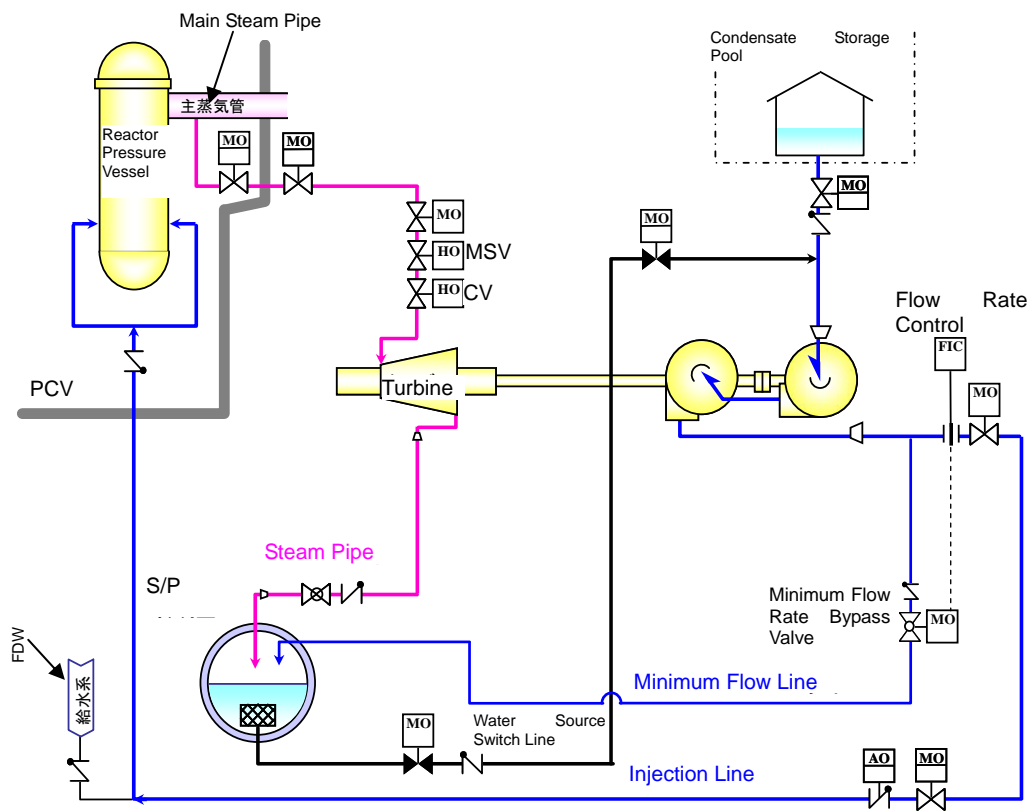
-If steam pipes of HPCI are fractured and the vapor is leaked out of PCV, the isolation signal is given off as a result of the fracture of HPCI steam pipes (increased volume of the steam flow rate), and the isolation signal is also given off due to the temperature increase in the atmosphere detected by temperature detectors installed around HPCI steam pipes in HPCI turbine/pump rooms, steam supply penetration rooms etc, thus HPCI won't be activated or stopped. This is inconsistent with the water level in Reactor maintained

3. Factors of fluctuations of parameters such as reduction of pressure in Reactor

-Normally after the water injection by HPCI starts, the pressure in Reactor is reduced in accordance with the injection, however, the steam used for the injection by HPCI is condensed in the suppression pool (S/P), thus the temperature in S/P increases and the pressure in PCV also increases.

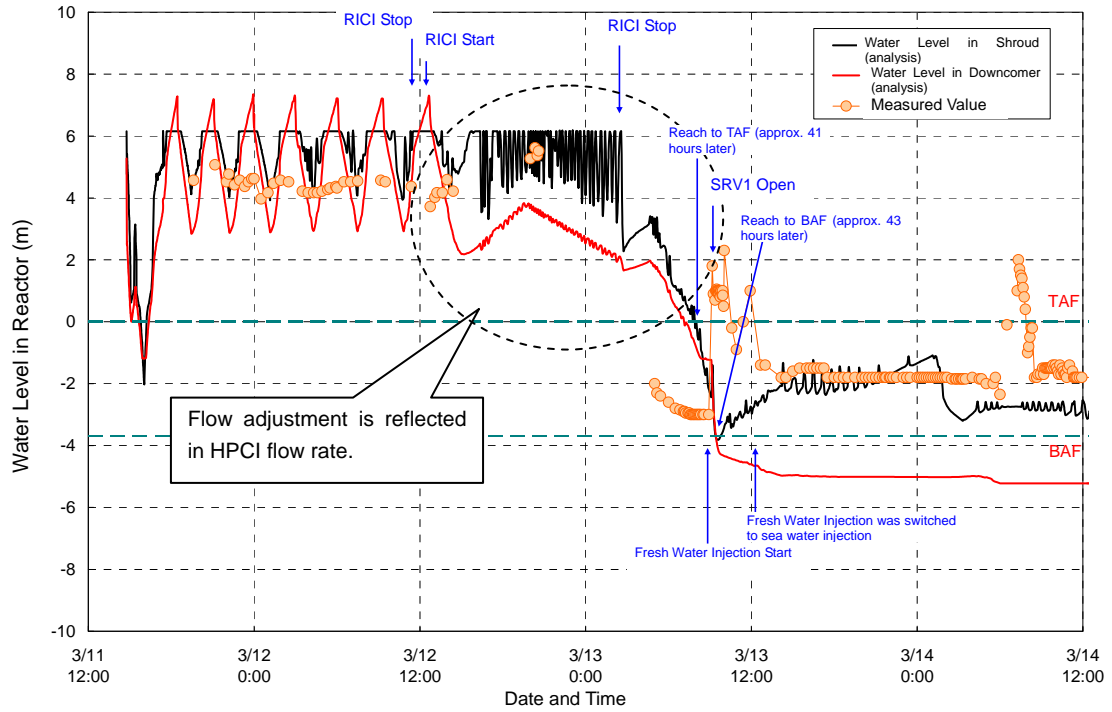
-The fluctuation this time is estimated as follows; while continuous operation of HPCI decreases the pressure in Reactor, the minimum flow line (which is opened when the flow rate at the pump is less than approx. 180t/h) is opened by the adjustment of inflow rate from HPCI to avoid unnecessary stop of HPCI due to the high water level in Reactor (L-8), through which cold water whose source is Condensate Storage Pool flows into the suppression pool (S/P), and this suppressed the increase of the pressure in PCV (refer to the picture below).

END

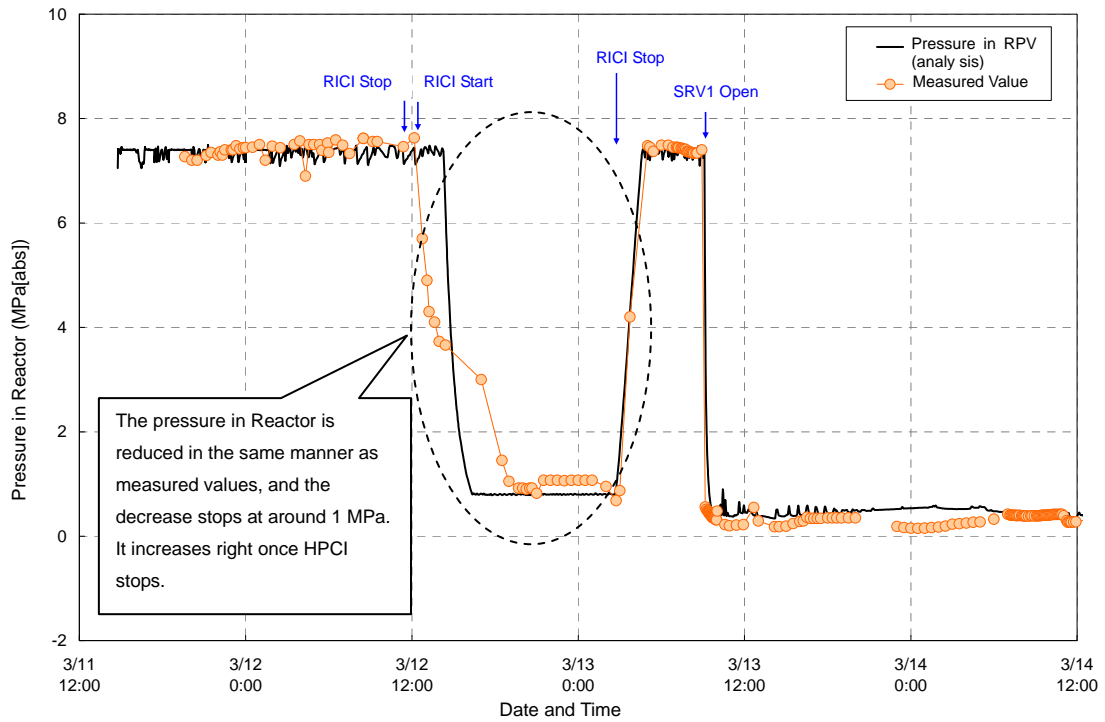


Picture Overview of HPCI System (operated at the adjusted flow rate)

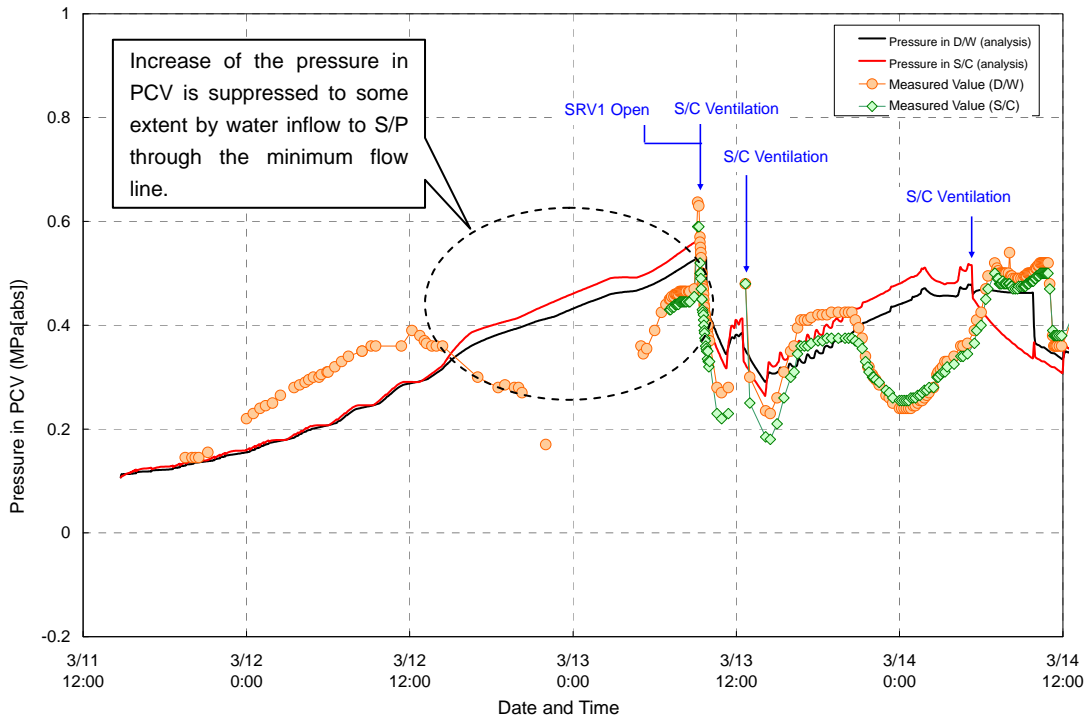
Trial analysis by MAAP analysis



Picture 1 Changes in the water level in Reactor at Unit 3(HPCI adjusted flow rate is reflected.)



Picture 2 Changes in the pressure in Reactor at Unit 3(HPCI adjusted flow rate is reflected.)



Picture 3 Changes in the pressure in PCV at Unit 3(HPCI adjusted flow rate is reflected.)