# 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

May 23, 2011

The Tokyo Electric Power Company, Incorporated

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## 1. Introduction

Fukushima Daiichi Nuclear Power Station sustained damage from the Tohoku–Chihou-Taiheiyo-Oki Earthquake occurred at 14:46 on March 11, 2011. Regarding the data which show the status of each Unit of Fukushima Daiichi Nuclear Power Station before and after the occurrence of the earthquake disaster, in response to the instruction from Nuclear and Industrial Safety Agency(NISA) of Ministry of Economy, Trade and Industry pursuant to Article 67, paragraph 1 of the Act on Regulation of Nuclear Source Materials, Nuclear Fuel Materials and Reactors", TEPCO submitted the report regarding operations data and the accident record of reactor facilities to the NISA on May 16, 2011

With regards to the accident at Fukushima Daiichi Nuclear Power Station, TEPCO was ordered by NISA on May 16, 2011 to analyze the submitted records before and after the occurrence of the earthquake and to evaluate the impact on safety of reactor facilities based on the results of the analysis in order to take appropriate emergency measures in the future.

This report contains the analysis of the records before and after the occurrence of the earthquake and the summary of the impact on the safety of the reactor facilities in response to NISA's instruction. In this report, TEPCO estimated the status of Units 1 to 3 of Fukushima Daiichi Nuclear Power Station applying the accident analysis code considering the operations record of Fukushima Daiichi Nuclear Power Station submitted on May 16, 2011 and the accident record data.

## 2. Overview of data analysis of Unit 1

### (1) Plant data

Plant behavior represented by using data collected from Unit 1 is shown as follows.

The chart of Unit 1 recorded data when the earthquake and tsunami attacked. However, due to the loss of power sources and signals caused by the effects of inundation by tsunami, the chart stopped after a certain period of time. The annunciator output data for about 10 minutes after the occurrence of scram. However, it stopped printing by some reasons. Since it didn't have any data storage function, the data after that were lost. Regarding the operation log which is the record by the operators on duty the records before the earthquake are kept, however, as for the records after the earthquake they could only record some items in the operation log afterwards by transferring items written in the whiteboard, because the plant accident hadn't settled yet at all thus they had to tackle the accident under severe conditions. The transient phenomenon recorder of Unit 1 which was activated by the increased vibration of the upper part of re-circulation pump due to the earthquake recorded data in about 30 minutes.

### (2) Plant behavior

① Before the occurrence of the earthquake at 14:46 on March 11, 2011, Unit 1 had been operated in the rated electric output and the data indicated it was under normal conditions. According to Shift Supervisor Task Handover Journal, the supervisor confirmed that the water level at the spent fuel pool was full (near overflow line) and the temperature of the pool was 25℃, i.e. under normal conditions. (Attachment 1-1 to 1-5)

② Unit 1 scrammed by the earthquake at 14:46 on the same day.

③ All control rods were inserted at 14:47 on the same day.

④ Immediately after the scram, Average Power Range Monitor (APRM) indicated sudden decrease. It means that the output surely decreased with normal operation. (Attachment 1-6 to 1-8)

⑤ Transition of water level in the reactor indicated the decrease of water level by crashing void immediately after the scram. However, the water level was recovered and maintained within the normal level range without reaching automatic starting level (L-L) of the Emergency Core Cooling System.

⑥ The pressure of the reactor was also reduced after the scram. However, since the main steam isolation valve was closed on 14:47 on the same day, the pressure increased. (Attachment 1-9 to 1-11)

⑦ In the record of the annunciator, the isolation signals indicated a rapture of main steam pipeline were printed out before and after the close of main steam isolation valves. However, the data collected from the transient phenomenon recorder showed that the main steam flow was zero (0) as a result of the closure of the main steam isolation valve, and did not indicate any increase of steam flow caused by the rapture of pipeline in the process. From abovementioned data and phenomena, it is estimated that the incorrect alarm regarding the rapture of main steam pipeline was made by closing signal according to the fail safe system caused by loss of external power sources for indicators by the earthquake. (Attachment 1-12 to 1-13)

⑧ On 14:52 on the same day, the Isolation Condensers were automatically opened due to the high reactor pressure (which means isolation valves of return pipeline, MO-3A and MO-3B, were opened) thus the steam in the reactor was cooled and the pressure in the reactor was decreased. On about 15:03 on the same day, about 10 minutes after the automatic opening, the Isolation Condensers were closed and then pressure in the reactor was increased again. The operation of the Isolation Condensers during these 10 minutes was recorded on the transient phenomenon recorder and the annunciator.

⑨ According to the operation manual of Isolation Condensors, the temperature drop rate of reactor pressure vessel (RPV) shall be adjusted below 55 ℃/h. Therefore, the manual operation of the Isolation Condensers is considered to be reasonable since it was observed sharp temperature drop in the RPV when the Isolation Condensers operated.
(Attachment 1-11, 1-13 and 1-14)

⑩ Meanwhile, external power sources were lost due the earthquake, 2 emergency diesel generators started at around 14:47 on the same day. By these units, voltage was kept at normal level. It is estimated that necessary power was secured.
(Attachment 1-15)

⑪ The reactor pressure was controlled within 6 to 7 MPa even after 15:00 on the same day at least until about 15:30 when the chart stopped functioning and no symptom indicating such rupture of steam pipeline was observed. The reason for pressure fluctuation is assumed to be the re-open of the Isolation Condensers and/or the work of main steam ventilation safety valve. The return water cooled by the Isolation Condensers are designed to be flowed into Primary Loop Recirculation System pipeline (B). Therefore, when the Isolation Condensers operated, the temperature of the Reactor Recirculation Pump inlet is to be decreased. Indeed, at the first automatic open of the Isolation Condensers, the indicated water temperature of the Reactor Recirculation Pump inlet was decreased. In accordance with the period of reactor pressure fluctuation observed after 15:00, the temperature of the Reactor Recirculation Pump inlet B line was decreased although the extent of temperature decreased was small, which indicated that it was highly likely that cooling water was flowed into Primary Loop Recirculation System through the Isolation Condensers. (Attachment 1-10 to1-11)

⑫ The knee point of the differential pressure was observed in the Suppression Chamber (differential pressure between the Primary Containment Vessel(PCV) and the Suppression Chamber), where it is the discharge place of steam from the main steam safety relief valve. Before the knee point appeared, the increase of the differential pressure at the Suppression Chamber would result from the pressure increase at PCV in accordance with the temperature increase at PCV. After the knee point, the increase of the differential pressure would result from further pressure drop at the Suppression Chamber with cooling of the Suppression Chamber by PCV spray line. (Attachment 1-16 and 1-17)

⑬ Other operations regarding the Isolation Condensers were manually opening the isolation valve of supply line to the Isolation Condenser (A), MO-3A, and the isolation valve of return line, MO-3A, after tsunami attacked at 18:18 on March 11[*1] in order to check the steam generated, and closing the isolation valve, MO-3A, at 18:25 on the same day, which were recorded on the whiteboard in the main control room. In addition, it was also recorded on the whiteboard that MO-3A was again operated to open at 21:30 on the same day in order to confirm whether the steam was generated.

⑭ After the reactor scram, temperature change of dry well cooler for the PCV until power sources for indicators stopped has a trend that the increase was moderate and saturated within several tens of degree. At that time, any sudden change of temperature indicating rapture of pipeline, etc. was not recognized in the PCV. (Attachment 1-18)

⑮ Regarding Emergency Core Cooling System (ECCS), pumps of PCV spray system were operated to cool the suppression chamber of PCV from 15:07 to 15:10 on March 11. No records which shows the operation of other pumps (high pressure water injection pumps and core spray pumps) were found (including manual operation) during the period after the earthquake until the loss of all alternative power sources, because the water level of the reactor did not draw down below the level ECCS would be the automatically activated. After the earthquake, the external power sources were lost and then Fuel Pool Cooling and Filtering System were stopped, however, emergency diesel generators were started. Cooling the pool using the shutdown cooling system pumps whose power is supplied from emergency diesel generators was not conducted before the arrival of tsunami, since it was confirmed that the water level of the spent fuel pool was full before the earthquake (around overflow level) and that the water temperature of the spent fuel pool was around 25℃, therefore it did not seem to be an obstacle for the immediate cooling of the fuel.
(Attachment 1-19)

⑯ Shift Supervisor Task Handover Journal states that all alternative power sources were lost at 15:37.

⑰ After the loss of all alternative power sources, it is assumed that PCV spray pumps of ECCS and core spray pumps did not work due to the loss of power. In addition, according to the contents written on the whiteboard in the main control room, it was confirmed that the direct current 125V panel was flooded at around 20:00 on March 11. It is considered that high pressure water injection system did not work due to the loss of power. Since then fresh water injection was started by using fire pumps from 5:46 on March 12.
(Annex-2)

⑱ Radiation monitoring at the exhaust stack indicated at stable values until the end of its recording even though there was some noise after the reactor scram. Abnormal situation was not recognized. (Attachment 1-20)

### (3) Consideration of the Isolated Condensers

① The Isolation Condensers automatically opened were estimated to be manually closed seeing that the transient phenomenon recorder showed the difference of shut down time for return pipeline valve, MO-3A and MO-3B.

② The operation manual of the Isolation Condensers requests to adjust the temperature drop rate of reactor pressure vessel below 55 ℃/h. When the Isolation Condensers operated this time, the temperature data at reactor recirculation pump inlet indicated that the temperature drop rate was more than 100 ℃/h in a short period, with pressure drop of the reactor, it was considered that operator(s) closed the Isolation Condensers manually due to such sudden temperature drop.

③ It was previously stated that there were is a possibility that the operator(s) operated the

Isolation Condensers after the Isolation Condensers were closed at 15:03, until about 15:30, during which the data were recorded. Based on the temperature at the reactor re-circulation pump inlet and pressure at the reactor recorded on the chart, the temperature change and pressure change were carefully controlled, compared with the big change of temperature and pressure caused by automatic open of the two Isolation Condensers. It was considered that pressure was controlled by manual operation of one Isolation Condenser in line with the manual operation procedure.

④ According to the description on the whiteboard, opening the valve of isolation supply line, MO-2A, of the Isolation Condenser at 18:18 on March 11 was recorded, while closing the MO-2A valve is not implemented under the normal operation. In this point, it was assumed that the tsunami attached between the time when operator manually stopped the Isolation Condenser and the time when operator activated it (at 18:18), and then the direct current power source used to detect “the rapture of the Isolation Condenser pipe,” was lost. Consequently, it was assumed the signal of “the rapture of the Isolation Condenser pipe” was transmitted as a fail-safe function therefore the isolation valves of the Isolation Condensers, including MO-2A valve, were automatically closed.

⑤ While examining the possibility that the signal of “the rapture of the Isolation Condenser pipe” was transmitted and then the isolation valves were closed, the examination report was issued on the status of open/close condition of the isolation MO-2B valve of the Isolation Condenser, which operator didn’t operate. (conducted on April 1, 2011) According to the result of the report, it was confirmed that it was highly likely that the valves were fully closed. Likewise, it was confirmed that it was highly likely MO-2A valve and MO-3A valve were fully opened, which was consistent with the operation record on the whiteboard.

⑥ According to the note on the whiteboard, the generation of steam was confirmed when operators opened the valve of the Isolation Condensers. Meanwhile, in the case that signal of “the rapture of the Isolation Condenser pipe” is transmitted, four isolation valves (MO-1A, MO-1B, MO-4A, MO-4B) installed inside the PCV Isolation Valves are designed to be fully closed if the driving power source remained. Further, as the result of the examination report on the status of open/close condition of the isolation valves, it indicated that the isolation valves were partially open; however, the opening degree of each valve was not clear. Therefore, at this stage, it is impossible to conclude how much extent the Isolation Condensers were functioned.

⑦ In order to obtain more precise information, the visual inspections of each isolation valve, especially of accessible outside isolation valves, are scheduled to be implemented if possible.

*1) Time was determined based on the note on the whiteboard in the Central Control Room. However, it was ambiguous since two different times were stated in the note on the whiteboard; 18:10 (7. “Summary report on various operation records” submitted on May 16, 2011) and 18:18. As the result of the analysis and the evaluation, the operation time was determined as 18:18.

Form-1
Fukushima Daiichi Nuclear Power Plant Unit 1 and 2

Shift Supervisor Task Handover Journal（1/3）

# Shift Supervisor Task Handover Journal

| |
|---|
| [confirmed by］ Chief engineer of reactors |
| |

Red colored is tentative data

| | | |
|---|---|---|
| March 11, 2011, Friday, 8:30, Shift 2, Group E | ［confirmed by］<br>Supervisor of next shift | ［made and approved by］<br>Shift supervisor |
| | | |

| | | | | |
|---|---|---|---|---|
| On duty<br>11（operator）<br>-（instructor）<br>1（trainee） | No. of organization | Off duty | [redacted] | Support duty |
| | 172 | Replacement | [redacted] | Refer to attachment |

| | | | | |
|---|---|---|---|---|
| Unit 1 | Generator Output | 460MWe | Reactor Status | [✓ in operation]・start up・hot shutdown・cold shutdown・fuel exchange |
| Unit 2 | Generator Output | 789MWe | Reactor Status | [✓ in operation]・start up・hot shutdown・cold shutdown・fuel exchange |

Notes

Unit 1

1. Operation Status

(1) Generator output 460MWe in operation

(2) M.COND B/W 04:04~04:51

2. Compliance status of safety regulation

Not particular

3. Periodic test

None

4. Requested work, non compliance event

None

5. Status of waste treatment facility

None

Fukushima Daiichi Nuclear Power Station Unit 1

# Operation log [1]

一発一360 運転日誌記載ガイド
2011年3月10日(90)

太枠は炉規則第7条／保安規定第120条対象記録

福島第一原子力発電所 1号機

# 運 転 日 誌 〔1〕

2011年 3月 11日

1F-1-6

| | 業務記録確認表（引継ぎ後のプラント状態をチェックする） | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 炉水温度 | 燃料の状態 | プールゲートの状態 | 原子炉の加圧 | 記録項目確認 2直 | 1-1直 | 1-2直 | 2直 | 記録が必要な項目 |
| 定格熱出力一定運転中（[illegible]） | — | — | — | — | ✓ | ✓ | | | 1,2,8,11,12 |
| 発電機並列中 | — | — | — | — | ✓ | ✓ | | | 1,8,11,12,13,23,24,25 |
| 原子炉の状態 運転 | — | — | — | — | ✓ | ✓ | | | 1,2,3,4,5,6,7,8,9,10 |
| 原子炉の状態 起動 | — | — | — | — | | | | | 1,2,3,6,7,8,9,10,12,14～19,21,22 |
| 原子炉の状態 高温停止 | — | — | — | — | | | | | 1,2,3,6,7,10,12,14,22 |
| 原子炉の状態 冷温停止 | 65℃以上 | — | — | 加圧なし | | | | | 1,2,8,9,12,14,22 |
| | | | | 加圧 | | | | | 1,2,8,9,12,14,20,22 |
| | 65℃未満 | — | — | 加圧なし | | | | | 1,2,8,9,12,14,22 |
| 原子炉の状態 燃料交換 | — | 1体以上炉心に装荷 | 閉鎖 | — | | | | | 1,2,8,9,12,14,22 |
| | | | 開放 | — | | | | | 1,2,8,9,12,14 |
| | — | 全燃料取出中 | 閉鎖 | — | | | | | 1,2,9,12,22,★ |
| | | | 開放 | — | | | | | 1,2,9,12,14 |
| 格納容器閉鎖中 | — | — | — | — | ✓ | ✓ | | | 1,2,3,4,5,10,12 |

## 記録確認項目

1 原子炉水導電率
2 サプレッションチェンバー水位
3 サプレッションチェンバー水温度
4 ドライウェル酸素濃度
5 原子炉熱出力（瞬時値、1時間平均値）
6 原子炉熱出力（SRM、IRM、APRM）
7 給水圧力
8 排ガス再結合器温度
9 補給水積算記録
10 格納容器内の原子炉冷却材漏えい率
11 発電機出力（読み）
12 変圧器等積算
13 タービン軸振動（軸振等）
14 ◆原子炉再循環ループ温度
15 ◆給水温度
16 ◆主蒸気流量
17 ◆給水流量
18 ◆主蒸気圧力
19 ◆主蒸気温度
20 [illegible]
21 ◆原子炉圧力
22 ◆原子炉水位
23 ◆発電機出力（電力量）
24 ◆復水器真空
25 ◆高圧第1段圧力

★全燃料取出中でプールゲートが閉鎖されている場合にRPVスタッドボルトの締付完了後またはRPVスタッドボルト緩め作業開始前は原子炉再循環ループ温度／原子炉冷却材温度記録を行う。

◆の項目に記録要求がある場合でプロセス計算機打ち出しによる確認ができない場合は、計器を使用し記録を行う。

| 確認 | | 承認 | 内容確認 | 作成 | プロセス計算機データ異常 |
|---|---|---|---|---|---|
| 原子炉主任技術者 | | 当直長 | 当直副長 | 当直員 | |
| | 2直 | [redacted] | [redacted] | [redacted] | [✓ 異常なし]<br>異常有り |
| | 1-1直 | | | | 異常なし<br>異常有り |
| | 1-2直 | | | | 異常なし<br>異常有り |
| | 2直 | | | | 異常なし<br>異常有り |

| 保安規定 | 9,18,120 | 9,13,40,46 | 9,13,45 | 9,13,48 | 28 | | 9,26,27,120 | | | | | | | | 9,120 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | | | | | | 熱出力・炉心の中性子束密度 | | | | | | | | 冷却材圧力 | 再結合装置内の温度 | | | |
| 記録すべき場合、頻度 | 毎日1回 | すべての期間 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | 定格熱出力一定運転時 | | 原子炉に1体以上燃料が装荷されている場合運転 | | | | | | | | 原子炉の状態が運転及び起動において1時間ごと | | | | |
| | 1 | 2 | 3 | 4 | 5 | | 6 | | | | | | | | 7 | 8 | | | |
| 項目 | （補2）<br>原子炉水電導度 | サプレッションチェンバー水位 | サプレッションチェンバー水温度 | ドライウェル酸素濃度 | 原子炉熱出力<br>瞬時値 | 1時間平均値 | 原子炉熱出力（補1）（SRM IRM [✓ APRM]） | | | | | | | | 給水圧力 | 排ガス再結合器温度 A 入口 | A 出口 | B 入口 | B 出口 |
| | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | | | | | | |
| 時刻 | μS/cm | mm | ℃ | % | MWt | MWt | s⁻¹ [✓ %] | | | | | | | | MPa | ℃ | | | |
| | 977 | 903 | 996A | 925 | 計算機 | | 905 | | | | | | | | 906 | 934 | | | |
| 計器 | PH/CRS-9-14 | LI-1602-2 | TR3-1601-71A/71B | O₂RS-9-75 | 原子炉熱出力 | 原子炉平均熱出力 | NR-750-10A/B/C/D | | | | | | | | PI-2-13 A～C | TR-2402-119A | | TR-2402-119B | |
| PID | — | — | — | — | S258 | S258 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 1 | | | | | | | | 101 | 101 | 101 | 101 | 101 | 101 | | 9.8 | 149 | 255 | 149 | 253 |
| 2 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 254 | 149 | 253 |
| 3 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 254 | 149 | 253 |
| 4 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 254 | 149 | 253 |
| 5 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 255 | 149 | 253 |
| 6 | | 10 | 21.0 | 0.85 | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 254 | 149 | 253 |
| 7 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 8 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 9 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 10 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 11 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 12 | | 10 | 21.0 | 0.85 | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 13 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 14 | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | 9.8 | 149 | 264 | 149 | 262 |
| 15 | | | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | |

| | 9,120 | 9,13,31 | | | | |
|---|---|---|---|---|---|---|
| | 原子炉に使用している冷却材及び減速材の毎日の補給量 | | | | | |
| | 毎日1回 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | | | |
| | 9 | 10 | | | | |
| | 補給水積算記録 | 格納容器内の原子炉冷却材漏えい率 | | | | |
| | 純水補給水量 FQ-7-L1 ×100ℓ | D/W床ドレンサンプ流量 FQ-2001-432（×0.01m³） | D/W機器ドレンサンプ流量 FQ-2001-419（×0.01m³） | D/W冷却器ドレン量 FQ-1602-19（×0.1ℓ） | | |
| | 現場 | 919 | | | | |
| 24 | | | | | D/W床ドレン | m³/h |
| 0 | 40808 | 43177 | 247538 | 239434 | 全漏洩量 | m³/h |
| 差 | | | | | | |

| | 主発電機 | 変圧器等積算 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 12 | | | | | | | |
| | 発電機出力 | 起動変圧器 | | | | 所内変圧器 | | | 所内電力量合計 |
| | 11 | | | | | | | | |
| | 読み | 1S | 2SA | 2SB | 小計 | 1A | 1B | 小計 | |
| | kWh×10,000 | kWh×1,000 | kWh×1,000 | kWh×1,000 | MWh | kWh×1,000 | kWh×1,000 | MWh | MWh |
| | 931 | メタクラ | | | | メタクラ | | | |
| | EI-102 | 1S1 | 2SA1 | 2SB1 | | 1A2B | 1B2 | | |
| 24 | | | | | | | | | |
| 0 | 37 622.6 | 66 382.0 | 86 445.0 | 09 358.0 | | 15 150.0 | 72 253.0 | | |
| 差 | | | | | | | | | |

所内電力量算出
1S1＋2SA1＋2SB1＋1A2B＋1B2－~~(2A3B＋2B2＋集中ラド)~~ ＝ ＿＿＿＿＿ MWh
※2A3B＋2B2＋集中ラド＋4A

2A3B電力量合計 ＿＿＿＿ MWh　2B2電力量合計 ＿＿＿＿ MWh　所内電力量のうち 集中ラド(2SA)使用分 ＿＿＿＿ MWh

※ 4A電力量合計 ＿＿＿＿ MWh

| 定格熱出力運転時 タービン軸受振動（1日の最大値） | |
|---|---|
| 907 | |
| VbR-10-1/2/3 | |
| 13 | |
| 軸受 No. | 最大値 1/100mm |
| | |

補足事項
補1 炉規則第7条、保安規定第120条記録は運転記録のチャートである。
補2 原子炉水導電率が記録できない場合は代替記録採取場所により記録する。詳細は運転日誌記載ガイドを確認すること。
補3 再循環ポンプ吸込温度（原子炉冷却材浄化系入口温度）の毎正時の温度と1時間前の温度を確認し、温度差が55℃/hを超えていないことを確認する。

注意事項（運転日誌共通）
1. 運転日誌別紙の項目に◆が記載されているものは、BOP打出紙参照記録のため、毎時打出し記録を確認しデータに異常が無い事を確認し空欄とすること。
2. PTW以外で記録不可能な場合は「－」としその理由を余白に記載する。PTWの場合は「PTW」と記載する。
3. 記録不要な場合は当該欄の横に「／」とする。（運転日誌別紙の◆項目も同様）

記事
※M/C 3SA受電切替の為
所内電力算出方法変更

添付資料－1－2

一発－360 運転日誌記載ガイド
2011年3月10日(00)

# Fukushima Daiichi Nuclear Power Station Unit 1 Status of emergency machines check sheet

福島第一原子力発電所　1 号 機　**非常用機器状態確認チェックシート**

2011年 3月 11日

| | 承認<br>当直長 | 内容確認<br>当直副長 | 作成<br>当直員 |
|---|---|---|---|
| 1直 | | | |
| 2直 | [redacted] | [redacted] | [redacted] |

| 項 | 目 | 通常状態 | 2直 | 1直 |
|---|---|---|---|---|
| 自動逃し弁系 | AO－95－2 | × | レ | |
| | －95－4 | ○ | レ | |
| | RV－203－3A | × | レ | |
| | 〃 B | × | レ | |
| | 〃 C | × | レ | |
| | 〃 D | × | レ | |
| 隔離時復水器系〔A〕 | MO－ 1A | ○ | レ | |
| | － 2A | ○ | レ | |
| | － 3A | × | レ | |
| | － 4A | ○ | レ | |
| | －10A | × | レ | |
| | －17A・20A | ○ | レ | |
| 炉心スプレイ系〔A〕 | ポンプA | SB | レ | |
| | 〃 C | SB | レ | |
| | MO－25A | × | レ | |
| | －24A | ○ | レ | |
| | － 3A | ○ | レ | |
| | － 4A | × | レ | |
| | A系潤滑油ポンプ1A | SB | レ | |
| | 〃 2A | SB | レ | |
| | 〃 3A | SB | レ | |
| 格納容器冷却系〔A〕 | 格納容器スプレイポンプA | SB | レ | |
| | 〃 B | SB | レ | |
| | MO－ 4A | ○ | レ | |
| | － 4B | ○ | レ | |
| | －10A | × | レ | |
| | －11A | × | レ | |
| | －13A | × | レ | |
| | －30A | ○ | レ | |
| | 格納容器冷却海水ポンプA | SB | レ | |
| | 〃 B | SB | レ | |
| | MO－5A | × | レ | |
| | －5B | × | レ | |
| | －6A | × | レ | |
| | MO－6B | × | レ | |

| 項 | 目 | 通常状態 | 2直 | 1直 |
|---|---|---|---|---|
| 格納容器冷却系〔A〕 | MO－2A | × | レ | |
| | AO－3001 | × | レ | |
| | －3002 | × | レ | |
| | －3008 | × | レ | |
| | －3009 | × | レ | |
| | －3010 | × | レ | |
| | －3011 | × | レ | |
| | －3012 | × | レ | |
| | －3013 | × | レ | |
| 高圧注水系 | MO－ 3 | × | レ | |
| | － 4 | ○ | レ | |
| | － 5 | ○ | レ | |
| | － 6 | ○ | レ | |
| | － 8 | × | レ | |
| | － 9 | ○ | レ | |
| | －10 | × | レ | |
| | －14 | × | レ | |
| | －15 | × | レ | |
| | －29 | ○ | レ | |
| | －30 | ○ | レ | |
| | －31 | × | レ | |
| | －32 | × | レ | |
| | －35 | × | レ | |
| | －36 | × | レ | |
| | －64 | × | レ | |
| | －65 | × | レ | |
| | タービン止め弁（HO弁） | × | レ | |
| | タービン加減弁（HO弁） | × | レ | |
| | AOP | SB | レ | |
| | 復水ポンプ | SB | レ | |
| | 真空ポンプ | SB | レ | |
| | 流量制御器 | AUTO | レ | |
| 隔離時復水器系〔B〕 | MO－1B | ○ | レ | |
| | MO－ 2B | ○ | レ | |
| | － 3B | × | レ | |

| 項 | 目 | 通常状態 | 2直 | 1直 | 記　事 |
|---|---|---|---|---|---|
| 隔離時復水器系〔B〕 | － 4B | ○ | レ | | |
| | －10B | × | レ | | |
| | －17B・20B | ○ | レ | | |
| 炉心スプレイ系〔B〕 | ポンプB | SB | レ | | |
| | 〃 D | SB | レ | | |
| | MO－25B | × | レ | | |
| | －24B | ○ | レ | | |
| | － 3B | ○ | レ | | |
| | － 4B | × | レ | | |
| | B系潤滑油ポンプ1B | SB | レ | | |
| | 〃 2B | SB | レ | | |
| | 〃 3B | SB | レ | | |
| 格納容器冷却系〔B〕 | 格納容器スプレイポンプC | SB | レ | | |
| | 〃 D | SB | レ | | |
| | MO－ 4C | ○ | レ | | |
| | － 4D | ○ | レ | | |
| | －10B | × | レ | | |
| | －11B | × | レ | | |
| | －13B | × | レ | | |
| | －30B | ○ | レ | | |
| | －1200 | × | レ | | |
| | －1201 | × | レ | | |
| | 格納容器冷却海水ポンプC | SB | レ | | |
| | 〃 D | SB | レ | | |
| | MO－ 2B | × | レ | | |
| ディーゼル発電機1A | ディーゼル発電機 | SB | レ | | |
| | 6.9KVしゃ断器1C1 | ○ | レ | | |
| ディーゼル発電機1B | ディーゼル発電機 | SB | レ | | |
| | 6.9KVしゃ断器1D1 | ○ | レ | | |

1. 主要操作が終了し、引継ぎまでの間に状態を確認する。
   1直帯は18時～引継ぎまで、2直帯は6時～引継ぎまで
2. 通常状態と比較し異常なければ「レ」相違する場合は、次の記号で記載する。
3. 記号　レ：異常なし　○：開　×：閉　W：作業中　RUN：運転中
   MAN：手動　P/L：引き保持

プラント主要パラメータを打出したBOPタイパー　サンプル

BOP (Balance of Plant) Typer (printed out main parameters of the plant) - sample

## 1号機　BOPログ

| 発電所コード | 号機コード | データ採取日 | データ採取時間 | 原子炉平均熱出力(MW) | 原子炉APRM平均(%) | 原子炉熱出力(MW) | 原子炉給水熱出力(MW) |
|---|---|---|---|---|---|---|---|
| 1F | 1 | 2011/03/11 | 01 | 1376 | 100.63585 | 1378 | 1363.5857 |
| 1F | 1 | 2011/03/11 | 02 | 1377 | 100.60976 | 1379 | 1364.0286 |
| 1F | 1 | 2011/03/11 | 03 | 1377 | 100.63496 | 1375 | 1363.312 |
| 1F | 1 | 2011/03/11 | 04 | 1377 | 100.68285 | 1377 | 1360.4839 |
| 1F | 1 | 2011/03/11 | 05 | 1377 | 100.66801 | 1377 | 1362.3198 |
| 1F | 1 | 2011/03/11 | 06 | 1377 | 100.69589 | 1377 | 1366.1277 |
| 1F | 1 | 2011/03/11 | 07 | 1377 | 100.71751 | 1376 | 1361.458 |
| 1F | 1 | 2011/03/11 | 08 | 1377 | 100.68282 | 1377 | 1364.7932 |
| 1F | 1 | 2011/03/11 | 09 | 1377 | 100.66106 | 1376 | 1365.0151 |
| 1F | 1 | 2011/03/11 | 10 | 1376 | 100.65723 | 1378 | 1362.2947 |
| 1F | 1 | 2011/03/11 | 11 | 1377 | 100.60942 | 1379 | 1359.7825 |
| 1F | 1 | 2011/03/11 | 12 | 1377 | 100.64201 | 1375 | 1362.0383 |
| 1F | 1 | 2011/03/11 | 13 | 1377 | 100.64522 | 1374 | 1359.2983 |
| 1F | 1 | 2011/03/11 | 14 | 1377 | 100.66862 | 1376 | 1362.9126 |
| 1F | 1 | 2011/03/11 | 15 | 1107 | 78.534958 | 0 | |
| 1F | 1 | 2011/03/11 | 16 | | | | |
| 1F | 1 | 2011/03/11 | 17 | | | | |
| 1F | 1 | 2011/03/11 | 18 | | | | |
| 1F | 1 | 2011/03/11 | 19 | | | | |
| 1F | 1 | 2011/03/11 | 20 | | | | |
| 1F | 1 | 2011/03/11 | 21 | | | | |
| 1F | 1 | 2011/03/11 | 22 | | | | |
| 1F | 1 | 2011/03/11 | 23 | | | | |
| 1F | 1 | 2011/03/11 | 24 | | | | |
| | | | | ≦ 1380 | 98～100 | ≦ 1380 | ≦ 1380 |

※ 1号機 第26回定期検査総合性能検査記録より
制限値（≦　）、過去データ（　～　）がある
パラメータについて表記。

※From "Integrated Performance Test Record of the 26th Periodic Inspection of Unit 1", parameters with that there exist limit values ( ≦ ), or past data ( ～ ) are referred here.

Summary Log of Output Distribution

Calculation/ Result of Output

# 出力分布計算サマリログ

```
出力分布計算サマリログ                                日付 2011/03/11  時刻 14:00     福島第一原子力発電所・１号機  第25サイクル

出力分布計算結果         日付  2011/03/11  時刻  14:00

CTP       1376. 6   (     99. 8 %)     CAEQ     0. 137     PR        6. 92      WFW     2462   (  99. 8 %)     CAVEX    25779. 0   MWd/mt      CRD       0. 1014      SEQ. 14
GMWE       459. 6   (     99. 9 %)     CAQA    36. 82      DPC-M     0. 079     WD      9184   (  82. 0 %)     CYCLEX    3826. 4   MWd/mt      CRSYM          1
MFLCPR      0. 849  ( 19-24      )     CAVF     0. 363     DPC-C     0. 104     WTSUB  18392   (  84. 5 %)     CAXEN    1. 295E+15              IREC           0
MFLPD       0. 805  ( 27-10-04   )     CAPD    40. 51      RWL     932          WTHB   18554                    CAIODN   2. 716E+15              IDMODE        20
CMPF        2. 796                                         DHS      63. 80      WT     18340   (  84. 2 %)                                         ITE            3
                                                                                WTFLG      2
```

```
                        制御棒位置
 43                      **   **   **   **   **
 39                 **   **   **   12   **   **   **
 35            **   **   **   **   **   **   **   **
 31       **   **   **   06   **   08   **   06   **   **   **
 27       **   **   **   **   **   **   **   **   **   **   **
 23       **   12   **   08   **   **   **   08   **   12   **
 19       **   **   **   **   **   **   **   **   **   **   **
 15       **   **   **   06   **   08   **   06   **   **   **
 11            **   **   **   **   **   **   **   **   **
 07                 **   **   **   12   **   **   **
 03                      **   **   **   **   **
          02   06   10   14   18   22   26   30   34   38   42
```

```
LOCATION    RING. R    APRM
            RPF        GAF
  1 (A)     1. 49      0. 990
  2 (B)     1. 45      0. 995
  3 (C)     1. 22      0. 995
  4 (D)     1. 26      0. 990
  5 (E)     1. 19      0. 990
  6 (F)     0. 49      0. 994
```

```
                          ＦＬＣＰＲ及びＦＬＰＤの最大値（全炉心）
NO   FLCPR    CPR    FUELID    ( X  -  Y )  TYPE  NO   FLPD     LHGR     FUELID    ( X  -  Y  -  Z )  TYPE
 1   0. 849   1. 507  ZN21     ( 19 -  24 )   3    1   0. 805   35. 420  ZN30      ( 27 -  10 -  04 )   3
 2   0. 806   1. 588  ZN32     ( 09 -  18 )   3    2   0. 788   34. 689  ZN27      ( 27 -  36 -  04 )   3
 3   0. 797   1. 606  AAN65    ( 17 -  28 )   5    3   0. 788   34. 672  ZN29      ( 17 -  36 -  05 )   3
 4   0. 797   1. 606  ZN28     ( 17 -  10 )   3    4   0. 778   34. 232  AAN17     ( 15 -  38 -  05 )   4
 5   0. 791   1. 619  AAN64    ( 17 -  22 )   5    5   0. 777   34. 209  AAN18     ( 29 -  08 -  04 )   4

                          ＦＬＣＰＲ及びＦＬＰＤの最大値（燃料タイプ毎）
TYPE  FLCPR    CPR    FUELID   ( X  -  Y )        TYPE  FLPD     LHGR     FUELID    ( X  -  Y  -  Z )
 1    0. 522   2. 453  V053    ( 09 -  26 )         1   0. 504   22. 156  V053      ( 09 -  26 -  20 )
 2    0. 778   1. 646  ZN61    ( 17 -  26 )         2   0. 716   31. 493  YN18      ( 29 -  10 -  04 )
 3    0. 849   1. 507  ZN21    ( 19 -  24 )         3   0. 805   35. 420  ZN30      ( 27 -  10 -  04 )
 4    0. 744   1. 720  AAN05   ( 09 -  32 )         4   0. 778   34. 232  AAN17     ( 15 -  38 -  05 )
 5    0. 797   1. 606  AAN65   ( 17 -  28 )         5   0. 673   29. 617  AAN85     ( 11 -  34 -  05 )
```

```
  AXIAL
 K   RPF
24  0. 32         較正済ＬＰＲＭ読み値
23  0. 78    41              28   32   18
22  0. 99                    34   32   24
21  1. 11                    36   30   24
20  1. 12                    33   24   22
19  1. 13
18  1. 12    33        30    41   45   36   18
17  1. 12              40    48   47   46   24
16  1. 12              44    50   48   49   24
15  1. 12              50    51   44   52   22
14  1. 12    25        40    48   47   46   33
13  1. 11              40    51   59   49   33
12  1. 12              44    51   60   51   31
11  1. 12              46    42   49   47   27
10  1. 07    17        35    43   47   39   26
 9  1. 08              45    49   50   45   34
 8  1. 10              48    50   52   48   35
 7  1. 09              61    41   42   48   35
 6  1. 11
 5  1. 12    09 D      18    34   41   30
 4  1. 07       C      23    43   43   40
 3  0. 97       B      25    46   45   45
 2  0. 79       A      25    59   47   48
 1  0. 21
                       08    16   24   32   40
```

```
非対称制御棒位置（右下象限）
(TT :  0)
   0     0     0     0     0     0     0     0     0     0
   0     0     0     0     0     0     0     0     0     0
   0     0     0     0     0     0     0     0     0     0
   0     0     0     0     0     0     0     0     0     0
   0     0     0     0     0     0     0     0

代替制御棒位置
(TT :  0)
   0     0     0     0     0     0     0     0     0     0

故障センサー
(TT :  0)
  0    0    0    0    0    0    0    0    0    0
  0    0    0    0    0    0    0    0    0    0
  0    0    0    0    0    0    0    0    0    0
  0    0    0    0    0    0    0    0    0    0
  0    0    0    0    0    0    0    0
```

```
故障ＬＰＲＭリスト
(TT :  0)
   0 , 0,  0      0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0
   0 , 0,  0      0 , 0,  0

BASE CRIT CODE
(TT :  0)
   0 ,  0       0 ,  0       0 ,  0
   0 ,  0       0 ,  0       0 ,  0
   0 ,  0       0 ,  0
   0 ,  0       0 ,  0
   0 ,  0       0 ,  0
   0 ,  0       0 ,  0
   0 ,  0       0 ,  0
   0 ,  0       0 ,  0
   0 ,  0       0 ,  0
   0 ,  0       0 ,  0
```

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 1 and 2

# Major Test Items

March 11, 2011, Friday, Shift 2, Shift Supervisor Task Handover Journal (3/3)

| Test Items | | Test Frequency | Unit 1 | Unit 2 | Notes |
|---|---|---|---|---|---|
| 1 | Core Minimum Fraction of limiting Critical Power ratio (CMFCP) | 1/ shift | 0.85 | 0.90 | |
| 2 | Core Maximum Fraction of Limiting Power Density (CMFLPD) | 1/ shift | 0.81 | 0.76 | |
| 3 | Reactor lowest water level | 1/ shift | 925 mm | 1130 mm | |
| 4 | Spent fuel pool highest temperature | 1/ shift | 25℃ | 26 ℃ | |
| 5 | Spent fuel pool water level status | 1/ shift | Around overflow water level | Around overflow water level | |
| 6 | Reactor coolant maximum temperature change rate | at the time of activation and shutdown | —℃／hr | —℃／hr | |
| 7 | RPV lowest temperature | At the time of pressure resistance test of RPV | —℃ | —℃ | |

(Form for Unit 1, 2 and 5,6)　　　　Units in recording papers can be changed.

Form-1
Fukushima Daiichi Nuclear Power Plant Unit 1 and 2

Shift Supervisor Task Handover Journal（1/4）

# Shift Supervisor Task Handover Journal

［confirmed by］ Chief engineer of reactors

Red colored is tentative data

March 11, 2011, Friday, 21:00, Shift 1, Group A

［confirmed by］ Supervisor of next shift

［made and approved by］ Shift supervisor

| | | | | | |
|---|---|---|---|---|---|
| On duty<br>12（operator）<br>-（instructor）<br>1（trainee） | | No. of organization | Off duty | [redacted] | Support duty |
| | | 172 | Replacement | [redacted] | Refer to attachment |
| Unit 1 | Generator Output | 0MWe | Reactor Status | in operation・start up・[✓ hot shutdown]・cold shutdown・fuel exchange | |
| Unit 2 | Generator Output | 0MWe | Reactor Status | in operation・start up・[✓ hot shutdown]・cold shutdown・fuel exchange | |

Notes

Unit 1

1. Operation Status

(1) Reactor is shutdown

(2) Alarm “SEISMIC TRIP” 14:46

(3) Reactor automatic scram, main turbine automatic shutdown (occurrence of the earthquake offshore of Miyagi pref.) 14:46

(4) Status of reactor “operation” to “hot shutdown” 14:47

(5) Insertion of all control rods 14:47

(6) Complete closure of MSIV 14:47

(7) D/G 1A/1B automatic start up/ 1B trip 14:47/15:37

(8) Reactor mode switch “operation” to “shutdown” 14:52

(9) Reactor in subcriticality 15:02

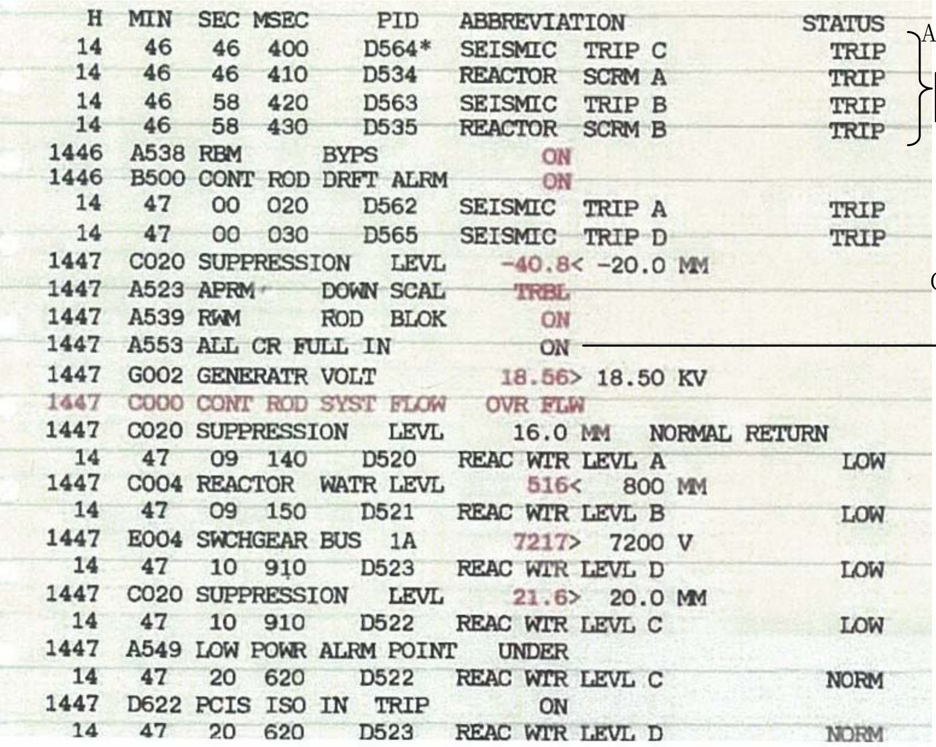
(10) Torus cooling (A system) in / (B system) in 15:07/15:10

(11) Loss of All A/C power 15:37

添付資料－１－７

## Printed out main alarm typer of Unit 1 (extract)

○1 号機　アラームタイパー主要打ち出し（抜粋）



```
   H  MIN  SEC MSEC      PID    ABBREVIATION                STATUS
  14   46   46  400      D564*  SEISMIC  TRIP C               TRIP
  14   46   46  410      D534   REACTOR  SCRM A               TRIP
  14   46   58  420      D563   SEISMIC  TRIP B               TRIP
  14   46   58  430      D535   REACTOR  SCRM B               TRIP
1446  A538 RBM      BYPS            ON
1446  B500 CONT ROD DRFT ALRM       ON
  14   47   00  020      D562   SEISMIC  TRIP A               TRIP
  14   47   00  030      D565   SEISMIC  TRIP D               TRIP
1447  C020 SUPPRESSION   LEVL    -40.8< -20.0 MM
1447  A523 APRM     DOWN SCAL       TRBL
1447  A539 RWM      ROD  BLOK       ON
1447  A553 ALL CR FULL IN           ON
1447  G002 GENERATR VOLT         18.56> 18.50 KV
1447  C000 CONT ROD SYST FLOW    OVR FLW
1447  C020 SUPPRESSION   LEVL      16.0 MM   NORMAL RETURN
  14   47   09  140      D520   REAC WTR LEVL A                LOW
1447  C004 REACTOR  WATR LEVL       516<   800 MM
  14   47   09  150      D521   REAC WTR LEVL B                LOW
1447  E004 SWCHGEAR BUS  1A        7217>  7200 V
  14   47   10  910      D523   REAC WTR LEVL D                LOW
1447  C020 SUPPRESSION   LEVL      21.6>  20.0 MM
  14   47   10  910      D522   REAC WTR LEVL C                LOW
1447  A549 LOW POWR ALRM POINT   UNDER
  14   47   20  620      D522   REAC WTR LEVL C               NORM
1447  D622 PCIS ISO IN  TRIP        ON
  14   47   20  620      D523   REAC WTR LEVL D               NORM
```

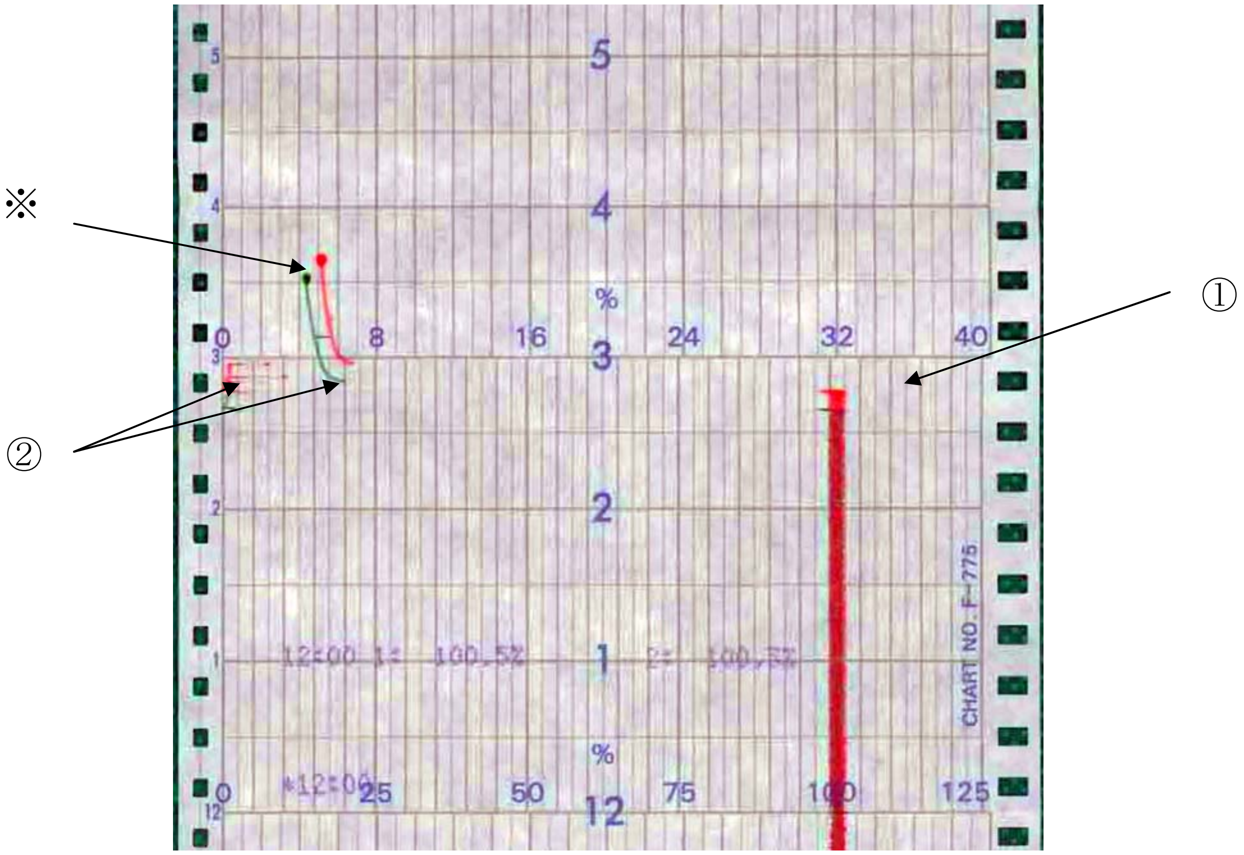
Automatic scram due to the earthquake

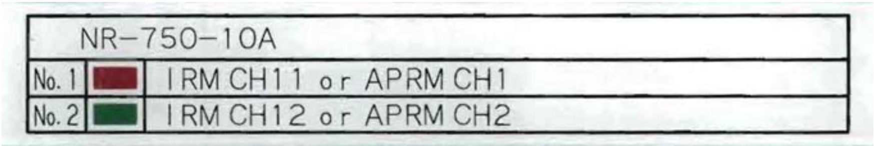
地震による自動スクラム

Complete insertion of all control rods

全制御棒全挿入

## 【1号　ＩＲＭ、ＡＰＲＭ】





| | | |
|---|---|---|
| NR-750-10A | | |
| No. 1 | 🟥 | IRM CH11 or APRM CH1 |
| No. 2 | 🟩 | IRM CH12 or APRM CH2 |

①　１４時４６分　地震によるスクラムとスクラムによる出力低下

②　平均出力領域モニタ（ＡＰＲＭ）としてのダウンスケールと中間領域モニタ（ＩＲＭ）への切替

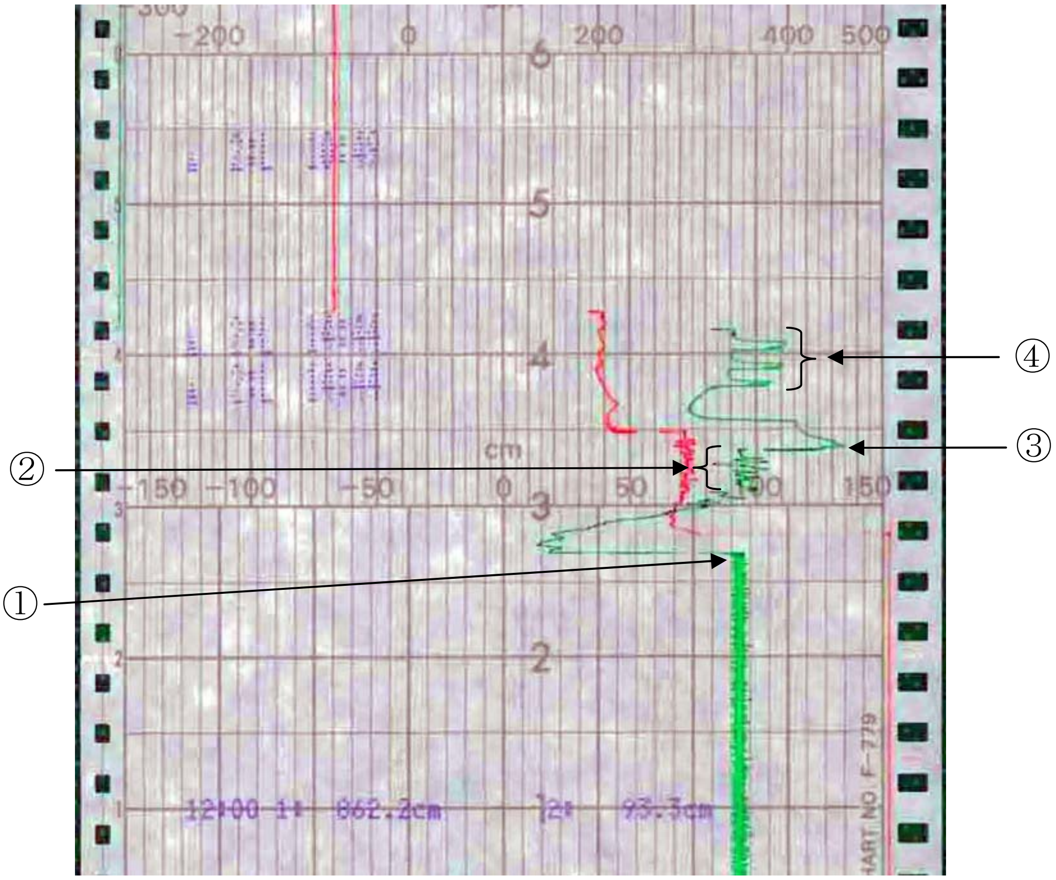
※　１５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

①14:46 Scram due to the earthquake and the output decrease due to the scram

② Below detectable level by Average Power Output Region Monitor (APRM), and switch to Interrevel Region Monitor (IRM)

*It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

## UNIT1 REACTOR LEVEL
## 【１号　原子炉水位】



緑　原子炉水位　(GREEN)REACTOR LEVEL

赤　原子炉水位（燃料域）(RED) REACTOR LEVEL (FUEL AREA)

①　14 時 46 分　地震によるスクラム（チャート早送り：６０倍の速度、１時間が１分）

②　このあたりで外部電源喪失、主蒸気隔離弁閉（電源喪失でチャート早送りリセット）

③　非常用復水器自動起動

④　非常用復水器の動作によると思われる水位変動

① 14:46 Scram due to the earthquake (Fast feed of chart: 60 times ,1hour = 1min)

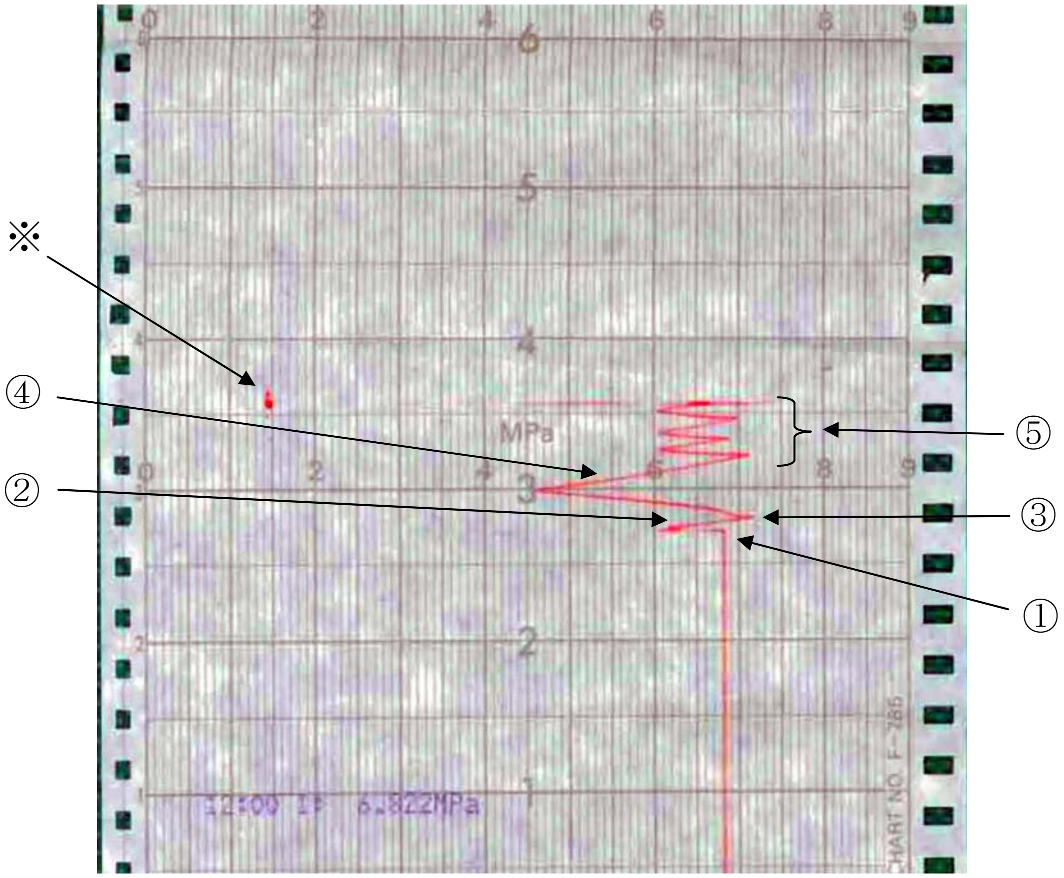
② Offsite power lost at around this time, main steam isolation valve closed
(fast feed of chart reset due to the power loss)

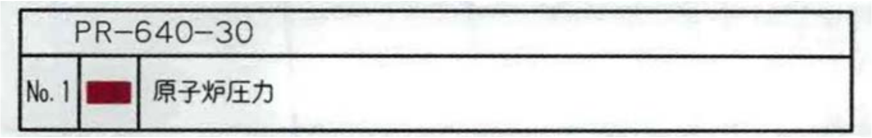
③ Automatic start of isolation condenser

④ Change in the water level presumably due to the operation of isolation condenser

## UNIT1 REACTOR PRESS

## 【１号　原子炉圧力】





| PR−640−30 | | |
|---|---|---|
| No. 1 | 🟥 | 原子炉圧力 |

①　１４時４６分　地震によるスクラム

②　主蒸気隔離弁閉止に伴う圧力上昇

③　１４時５２分　非常用復水器作動とそれに伴う減圧

④　非常用復水器停止に伴う圧力上昇

⑤　非常用復水器によると思われる圧力変動

※　１５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

① 14:46 Scram due to the earthquake

② Pressure increase due to the closure of main steam isolation valve

③ 14:52 the operation of isolation condenser and the subsequent pressure decrease

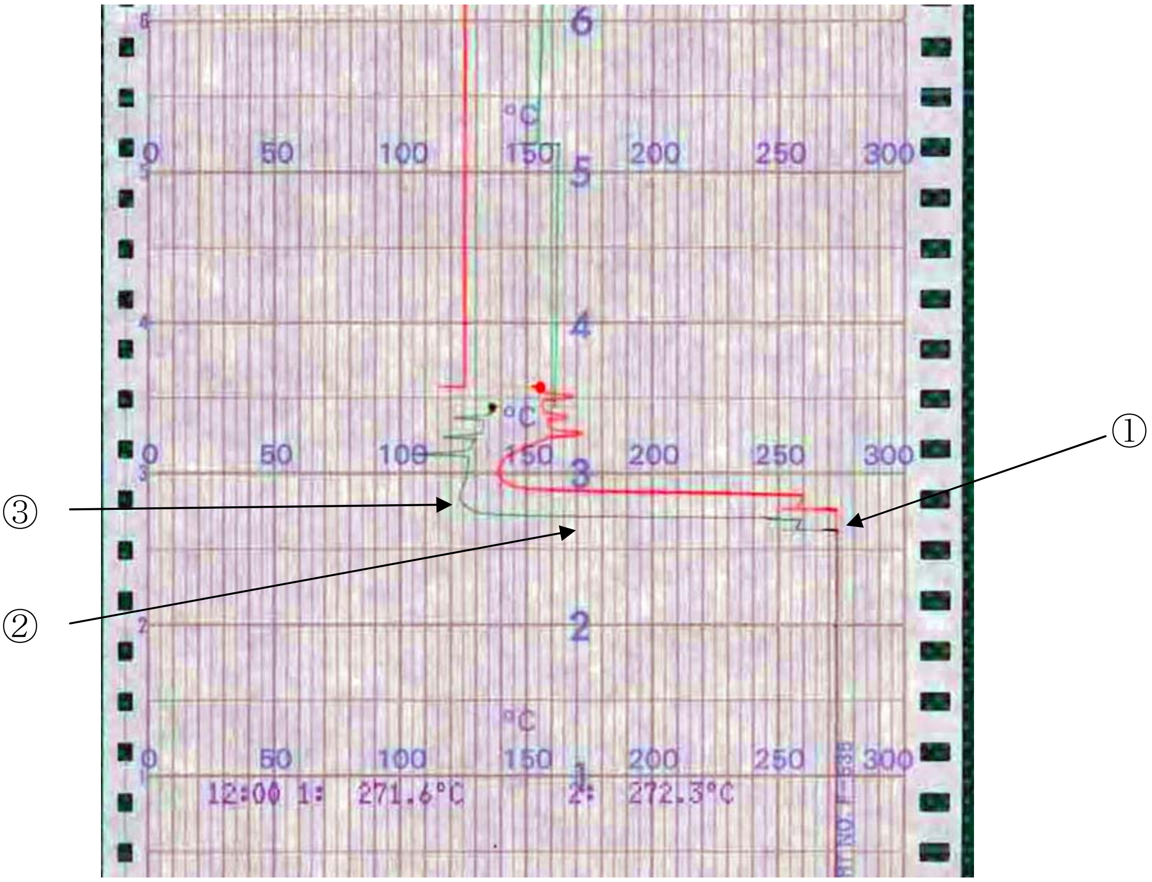
④ Pressure increase due to the stop of isolation condenser

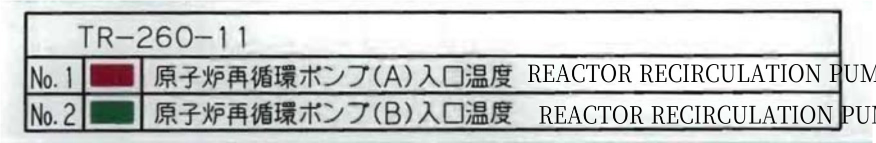
⑤ Changes in the pressure presumably due to isolation condenser

*It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

## ＰＬＲ PUMP INLET TEMP

## 【１号　ＰＬＲポンプ入口温度】





| TR-260-11 | | |
|---|---|---|
| No. 1 | 🟥 | 原子炉再循環ポンプ(A)入口温度 REACTOR RECIRCULATION PUMP A INLET TEMP |
| No. 2 | 🟩 | 原子炉再循環ポンプ(B)入口温度 REACTOR RECIRCULATION PUMP B INLET TEMP |

①　１４時４６分　地震によるスクラム

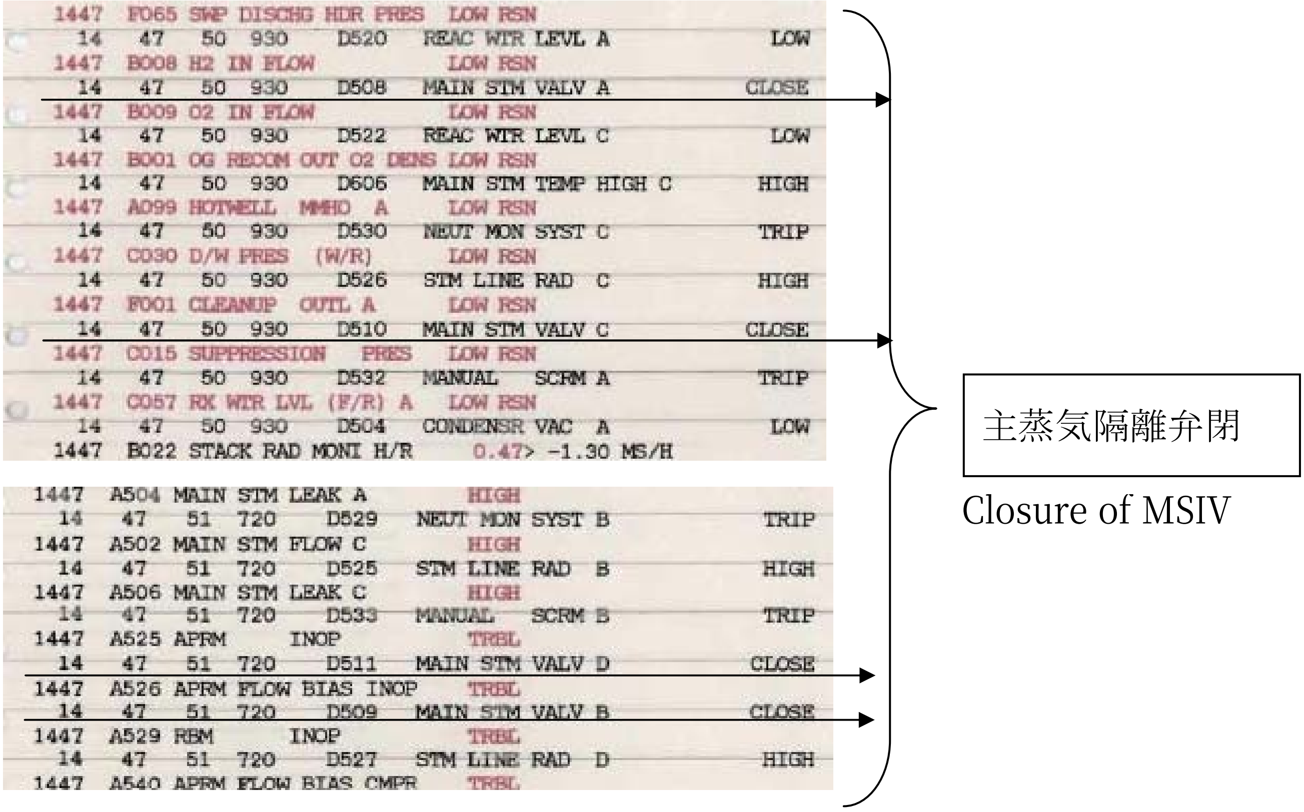
②　スクラムによる出力低下、非常用復水器作動による減圧、低温水注入による温度低下

③　自動起動した非常用復水器の停止

① Automatic scram due to the earthquake

② Output decrease due to scram, pressure decrease due to the operation of isolation condenser, temperature decrease due to the injection of low-temperature water

③ Stop of isolation condenser which had started automatically

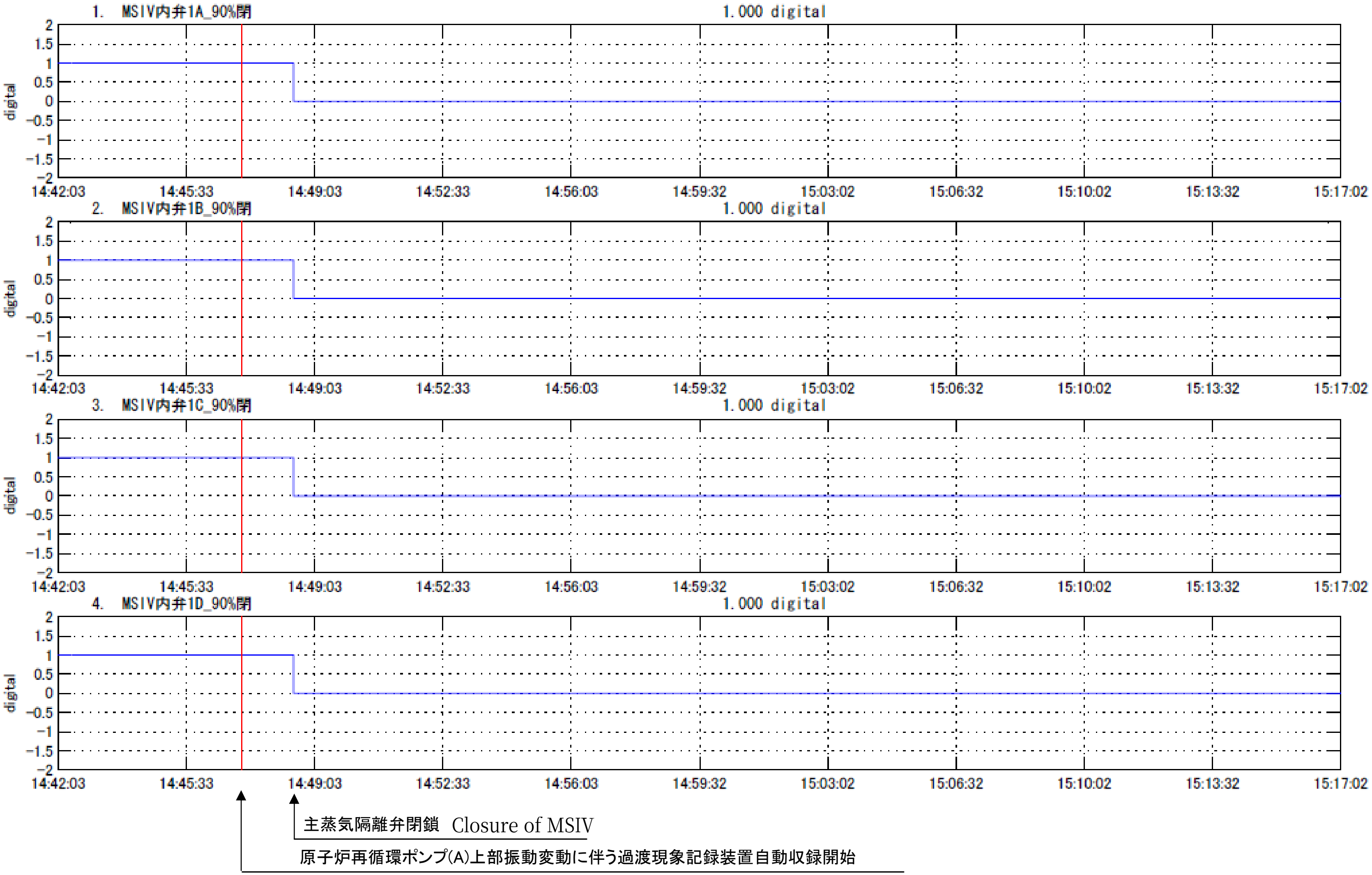


```
1447  F065 SWP DISCHG HDR PRES  LOW RSN
  14   47   50  930     D520   REAC WTR LEVL A                  LOW
1447  B008 H2 IN FLOW           LOW RSN
  14   47   50  930     D508   MAIN STM VALV A                CLOSE
1447  B009 O2 IN FLOW           LOW RSN
  14   47   50  930     D522   REAC WTR LEVL C                  LOW
1447  B001 OG RECOM OUT O2 DENS LOW RSN
  14   47   50  930     D606   MAIN STM TEMP HIGH C            HIGH
1447  A099 HOTWELL  MMHO  A     LOW RSN
  14   47   50  930     D530   NEUT MON SYST C                 TRIP
1447  C030 D/W PRES  (W/R)      LOW RSN
  14   47   50  930     D526   STM LINE RAD  C                 HIGH
1447  F001 CLEANUP  OUTL A      LOW RSN
  14   47   50  930     D510   MAIN STM VALV C                CLOSE
1447  C015 SUPPRESSION   PRES   LOW RSN
  14   47   50  930     D532   MANUAL   SCRM A                 TRIP
1447  C057 RX WTR LVL (F/R) A   LOW RSN
  14   47   50  930     D504   CONDENSR VAC  A                  LOW
1447  B022 STACK RAD MONI H/R      0.47> -1.30 MS/H
```

```
1447  A504 MAIN STM LEAK A            HIGH
  14   47   51  720     D529   NEUT MON SYST B                 TRIP
1447  A502 MAIN STM FLOW C            HIGH
  14   47   51  720     D525   STM LINE RAD  B                 HIGH
1447  A506 MAIN STM LEAK C            HIGH
  14   47   51  720     D533   MANUAL   SCRM B                 TRIP
1447  A525 APRM      INOP             TRBL
  14   47   51  720     D511   MAIN STM VALV D                CLOSE
1447  A526 APRM FLOW BIAS INOP        TRBL
  14   47   51  720     D509   MAIN STM VALV B                CLOSE
1447  A529 RBM       INOP             TRBL
  14   47   51  720     D527   STM LINE RAD  D                 HIGH
1447  A540 APRM FLOW BIAS CMPR        TRBL
```

（注記）主蒸気隔離弁閉に前後して破断検出等の各種異常信号が打ち出されているが、これは地震による外部電源喪失の影響によってこれら計器への電源が失われたことから、フェールセーフで異常信号が発生したものと考えられる。主蒸気隔離弁閉止の過程で蒸気流量の増大等、異常の兆候は見られていない。

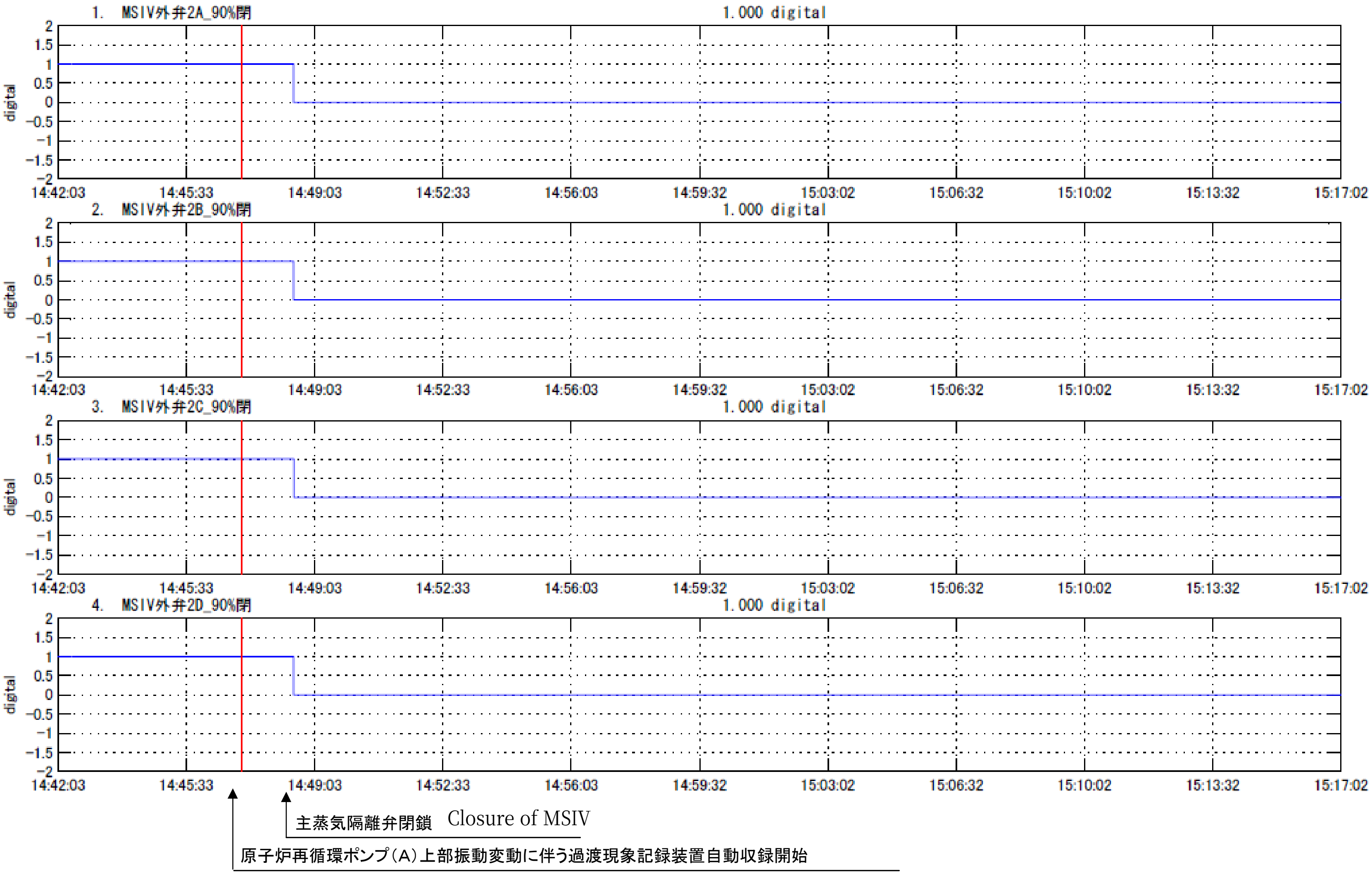
(Note) At around the closure of main steam isolation valve, abnormal nuclide signals showing the detection of ruptured pipes are printed out. We estimate that these are fail-safe abnormal signals transmitted due to the loss of power for indicators resulting from the loss of offsite power after the earthquake. There is no sign of abnormality such as the increase of steam flow rate in the process of closing main steam isolation valve.

| パラメータ | 備　考 |
|---|---|
|  | 主蒸気隔離弁（内側）は、閉鎖している。<br>Main steam isolation valve (inside) is closed. |

Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (B)

図－１ 福島第一・1号機 過渡現象記録装置 データ

Figure-1 Fukushima Daiichi Nuclear Power Station Unit 1 data of transient recorders

| パラメータ | 備 考 |
|---|---|
|  | 主蒸気隔離弁（外側）は、閉鎖している。<br>Main steam isolation valve (outside) is closed. |

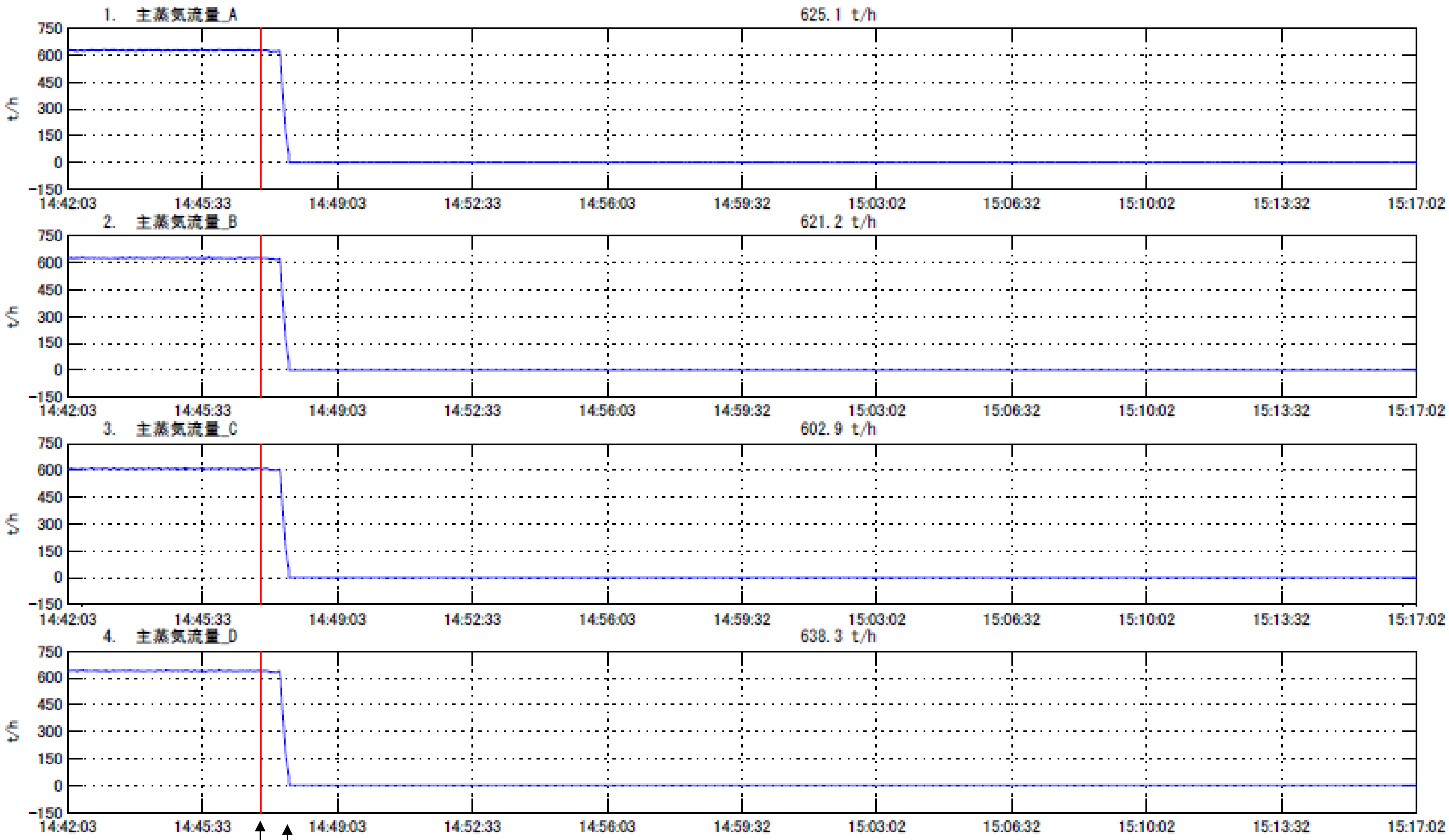
主蒸気隔離弁閉鎖 Closure of MSIV

原子炉再循環ポンプ（A）上部振動変動に伴う過渡現象記録装置自動収録開始

Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (A)

図－１ 福島第一・1号機 過渡現象記録装置 データ

Figure-1 Fukushima Daiichi Nuclear Power Station Unit 1 data of transient recorders

<table>
<tr><th>パラメータ</th><th>備　考</th></tr>
<tr><td>


主蒸気隔離弁閉鎖に伴い主蒸気流量減少　Reduction of main steam flow in accordance with Main Steam Valve closure

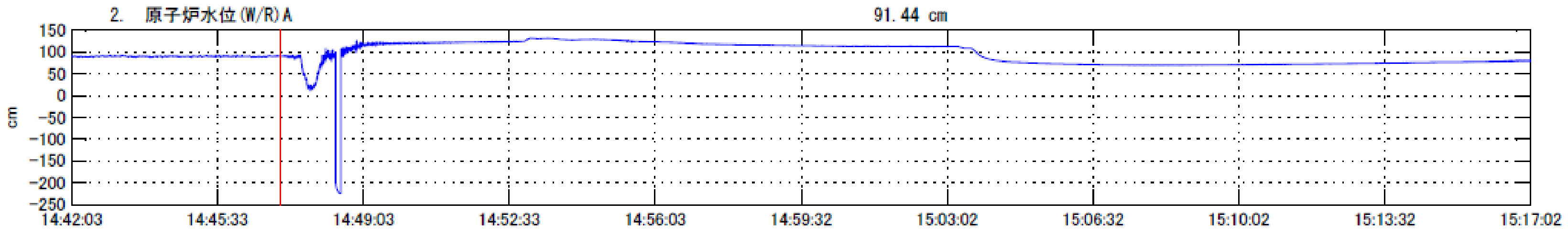
原子炉再循環ポンプ（A）上部振動変動に伴う過渡現象記録装置自動収録開始
</td>
<td>
主蒸気隔離弁の閉鎖と共に、主蒸気流量は減少している。

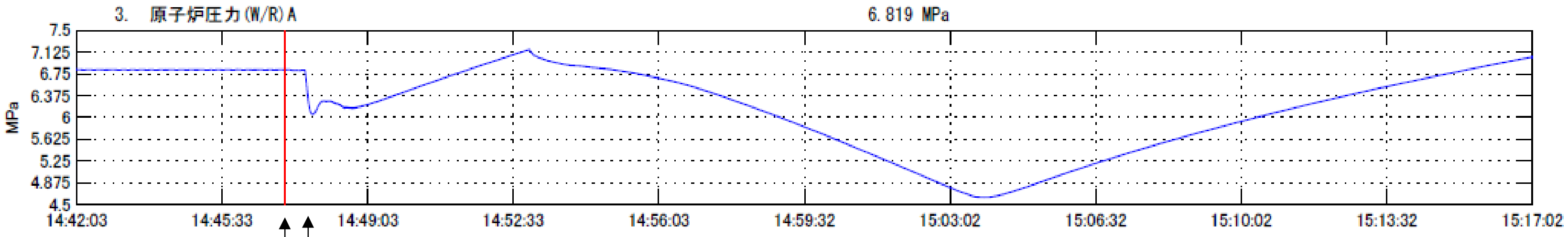
Main steam flow rate is decreased with the closure of main steam isolation valve.
</td></tr>
</table>

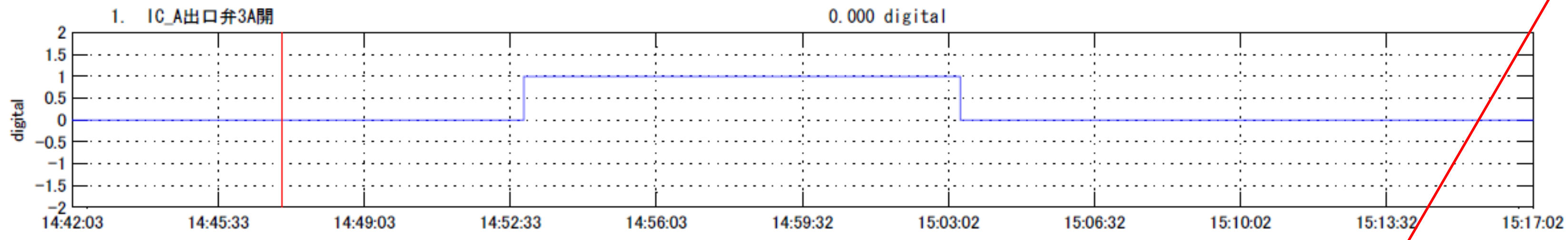
Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (A)

図－１　福島第一･１号機　過渡現象記録装置　データ

Figure-1 Fukushima Daiichi Nuclear Power Station Unit 1 data of transient recorders

<table>
<tr><th>パラメータ</th><th>備 考</th></tr>
<tr><td>


<br>地震に伴う原子炉自動停止 Automatic shut down of reactor due to the earthquake
<br>原子炉再循環ポンプ(A)上部振動変動に伴う過渡現象記録装置自動収録開始
<br>Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (A)
</td><td>原子炉水位は、スクラム直後にボイド(気泡)のつぶれに伴い瞬時変動し、その後通常水位で安定している。<br>Water level in the reactor was changed immediately after the scram due to the crash of void and maintained within the normal level thereafter.</td></tr>
<tr><td>


<br>地震に伴う原子炉自動停止 Automatic shut down of reactor due to the earthquake
<br>原子炉再循環ポンプ(A)上部振動変動に伴う過渡現象記録装置自動収録開始
<br>Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (A)
</td><td>原子炉圧力は、スクラム直後に低下し、その後、主蒸気隔離弁の閉鎖、崩壊熱により上昇している。<br>14時52分頃、非常用復水器(IC)の起動に伴い圧力は低下し、また非常用復水器(IC)の停止に伴い上昇している。</td></tr>
<tr><td>


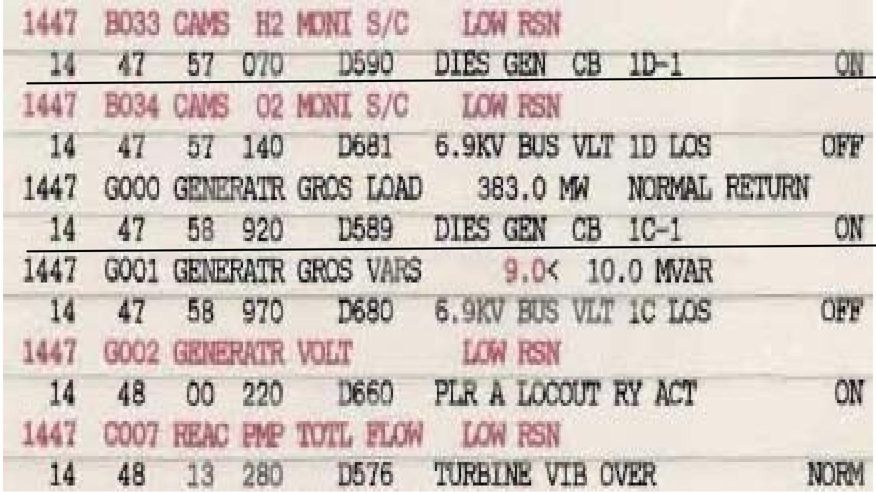
<br>非常用復水系起動 Start of isolation condenser system
<br>非常用復水系停止 Stop of isolation condenser system
</td><td>非常用復水器(IC)は、14時52分頃起動し、15時03分頃に停止している。<br>Isolation condenser was started at around 14:52 and stopped at around 15:03.</td></tr>
</table>

The pressure in the reactor was decreased immediately after the scram and then increased due to the closure of main steam isolation valve and decay heat thereafter. At around 14:52, the pressure was decreased due to the start of isolation condenser, and was increased due to

図ー1 福島第一・1号機 過渡現象記録装置 データ

Figure-1 Fukushima Daiichi Nuclear Power Station Unit 1 data of transient recorders

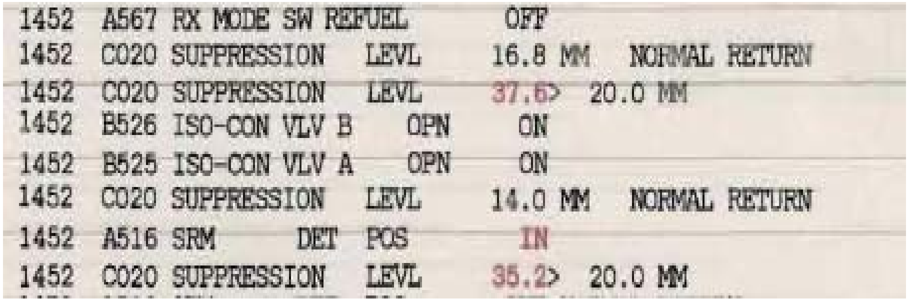
添付資料－１－１４



```
1447  B033 CAMS  H2 MONI S/C    LOW RSN
  14   47   57  070     D590   DIES GEN  CB  1D-1              ON
1447  B034 CAMS  O2 MONI S/C    LOW RSN
  14   47   57  140     D681   6.9KV BUS VLT 1D LOS            OFF
1447  G000 GENERATR GROS LOAD    383.0 MW   NORMAL RETURN
  14   47   58  920     D589   DIES GEN  CB  1C-1              ON
1447  G001 GENERATR GROS VARS       9.0<  10.0 MVAR
  14   47   58  970     D680   6.9KV BUS VLT 1C LOS            OFF
1447  G002 GENERATR VOLT         LOW RSN
  14   48   00  220     D660   PLR A LOCOUT RY ACT             ON
1447  C007 REAC PMP TOTL FLOW   LOW RSN
  14   48   13  280     D576   TURBINE VIB OVER               NORM
```

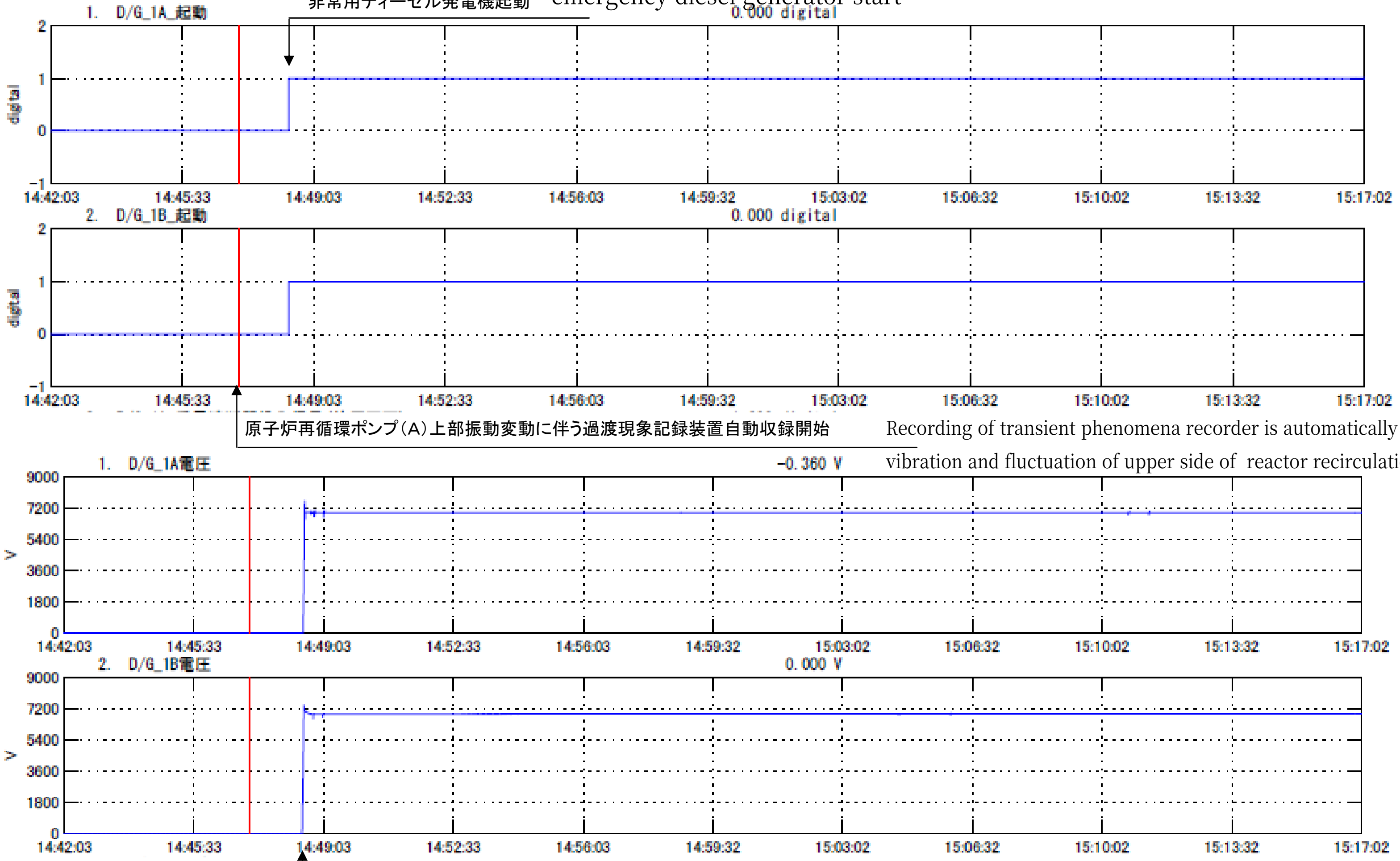
DG(B) 遮断器投入
Circuit breaker closed

DG(A) 遮断器投入
Circuit breaker closed



```
1452  A567 RX MODE SW REFUEL        OFF
1452  C020 SUPPRESSION    LEVL     16.8 MM   NORMAL RETURN
1452  C020 SUPPRESSION    LEVL     37.6>  20.0 MM
1452  B526 ISO-CON VLV B      OPN     ON
1452  B525 ISO-CON VLV A      OPN     ON
1452  C020 SUPPRESSION    LEVL     14.0 MM   NORMAL RETURN
1452  A516 SRM        DET  POS        IN
1452  C020 SUPPRESSION    LEVL     35.2>  20.0 MM
```

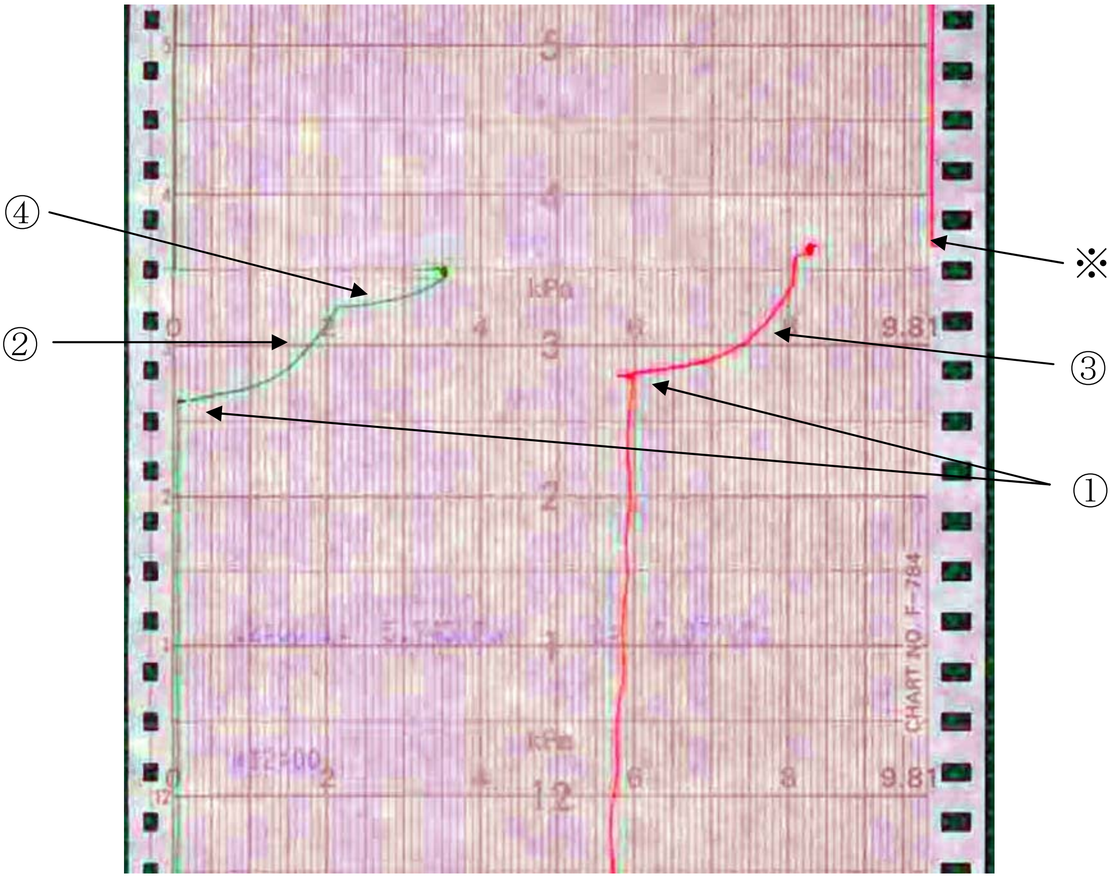
非常用復水器作動
Start of isolation condenser

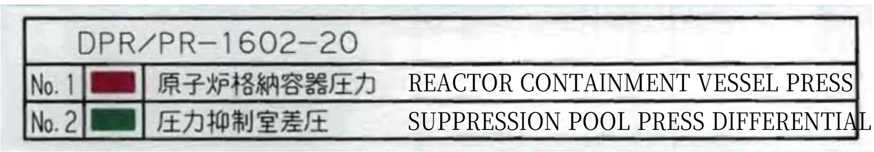
| パラメータ | 備　考 |
|---|---|
| <br>非常用ディーゼル発電機起動 emergency diesel generator start<br>原子炉再循環ポンプ(A)上部振動変動に伴う過渡現象記録装置自動収録開始 Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (A)<br>非常用ディーゼル発電機電圧確立 Voltage applied by emergency diesel generator | 14時48分頃、非常用ディーゼル発電機起動し、電圧が確立している。<br>At around 14:48, emergency diesel generator was started and the voltage was secured. |

# 図－１　福島第一・1号機　過渡現象記録装置　データ

Figure-1 Fukushima Daiichi Nuclear Power Station Unit 1 data of transient recorders

# UNIT1 REACTOR CONTAINMENT VESSEL PRESS / SUPPRESSION POOL PRESS DIFFERENTIAL
# 【１号　原子炉格納容器圧力、圧力抑制室差圧】





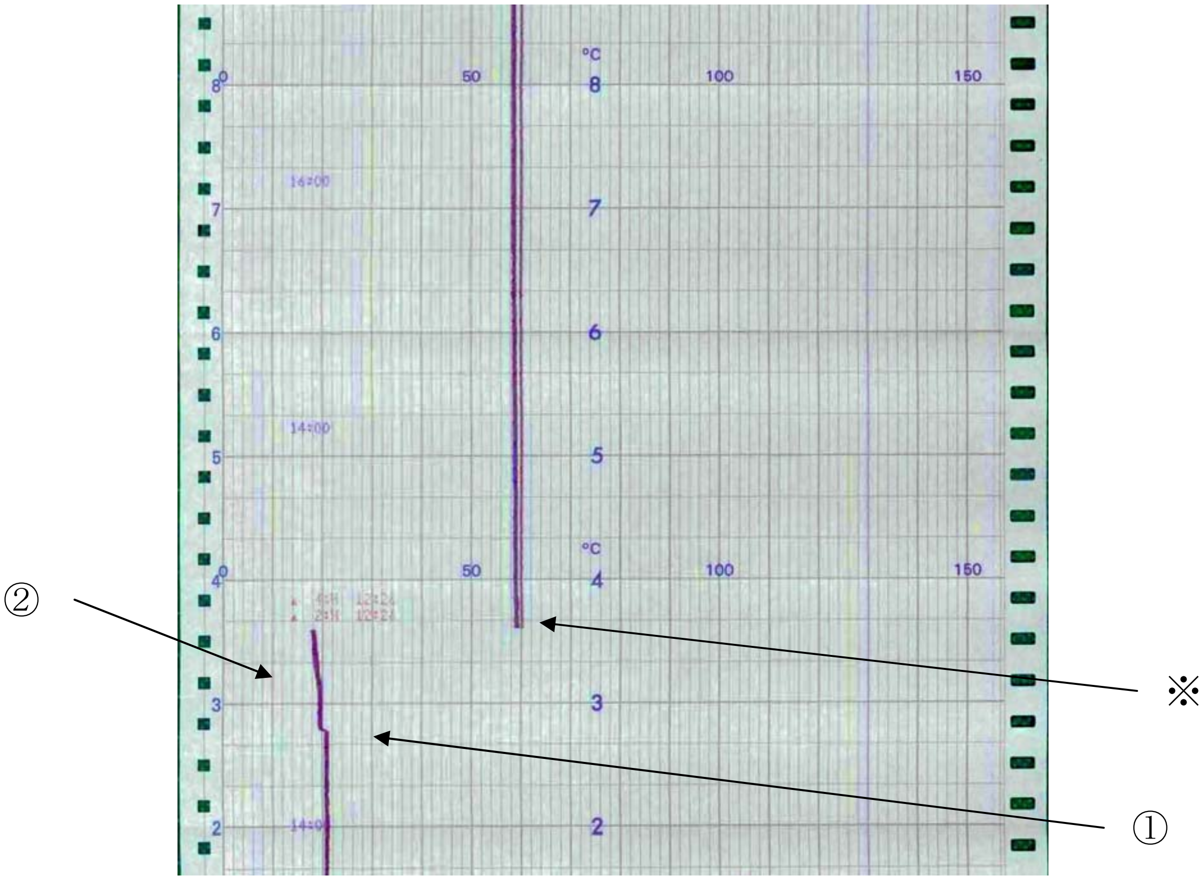
| DPR/PR-1602-20 | | | |
|---|---|---|---|
| No. 1 | 🟥 | 原子炉格納容器圧力 | REACTOR CONTAINMENT VESSEL PRESS |
| No. 2 | 🟩 | 圧力抑制室差圧 | SUPPRESSION POOL PRESS DIFFERENTIAL |

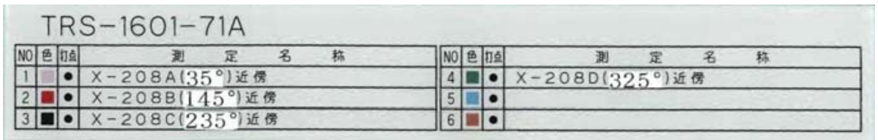
①　１４時４６分　地震によるスクラム
②　格納容器圧力上昇に伴う圧力抑制室差圧上昇
③　格納容器空調停止に伴う格納容器圧力上昇
④　圧力抑制室冷却に伴う圧力抑制室側圧力低下（さらなる差圧上昇を意味する）＝変曲点
※　１５時３０分過ぎに津波が到来したと想定される。津波の影響により正確な指示をしていないことも想定される。

① 14:46 Scram due to the earthquake
② Increase of the differential pressure due to the pressure increase in Primary Containment Vessel
③ Pressure increase in Primary Containment Vessel due to the stop of the air conditioner in Primary Containment Vessel
④ Pressure decrease in suppression chamber due to the cooling of suppression chamber (it means further pressure increase) = knee point

*It is estimated that the tsunami arrived past 15:30.

# UNIT1 SUPPRESSION POOL WATER TEMP
# 【１号　サプレッションプール水温度】





TRS-1601-71A

| NO | 色 | 打点 | 測定名称 | NO | 色 | 打点 | 測定名称 |
|---|---|---|---|---|---|---|---|
| 1 | ■ | ● | X-208A(35°)近傍 | 4 | ■ | ● | X-208D(325°)近傍 |
| 2 | ■ | ● | X-208B(145°)近傍 | 5 | ■ | ● | |
| 3 | ■ | ● | X-208C(235°)近傍 | 6 | ■ | ● | |

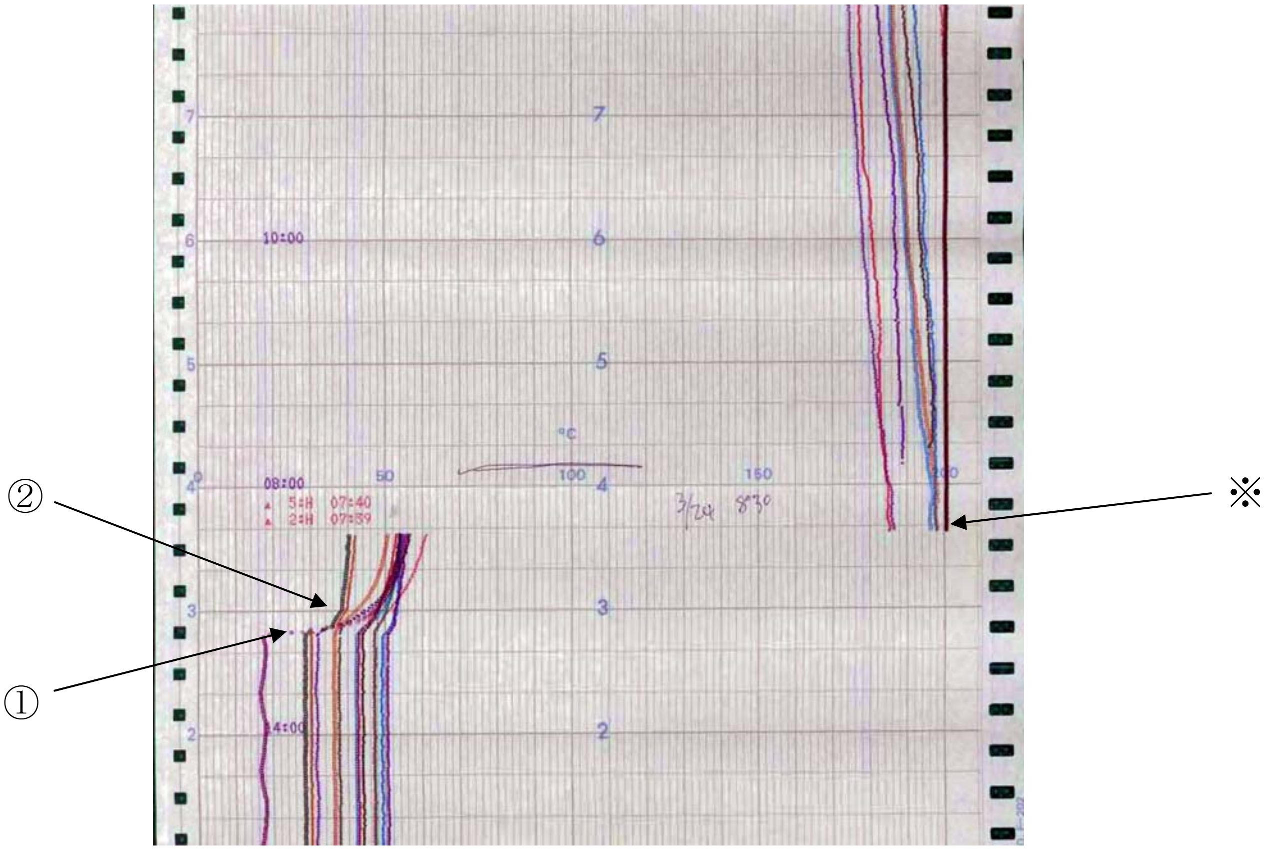
①　１４時４６分　地震によるスクラム　①14:46 Scram due to the earthquake

②　格納容器冷却系による冷却　②Cooling by Primary cooling system

※　１５時３０分過ぎに津波が到来したと想定される。津波の影響により正確な指示をしていないことも想定される。

*It is estimated that the tsunami arrived past 15:30. Indicator might not be correct due to the effect of tsunami.

## Unit1 Temperature of various parts in Primary Containment Vessel
## 【１号　原子炉格納容器内各部温度】



TR-1602-5

| No | 色 | 打点 | 測定名称 | No | 色 | 打点 | 測定名称 |
|---|---|---|---|---|---|---|---|
| 1 | 🟪 | ● | RETURN AIR DUCT HVH-12A | 13 | 🟪 | + | EQ AROUND CIRCUM RPV BELLOWS TE-1625N |
| 2 | 🟥 | ● | RETURN AIR DUCT HVH-12B | 14 | 🟥 | + | EQ AROUND CIRCUM RPV BELLOWS TE-1625P |
| 3 | ⬛ | ● | RETURN AIR DUCT HVH-12C | 15 | ⬛ | + | EQ AROUND CIRCUM RPV BELLOWS TE-1625R |
| 4 | 🟩 | ● | RETURN AIR DUCT HVH-12D | 16 | 🟩 | + | |
| 5 | 🟦 | ● | RETURN AIR DUCT HVH-12E | 17 | 🟦 | + | |
| 6 | 🟫 | ● | SUPPLY AIR DUCT HVH-12A | 18 | 🟫 | + | |
| 7 | 🟪 | ○ | SUPPLY AIR DUCT HVH-12B | 19 | 🟪 | Y | |
| 8 | 🟥 | ○ | SUPPLY AIR DUCT HVH-12C | 20 | 🟥 | Y | |
| 9 | ⬛ | ○ | SUPPLY AIR DUCT HVH-12D | 21 | ⬛ | Y | |
| 10 | 🟩 | ○ | SUPPLY AIR DUCT HVH-12E | 22 | 🟩 | Y | |
| 11 | 🟦 | ○ | EQ AROUND CIRCUM RPV BELLOWS TE-1625L | 23 | 🟦 | Y | |
| 12 | 🟫 | ○ | EQ AROUND CIRCUM RPV BELLOWS TE-1625M | 24 | 🟫 | Y | |

①　１４時４６分　地震によるスクラム　①14:46 Scram due to the earthquake

②　電源喪失による格納容器空調停止に伴う格納容器の温度上昇（配管破断等に起因する極端な温度上昇は認められず）

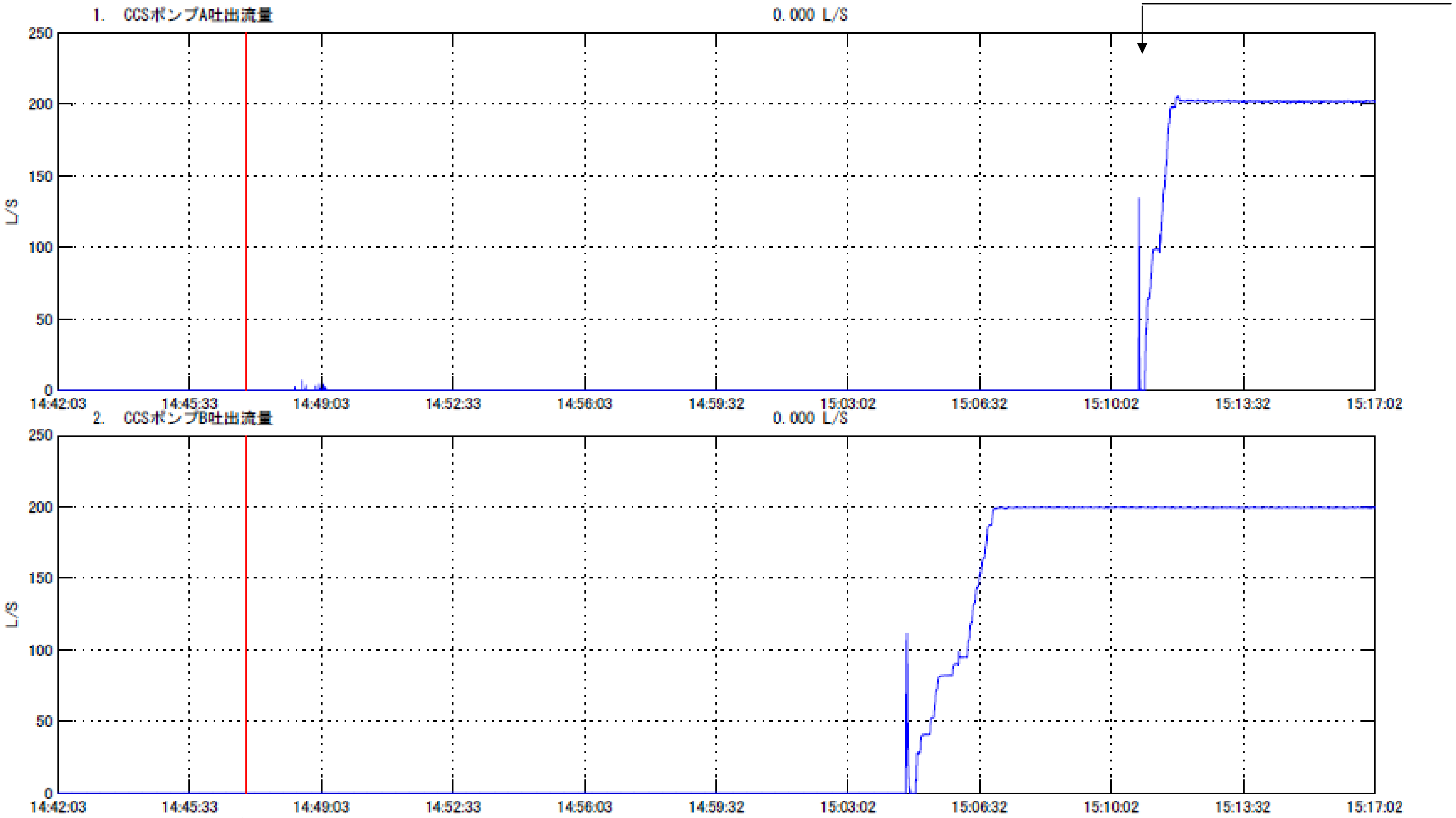
PCV temperature rise by shutdown of PCV air conditioner due to power outage (Rapid temperature rise caused by such as pipe rupture was not shown.)

※　１５時３０分過ぎに津波の到来により記録計電源が喪失し記録計が一旦停止。３月２４日に記録計電源復旧に伴い記録再開。

Just after 15:30, recorder suspended due to recorder's power outage by tsunami arrival. March 24, recording resumed with recorder's power souce recovery.

| パラメータ | 備　考 |
|---|---|
| | 格納容器スプレイ系ポンプＢを14時47分頃起動している。同様に格納容器スプレイ系ポンプAを15時11分頃起動している。これは、圧力抑制室プール水の冷却を行うために起動したものと推定される。<br>Primary Containment Vessel spray system pump (B) was started at around 14:47. Primary Containment Vessel spray system pump (A) was also started at around 15:11. It is estimated these were started to cool the water in suppression chamber. |

格納容器スプレイ系（A）系起動



格納容器スプレイ系（B）系起動

Primary Containment Vessel spray system (B) start

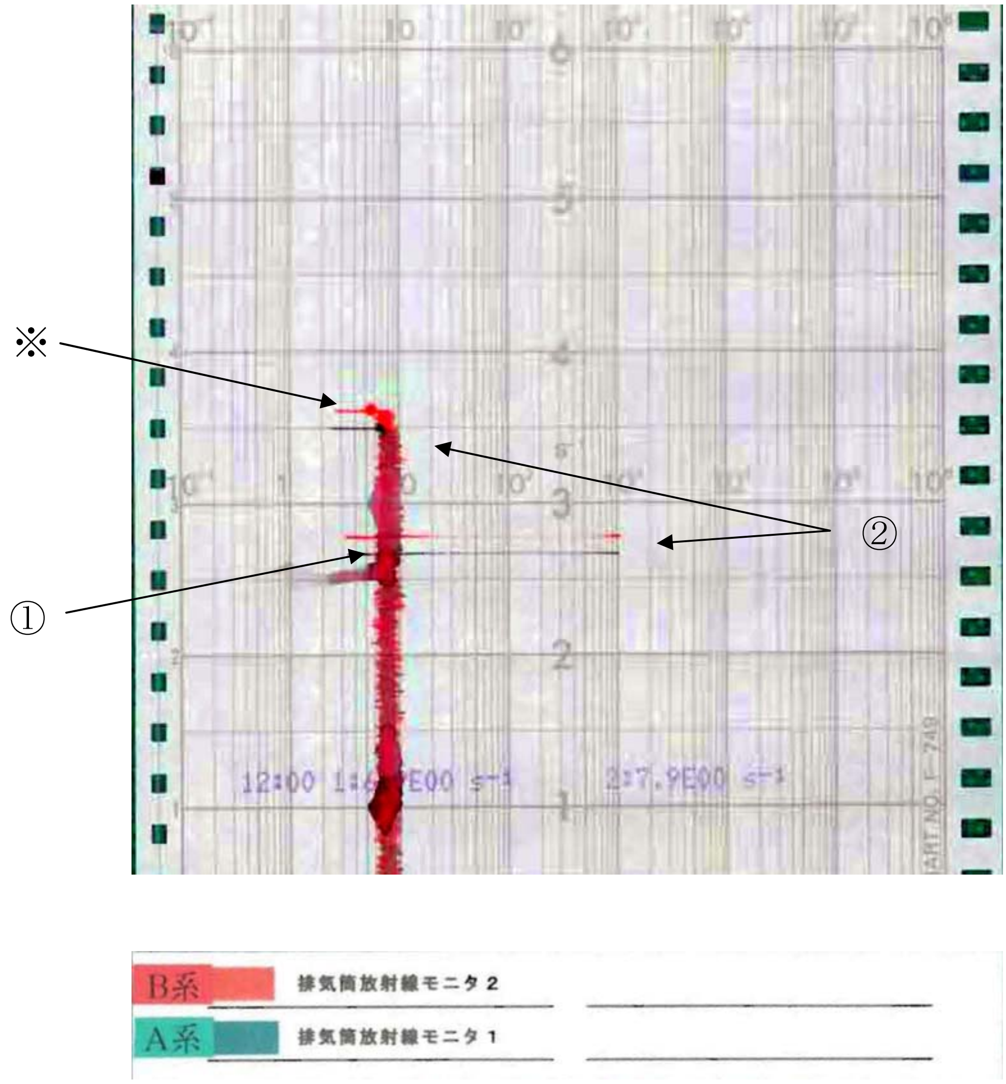
原子炉再循環ポンプ（A）上部振動変動に伴う過渡現象記録装置自動収録開始

Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (A)

図－１　福島第一・1号機　過渡現象記録装置　データ

Figure-1 Fukushima Daiichi Nuclear Power Station Unit 1 data of transient recorders

## 【１号　排気筒放射線モニタ】



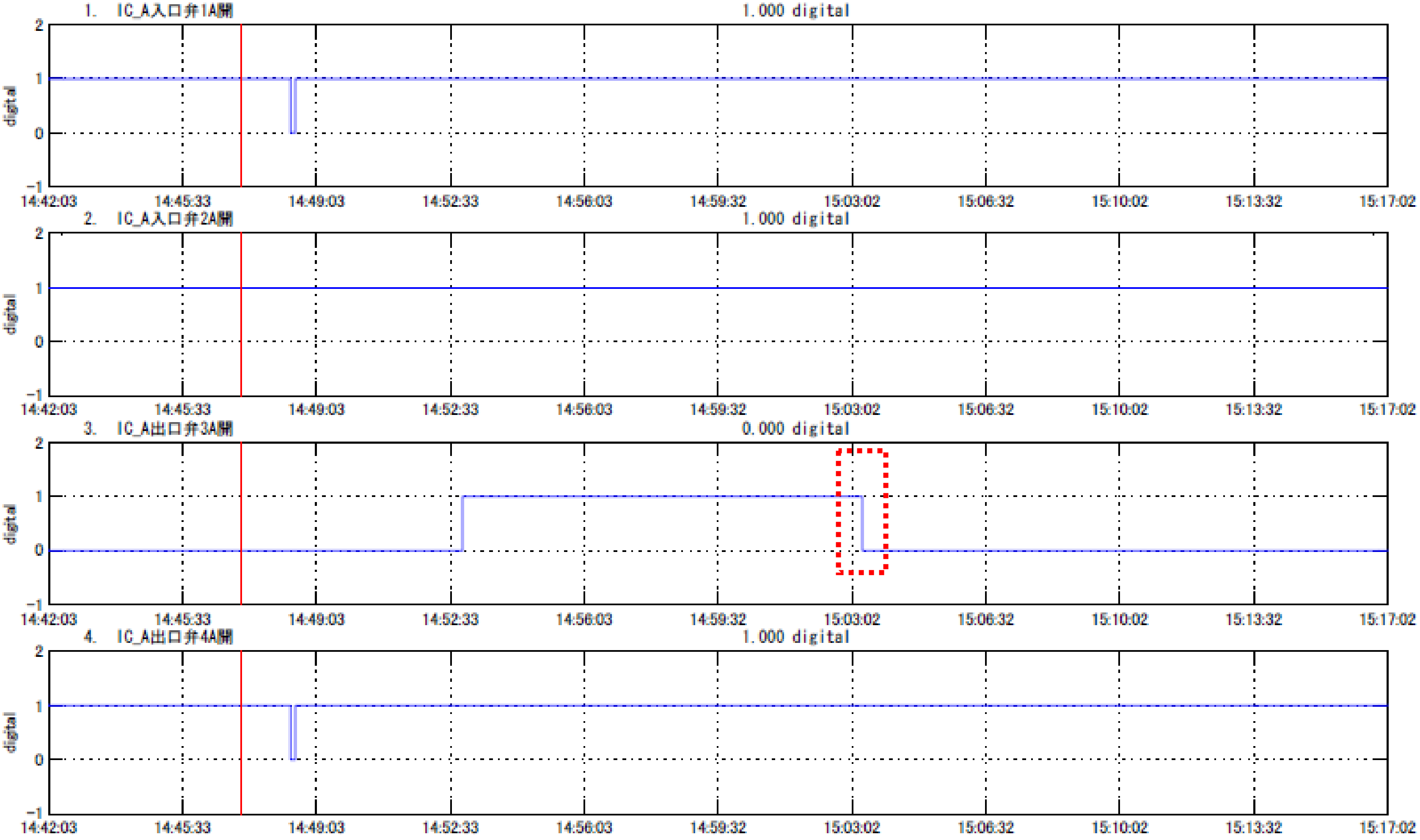
① １４時４６分　地震によるスクラム　①14:46 Scram due to the earthquake

② ノイズと思われる信号　②Signal which is presumably a noise

※ １５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

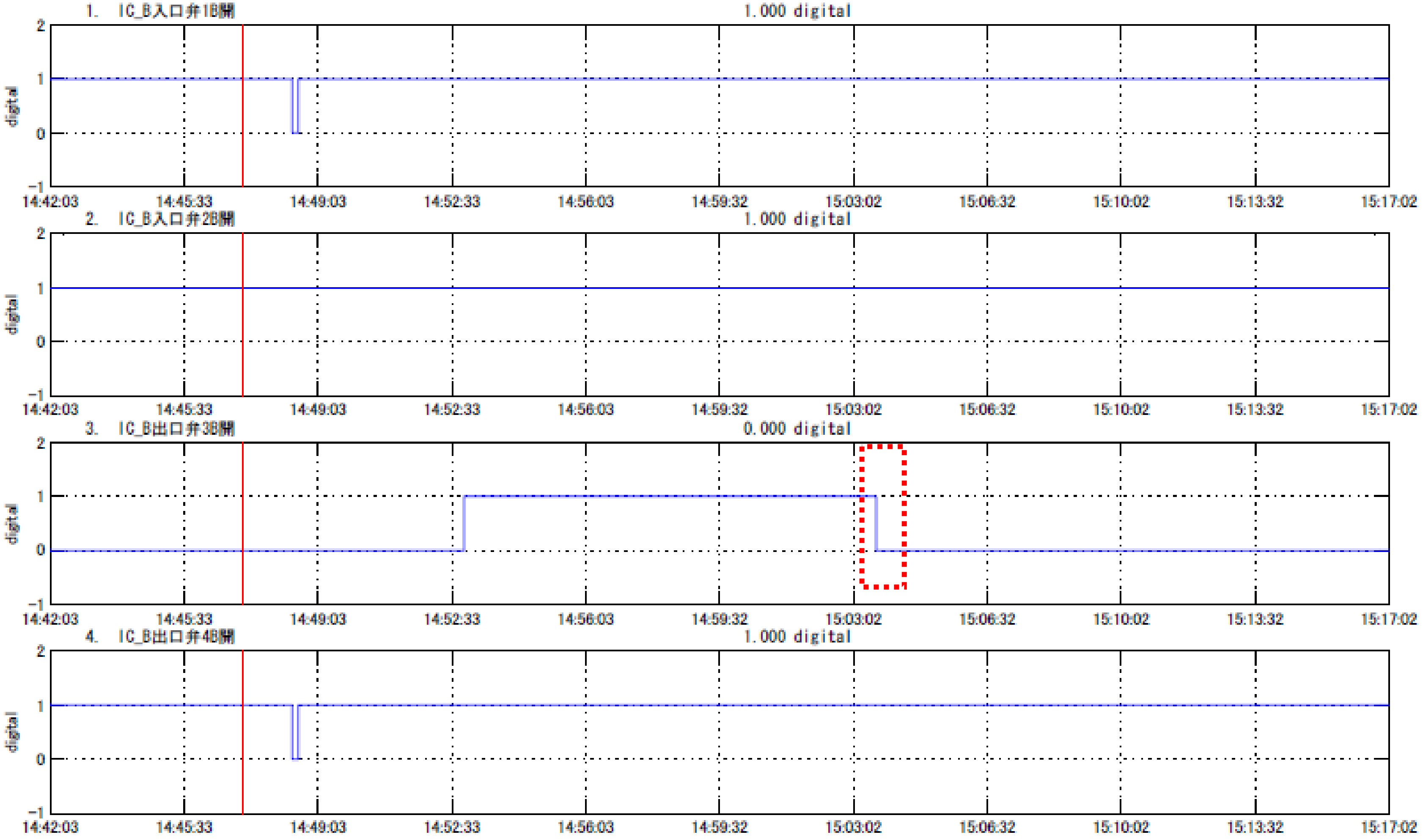
*It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

福島第一原子力発電所　１号機　　イベントデータ 時系列データ表示　　ファイル名 1F1_Cy24_EVF_DET_2011_03_11_Fri_14_47_04.dat　　データ周期 0.01秒　(1－
データ表示期間 2011年03月11日14時42分03秒～2011年03月11日15時17分02秒　　イベント検出時刻 2011年03月11日14時47分03秒 900 ミリ秒
グループ名称 ： １Ｆ－１ 非常用炉心冷却系流量（１１）－２



(1−

福島第一原子力発電所　１号機　　イベントデータ　時系列データ表示　　ファイル名　1F1_Cy24_EVF_DET_2011_03_11_Fri_14_47_04.dat　　データ周期　0.01秒
データ表示期間　2011年03月11日14時42分03秒～2011年03月11日15時17分02秒　　イベント検出時刻　2011年03月11日14時47分03秒　900　ミリ秒
グループ名称　：　１Ｆ－１　非常用炉心冷却系流量（１２）－２



## 3. Overview of Data Analysis of Unit 2

### (1) Plant Data

Plant behavior represented by data collected from Unit 2 is shown as follows.

The chart of Unit 2 recorded data when the earthquake and tsunami attacked. However, due to the loss of power sources and signals caused by the effects of inundation by tsunami, the chart stopped after a certain period of time. The annunciator output data for about 2 minutes after the occurrence of scram. However, it stopped printing by some reasons. Therefore, annunciator's record was recovere based on data collected from the hard disk. Regarding the operation log which is the record by the operators on duty the records before the earthquake are kept, however, as for the records after the earthquake they could only record some items in the operation log afterwards by transferring items written in the whiteboard, because the plant accident hadn't settled yet at all thus they had to tackle the accident under severe conditions. The transient phenomenon recorder of Unit 2 was activated by the increased vibration of the upper part of re-circulating pump due to the earthquake (like Unit 1) and recorded data in about 30 minutes. After that, the recorder worked again about 30 minutes after detecting the vibration of the upper part of re-circulating pump presumably due the afterquake. The recorder collected data for about one hour including the time of tsunami attack.

### (2) Plant Behavior

① Before the occurrence of the earthquake at 14:46 on March 11, 2011, Unit 1 had been operated in the rated heat output and the data indicated it was under normal conditions. According to Shift Supervisor Task Handover Journal, the supervisor confirmed that the water level of the spent fuel pool was full (near overflow line) and the temperature of the pool was 26℃, i.e. under normal conditions. (Attachment-2-1～4)

② Unit 2 scrammed by the earthquake, at 14:47 on the same day.

③ All control rods were inserted at 14:47 on the same day.

④ Immediately after the scram, Average Power Range Monitor (APRM) indicated sudden decrease. It means that the output surely decreased with a normal operation. (Attachement-2-5～7)

⑤ Transition of water level in the reactor indicated slight decrease of water level by crashing void immediately after the scram. However, the water level was recovered and maintained within the normal level range without reaching automatic starting level of ECCS (L-1 regarding core spray system and the residual heat removal system (RHR),　L-2 regarding high pressure water injection system).

⑥ The pressure of the reactor was also reduced after the scram. However, since the main steam isolation valve was closed on 14:47 on the same day, the pressure increased.

⑦ In response to the increase of pressure of reactor, the main steam safety relief valves have worked and stably controlled the pressure. (Attachment-2-8～9)

⑧ In the record of the annunciator, the isolation signals indicated a rapture of main steam pipeline were printed out before and after the close of main steam isolation valves. However, the data collected from the transient phenomenon recorder showed that the main steam flow was zero (0) as a result of the closure of the main steam isolation valve, and did not indicate any increase of steam flow caused by the rapture of pipeline in the process. From abovementioned data and phenomena, it is estimated that the incorrect alarm regarding the rapture of main steam pipeline was made by closing signal according to the fail safe system caused by loss of external power sources for indicators by the earthquake. (Attachment-2-10～11)

⑨ At 14:50 on the same day, in accordance with the response manual in case of reactor isolation (close of main steam isolation valve) due to the loss of external power source, Reactor Core Isolation Cooling System (RCIC) was manually started. However, RCIC automatically stopped due to the high water level at 14:51 amid the transient water fluctuation affected by the scram and the close of main steam isolation valve. After the stop of RCIC the water level dropped. At 15:02, RCIC was manually started. By the operation of RCIC, the water level in the reactor increased and automatically stopped due to the high water level at 15:28. This led to the drop of the water level and then RCIC was manually started at 15:39. Those start and stop processes were recorded in the alarm's record worked by the earthquake and the process calculation data, etc. (Attachement-2-12～13)

⑩ According to plant related parameters, from 22:00 on March 11 to around 12:00 on March 14, the water level (fuel range) in the reactor stably maintained the enough water level (above +3000mm) for the top of active fuel. At 2:55 on March 12, it was confirmed by observation of supply pressure on site that RCIC had worked. From 4:20 to 5:00, because the water level of condensate storage tank decreased and in order to suppress the water level in suppression chamber of PCV, water resource of RCIC was changed from the condensate storage tank to the suppression chamber. It was assumed that other water injection systems were not operated and RCIC continued to work and keep the water level in the reactor by around 12:00 on March 14. After that, since it was confirmed that the water level in the reactor dropped, it was judged that there was a possibility to lose the function of RCIC. At 19:54 on the same day, seawater injection started from fire protection system. (Attachement-2-14)

⑪ As previously mentioned, since soon after the reactor scram, main steam isolation valve was closed thus the reactor was isolated, RCIC which was driven by steam from reactor, was used for water injection into the reactor in the early time after the earthquake. After the transient water fluctuation at the time of the scram, the water level in the reactor was controlled through operation of RCIC. It is assumed that the water level in the reactor continued to have enough for the top of active fuel during operation of RCIC (it was judged that the function was lost at 13:25, March 14).

⑫ Besides, in the case that the reactor pressure increased by decay heat, the reactor pressure was controlled by opening and closing of main steam safety relief valve in order avoid too much increase of pressure.

⑬ It is stipulated in the safety regulation that the change rate of the water temperature in the reactor (temperature at PLR pump inlet) should be under 55℃/h in order to avoid sudden change of temperature. As the chart indicated, the water temperature in the reactor had been stable within several tens of degree in an hour until stop of recording by the tsunami after the earthquake. (Attachement-2-15)

⑭ Meanwhile, external power sources were lost due the earthquake, 2 emergency diesel generators started at around 14:47 on the same day. By these units, voltage was kept at normal level. It is estimated that necessary power was secured. (Attachement-2-16)

⑮ By RCIC and main steam safety relief valves, the temperature in the suppression chamber of PCV increased. Therefore, pumps of RHR were started sequentially from 15:00 to 15:07 on the same day to cool the water in the suppression chamber. The water temperature in the suppression chamber turned upward from 15:30. Seeing that the pumps of generator system stopped one after another at around 15:36, it is assumed that the function was lost by the tsunami arrived around this time. (Attachement-2-17)

⑯ At the same time, two emergency diesel generators for the power of Unit 2 also stopped. It is assumed that the stop was affected by the tsunami. (Attachement-2-18)

⑰ After the reactor scram, temperature change of cooling system for the primary containment vessel until power sources for indicators stopped has a trend that the increase was moderate and saturated within several tens of degree. At that time, any sudden change of temperature caused by rupture of pipeline, etc. was not recognized in the primary containment vessel. In addition, the reactor pressure was controlled by safety relief valves, etc. and kept at around 7 Mpa. It is assumed that there was no rupture. (Attachement-2-8, 9. 19)

⑱ Regarding ECCS, pumps of RHR were operated to cool the suppression chamber of PCV from 15:00 to 15:07 on March 11. No records which shows the operation of other pumps (high pressure water injection pumps and core spray pumps) were found (including manual operation) during the period after the earthquake until the loss of all alternative power sources, because the water level of the reactor did not draw down below the level ECCS would be the automatically activated. After the earthquake, the external power sources were lost and then Fuel Pool Cooling and Filtering System were stopped, however, emergency diesel generators were started. Cooling the pool using the pumps of RHR whose power is supplied from emergency diesel generators was not conducted before the arrival of tsunami, since it was confirmed that the water level of the spent fuel pool was full before the earthquake (around overflow level) and that the water temperature of the spent fuel pool was around 26℃, therefore it did not seem to be an obstacle for the immediate cooling of the fuel.

⑲ Shift Supervisor Task Handover Journal states that all alternative power sources were lost at 15:41.

⑳ After the loss of all alternative power sources, it is assumed that pumps of RHR of ECCS, and core spray pumps did not work due to the loss of power. In addition, according to contents written on the whiteboard in the main control room, earth connection occurred in direct current 125 V A system and B system at 15:31 on May 11. It is assumed that high pressure water injection system did not work due to the loss of power affected by the tsunami. (Annex-2)

㉑ Unit 1 and Unit 2 use an exhaust stack in common. As described in the analysis of Unit 1, radiation monitoring at the stack indicated at stable values until the end of its recording even though there was some noise after the reactor scram. Abnormal situation was not recognized.

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 1 and 2

March 11, 2011, Friday, Shift 2, Shift Supervisor Task Handover Journal（2/3）

| | |
|---|---|
| Unit 2 | |
| 1. Operation Status | |
| (1) Reactor rated thermal output　in steady operation | |
| (2)Output adjustment PLR (A/B) 81.5　↓81.4% | 04:03 |
| (3)M.COND B/W | 05:02~05:54 |
| | |
| | |
| 2. Compliance status of safety regulation | |
| Not particular | |
| | |
| 3. Periodic test | |
| None | |
| | |
| 4. Requested work, non compliance event | |
| None | |
| | |
| 5. Status of waste treatment facility | |
| None | |
| | |
| 6. Others (Common) | |
| None | |

一発－360 運転日誌記載ガイド
2011年3月10日(00)

1F-2-5

**太枠は炉規則第7条／保安規定第120条対象記録**

福島第一原子力発電所 2号機

# 運 転 日 誌 〔1〕

2011 年 3 月 11 日

Fukushima Daiichi Nuclear Power Station Unit 2 Operation log [1]

要求記録確認表（引継ぎ後のプラント状態をチェックする）

| | | 炉水温度 | 燃料の状態 | プールゲートの状態 | 原子炉の加圧 | 記録項目確認 2直 | 1-1直 | 1-2直 | 2直 | 記録が必要な項目 |
|---|---|---|---|---|---|---|---|---|---|---|
| 定格熱出力一定運転中（定格電気出力） | | → | → | → | → | ✓ | ✓ | | | 1,3,8,10,11 |
| 発電機並列中 | | → | → | → | → | ✓ | ✓ | | | 1,8,10,11,12,23,24,25 |
| 原子炉の状態 | 運転 | → | → | → | → | ✓ | ✓ | | | 1,2,3,4,6,7,8,9,11,13~19,21,22 |
| | 起動 | → | → | → | → | | | | | 1,2,3,6,7,8,9,11,13~19,21,22 |
| | 高温停止 | → | → | → | → | | | | | 1,2,3,8,9,11,13,22 |
| | 冷温停止 | 65℃以上 | → | → | 加圧なし | | | | | 1,2,8,9,11,13,22 |
| | | | | | 加圧 | | | | | 1,2,8,9,11,13,20,22 |
| | | 65℃未満 | → | → | 加圧なし | | | | | 1,2,8,9,11,13,22 |
| | 燃料交換 | → | 1体以上炉心に装荷 | 閉鎖 | → | | | | | 1,2,8,9,11,13,22 |
| | | | | 開放 | → | | | | | 1,2,8,9,11,13 |
| | | → | 全燃料取出中 | 閉鎖 | → | | | | | 1,2,8,11,22★ |
| | | | | 開放 | → | | | | | 1,2,8,11,13 |
| 格納容器閉鎖中 | | → | → | → | → | ✓ | ✓ | | | 1,2,3,4,8,9,11 |

## 記録確認項目

| | |
|---|---|
| 1 | 原子炉水電導度 |
| 2 | サプレッションチェンバー水位 |
| 3 | サプレッションチェンバー水温度 |
| 4 | ドライウェル酸素濃度 |
| 5 | 原子炉熱出力(瞬時値、1時間平均値) |
| 6 | 原子炉熱出力(SRNM, APRM) |
| 7 | 排ガス再結合器温度 |
| 8 | 補給水積算記録 |
| 9 | 格納容器内の原子炉冷却材漏えい率 |
| 10 | 発電機出力(読み) |
| 11 | 変圧器等積算 |
| 12 | タービン軸振動(最大値) |
| 13 | ●再循環系ループ温度 |
| 14 | ●原子炉入口給水温度 |
| 15 | ●主蒸気温度 |
| 16 | ●主蒸気流量 |
| 17 | ●給水流量 |
| 18 | ●給水圧力 |
| 19 | ●主蒸気圧力 |
| 20 | [illegible]原子炉圧力容器 |
| 21 | ●原子炉圧力 |
| 22 | ●原子炉水位 |
| 23 | ●発電機出力(電力量) |
| 24 | ●復水器真空 |
| 25 | ●高圧第1段圧力 |

★全燃料取出中でプールゲートが閉鎖されている場合にRPVスタッドボルトの締付を行う場合はRPVスタッドボルト締付開始以降再循環系ループ温度／原子炉冷却材温度変化率の記録を行う。

●の項目に記録要求がある場合でプロセス計算機打ち出しによる確認ができない場合は、別紙を使用し記録を行う。

| 確認 | | 承認 | 内容確認 | 作成 | プロセス計算機データ確認 |
|---|---|---|---|---|---|
| 原子炉主任技術者 | | 当直長 | 当直副長 | 当直員 | |
| | 2直 | [redacted] | [redacted] | [redacted] | [✓ 異常なし]<br>別紙有り |
| | 1-1直 | | | | 異常なし<br>別紙有り |
| | 1-2直 | | | | 異常なし<br>別紙有り |
| | 2直 | | | | 異常なし<br>別紙有り |

| 保安規定 | 9,19,120 | 9,13,40,46 | 9,13,45 | 9,13,48 | 26 | | 9,26,27,120 | | | | | | | | 9,120 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 炉規則第7条保安規定第120条記録項目 | 原子炉に使用している冷却材及び減速材の純度 | | | | | | 熱出力・炉心の中性子束密度 | | | | | | | | 再結合装置内の温度 | | | |
| 記録すべき場合、頻度 | 毎日1回 | すべての期間 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | 定格熱出力一定運転時 | | 原子炉に1体以上燃料が装荷されている場合連続 | | | | | | | | 原子炉の状態が運転及び起動において1時間ごと | | | |
| | 1 | 2 | 3 | 4 | 5 | | 6 | | | | | | | | 7 | | | |
| 項目 | (補2)原子炉水電導度 | サプレッションチェンバー水位 | サプレッションチェンバー水温度 | ドライウェル酸素濃度 | 原子炉熱出力 瞬時値 | 1時間平均値 | 原子炉熱出力（補1）( SRNM APRM ) | | | | | | | | 排ガス再結合器温度 | | | |
| | | | | | | | A | C | E | G | B | D | F | H | A 入口 | A 出口 | B 入口 | B 出口 |
| 時刻 | μS/cm | cm | ℃ | %O2 | MW | MW | cps | | | | (%) | | | | ℃ | | | |
| | 9-4 | 9-3 | 9-85 | 9-25 | 計算機 | | 9-5 | | | | | | | | 9-34 | | | |
| 計器 | CRS-59-132 | LI-16-132 | TRS-16-720A/B | O2RS-59-75 | 原子炉熱出力 | 原子炉平均熱出力 | NR-7-46A/B/C/D | | | | | | | | TRS-24-119A | | TRS-24-119B | |
| PID | — | — | — | — | S263 | S285 | — | — | — | — | — | — | — | — | — | — | — | — |
| 1 | | | | | ✓ | ✓ | 101 | 101 | 101 | ／ | 101 | 101 | 101 | ／ | 159 | 264 | 159 | 267 |
| 2 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 3 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 4 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 5 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 261 | 159 | 263 |
| 6 | | -1.0 | 15.5 | 2.60 | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 261 | 159 | 263 |
| 7 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 265 | 159 | 268 |
| 8 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 265 | 159 | 268 |
| 9 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 10 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 11 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 12 | 6.06 | -1.0 | 15.5 | 2.60 | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 13 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ／ | ✓ | ✓ | ✓ | ／ | 159 | 264 | 159 | 267 |
| 14 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | 159 | 263 | 159 | 267 |
| 15 | | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | |

| | 9,120 | 9,13,31 | | | | |
|---|---|---|---|---|---|---|
| | 原子炉に使用している冷却材及び減速材の毎日の補給量 | | | | | |
| | 毎日1回 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | | | |
| | 8 | 9 | | | | |
| | 補給水積算記録 | 格納容器内の原子炉冷却材漏えい率 | | | | |
| | 純水補給水量 FQI-57-100(m³) | D/W床ドレンサンプ流量 FQ-20-527(×0.01m³) | D/W機器ドレンサンプ流量 FQ-20-530(×0.01m³) | D/W冷却器ドレン量 FQ-16-143(ℓ) | | |
| | 現場 | 9-19 | | | | |
| 24 | | | | | D/W床ドレン | m³/h |
| 0 | 1752.3 | 40129 | 103503 | 176541 | 全漏流量 | m³/h |
| 差 | | | | | | |

| | 主発電機 | 変圧器等積算 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 発電機出力 10 | 11 | | | | | | | |
| | | 起動用連絡母線 | | | 所内変圧器 | | | 励磁電源変圧器 | 所内電力量合計 |
| | 読み | 2A | 2B | 小計 | 2A | 2B | 小計 | 電力量 | |
| | kWh×10,000 | kWh×1,000 | kWh×1,000 | MWh | kWh×1,000 | kWh×1,000 | MWh | ×100kWh | MWh |
| | 9-31 | メタクラ | | | メタクラ | | | 9-31 | |
| | WHT-43-107 | 2A3B | 2B2 | | 2A1B | 2B1 | | WHT-43-108 | |
| 24 | | | | | | | | | |
| 0 | 63<br>404.04 | 14<br>629.0 | 62<br>248.2 | | 31<br>195.0 | 23<br>067.0 | | 32<br>359.0 | |
| 差 | | | | | | | | | |

所内電力算出
2A3B+2B2+2A1B+2B1+(WHT-43-108×0. 1)＋集中ラド＋共用所内ボイラー変圧器(2号負荷分)＝ ＿＿＿＿ MWh

所内電力量のうち
集中ラド(2SA)使用分 ＿＿＿＿ MWh

所内電力量のうち
共用所内ボイラー(2号負荷分)使用分 ＿＿＿＿ MWh

| 定格回転速度運転時タービン軸受振動値(1日の最大値) | |
|---|---|
| 12 | |
| 9-75 | |
| S/VbR-30-20-3/4/5/6/7 | |
| 軸受 No. | 最大値 1/100mm |
| | |

補足事項
- 補1 炉規則第7条、保安規定第120条記録は連続記録のチャートである。
- 補2 原子炉水電導度が記録できない場合は代替記録採取場所により記録する。詳細は運転日誌記載ガイドを確認すること。
- 補3 再循環ポンプ吸込温度(原子炉冷却材浄化系入口温度)の修正時の温度と1時間前の温度を確認し、温度差が55℃/hを超えていないことを確認する。

注意事項(運転日誌共通)
1. 運転日誌別紙の項目に●が記載されているものは、BOP打出値参照記録のため、毎時打出し記録を確認しデータに異常が無い事を確認し空欄とすること。
2. PTW以外で記録不可能な場合は「－」としその理由を余白に記載する。PTWの場合は「PTW」と記載する。
3. 記録不要な場合は当該直の欄を「／」とする。(運転日誌別紙の●項目も同様)

記事

添付資料－２－2

## Status of emergency machines check sheet

福島第一原子力発電所　2 号機

# 非常用機器状態確認チェックシート

2011 年 3 月 11 日

|  | 承認<br>当直長 | 内容確認<br>当直副長 | 作成<br>当直員 |
|---|---|---|---|
| 1直 |  |  |  |
| 2直 | [redacted] | [redacted] | [redacted] |

| 項 | 目 | 通常状態 | 2直 | 1直 | 記事 |
|---|---|---|---|---|---|
| 自動逃し弁系 | AO−2−71A | × | レ |  |  |
|  | −71B | × | レ |  |  |
|  | −71C | × | レ |  |  |
|  | −71E | × | レ |  |  |
|  | −71G | × | レ |  |  |
|  | −71H | × | レ |  |  |
| 残留熱除去系〔A〕 | RHRポンプ　A | SB | レ |  |  |
|  | RHRポンプ　C | SB | レ |  |  |
|  | RHRSポンプ　A | SB | レ |  |  |
|  | RHRSポンプ　C | SB | レ |  |  |
|  | MO−10−15A | × | レ |  |  |
|  | −15C | × | レ |  |  |
|  | −16A | × | レ |  |  |
|  | −65A | ○ | レ |  |  |
|  | −66A | ○ | レ |  |  |
|  | −12A | ○ | レ |  |  |
|  | −27A | ○ | レ |  |  |
|  | −25A | × | レ |  |  |
|  | −31A | × | レ |  |  |
|  | −26A | × | レ |  |  |
|  | −38A | × | レ |  |  |
|  | −39A | × | レ |  |  |
|  | −34A | × | レ |  |  |
|  | −13A | ○ | レ |  |  |
|  | −13C | ○ | レ |  |  |
|  | −89A | × | レ |  |  |
|  | −20 | ○ | レ |  |  |
|  | RHRポンプA系潤滑油ポンプ1A | SB | レ |  |  |
|  | RHRポンプA系潤滑油ポンプ2A | SB | レ |  |  |
|  | RHRポンプA系潤滑油ポンプ3A | SB | レ |  |  |
|  | RHRSポンプA,C潤滑油ポンプ$A_1$ | SB | レ |  |  |
|  | RHRSポンプA,C潤滑油ポンプ$A_2$ | SB | レ |  |  |
|  | RHRSポンプA,C潤滑油冷却ファン$A_1$ | SB | レ |  |  |
|  | RHRSポンプA,C潤滑油冷却ファン$A_2$ | SB | レ |  |  |
| 炉心スプレイ系〔A〕 | ポンプA | SB | レ |  |  |
|  | MO−14− 7A | ○ | レ |  |  |
|  | −11A | ○ | レ |  |  |
|  | −12A | × | レ |  |  |
|  | −26A | × | レ |  |  |
|  | − 5A | ○ | レ |  |  |
| 炉心スプレイ系〔A〕 | CSポンプA潤滑油ポンプA | SB | レ |  |  |
|  | CSポンプA潤滑油予備ポンプA | SB | レ |  |  |
| 高圧注水系 | MO−23− 15 | ○ | レ |  |  |
|  | − 16 | ○ | レ |  |  |
|  | − 14 | × | レ |  |  |
|  | − 17 | ○ | レ |  |  |
|  | − 57 | × | レ |  |  |
|  | − 68 | × | レ |  |  |
|  | − 21 | × | レ |  |  |
|  | − 20 | ○ | レ |  |  |
|  | − 19 | × | レ |  |  |
|  | − 24 | × | レ |  |  |
|  | − 25 | × | レ |  |  |
|  | −144 | × | レ |  |  |
|  | タービン止め弁 | × | レ |  |  |
|  | タービン加減弁 | × | レ | - |  |
|  | 潤滑油ポンプ | SB | レ |  |  |
|  | 復水ポンプ | SB | レ |  |  |
|  | 真空ポンプ | SB | レ |  |  |
|  | 流量制御器 | AUTO | レ |  |  |
| 残留熱除去系〔B〕 | RHRポンプB | SB | レ |  |  |
|  | RHRポンプD | SB | レ |  |  |
|  | RHRSポンプB | SB | レ |  |  |
|  | RHRSポンプD | SB | レ |  |  |
|  | MO−10−15B | × | レ |  |  |
|  | −15D | × | レ |  |  |
|  | −16B | × | レ |  |  |
|  | −65B | ○ | レ |  |  |
|  | −66B | ○ | レ |  |  |
|  | −12B | ○ | レ |  |  |
|  | −27B | ○ | レ |  |  |
|  | −25B | × | レ |  |  |
|  | −31B | × | レ |  |  |
|  | −26B | × | レ |  |  |
|  | −38B | × | レ |  |  |
|  | −39B | × | レ |  |  |
|  | −34B | × | レ |  |  |
|  | −13B | ○ | レ |  |  |
|  | −13D | ○ | レ |  |  |
|  | −89B | × | レ |  |  |
| 残留熱除去系〔B〕 | RHRポンプB系潤滑油ポンプ1B | SB | レ |  |  |
|  | RHRポンプB系潤滑油ポンプ2B | SB | レ |  |  |
|  | RHRポンプB系潤滑油ポンプ3B | SB | レ |  |  |
|  | RHRSポンプB,D潤滑油ポンプ$B_1$ | SB | レ |  |  |
|  | RHRSポンプB,D潤滑油ポンプ$B_2$ | SB | レ |  |  |
|  | RHRSポンプB,D潤滑油冷却ファン$B_1$ | SB | レ |  |  |
|  | RHRSポンプB,D潤滑油冷却ファン$B_2$ | SB | レ |  |  |
| 炉心スプレイ系〔B〕 | ポンプB | SB | レ |  |  |
|  | MO−14− 7B | ○ | レ |  |  |
|  | −11B | ○ | レ |  |  |
|  | −12B | × | レ |  |  |
|  | −26B | × | レ |  |  |
|  | − 5B | ○ | レ |  |  |
|  | CSポンプB潤滑油ポンプB | SB | レ |  |  |
|  | CSポンプB潤滑油予備ポンプB | SB | レ |  |  |
| 隔離時冷却系 | MO−13− 15 | ○ | レ |  |  |
|  | − 16 | ○ | レ |  |  |
|  | −131 | × | レ |  |  |
|  | − 18 | ○ | レ |  |  |
|  | − 39 | × | レ |  |  |
|  | − 41 | × | レ |  |  |
|  | − 20 | ○ | レ |  |  |
|  | − 21 | × | レ |  |  |
|  | − 30 | × | レ |  |  |
|  | − 27 | × | レ |  |  |
|  | −132 | × | レ |  |  |
|  | タービン止め弁 | ○ | レ |  |  |
|  | タービン加減弁 | ○ | レ |  |  |
|  | 復水ポンプ | SB | レ |  |  |
|  | 真空ポンプ | SB | レ |  |  |
|  | 流量制御器 | AUTO | レ |  |  |
| ディーゼル発電機２A | ディーゼル発電機 | SB | レ |  |  |
|  | 6.9kvしゃ断器2C3 | ○ | レ |  |  |
| ディーゼル発電機２B | ディーゼル発電機 | SB | レ |  |  |
|  | 6.9kvしゃ断器2E2B | ○ | レ |  |  |

1．主要操作が終了し、引継ぎまでの間に状態を確認する。
　１直帯は１８時～引継ぎまで、２直帯は６時～引継ぎまで
2．通常状態と比較し異常なければ「レ」相違する場合は、次の記号で
　記載する。
3．記号　レ：異常なし　○：開　×：閉　W：作業中　RUN：運転中
　MAN：手動　P/L：引き保持

1F-2-6

添付資料－２－３

# 2号機　BOPログ

プラント主要パラメータを打出したBOPタイパー　サンプル

BOP (Balance of Plant) Typer (printed out main parameters of the plant) - sample

| 発電所コー | 号機コード | データ採取日 | データ採取時間 | 原子炉平均熱出力(MW) | 原子炉APRM平均(%) | 原子炉熱出力(MW) | 原子炉給水熱出力(MW) |
|---|---|---|---|---|---|---|---|
| 1F | 2 | 2011/03/11 | 01 | 2379.4976 | 100.80783 | 2379.7529 | 2371.615 |
| 1F | 2 | 2011/03/11 | 02 | 2379.4805 | 100.81427 | 2378.9148 | 2372.481 |
| 1F | 2 | 2011/03/11 | 03 | 2379.7356 | 100.81194 | 2379.7576 | 2372.123 |
| 1F | 2 | 2011/03/11 | 04 | 2379.7681 | 100.81345 | 2380.2283 | 2371.116 |
| 1F | 2 | 2011/03/11 | 05 | 2379.4617 | 100.79456 | 2378.9321 | 2369.1641 |
| 1F | 2 | 2011/03/11 | 06 | 2379.1123 | 100.77412 | 2378.9939 | 2371.5459 |
| 1F | 2 | 2011/03/11 | 07 | 2379.0081 | 100.7748 | 2378.7051 | 2370.5139 |
| 1F | 2 | 2011/03/11 | 08 | 2379.0715 | 100.77875 | 2378.3953 | 2371.3 |
| 1F | 2 | 2011/03/11 | 09 | 2379.1912 | 100.76691 | 2378.5503 | 2371.4551 |
| 1F | 2 | 2011/03/11 | 10 | 2379.3088 | 100.77721 | 2379.7583 | 2371.406 |
| 1F | 2 | 2011/03/11 | 11 | 2379.3074 | 100.76556 | 2379.5884 | 2370.1001 |
| 1F | 2 | 2011/03/11 | 12 | 2379.3491 | 100.75168 | 2379.4795 | 2372.8259 |
| 1F | 2 | 2011/03/11 | 13 | 2379.3245 | 100.76263 | 2379.8066 | 2372.6169 |
| 1F | 2 | 2011/03/11 | 14 | 2379.4778 | 100.7547 | 2379.9329 | 2371.394 |
| 1F | 2 | 2011/03/11 | 15 | 1939.2495 | 80.86731 | 152.0777 | |
| 1F | 2 | 2011/03/11 | 16 | | | | |
| 1F | 2 | 2011/03/11 | 17 | | | | |
| 1F | 2 | 2011/03/11 | 18 | | | | |
| 1F | 2 | 2011/03/11 | 19 | | | | |
| 1F | 2 | 2011/03/11 | 20 | | | | |
| 1F | 2 | 2011/03/11 | 21 | | | | |
| 1F | 2 | 2011/03/11 | 22 | | | | |
| 1F | 2 | 2011/03/11 | 23 | | | | |
| 1F | 2 | 2011/03/11 | 24 | | | | |
| | | | | ≦ 2381 | 98～101 | ≦ 2381 | |

※ ２号機 第25回定期検査総合性能検査記録より制限値（≦　）、過去データ（　～　）があるパラメータについて表記。

※From "Integrated Performance Test Record of the 25th Periodic Inspection of Unit 2", parameters with that there exist limit values ( ≦ ), or past data ( ～ ) are referred here.

Summary Log of Output Distribution Calculation/
Result of Output Distribution Calculation

```
出力分布計算サマリログ                          日付 2011/03/11  時刻 01:00      福島第一原子力発電所・２号機  第25サイクル

   出力分布計算結果     日付  2011/03/11  時刻  01:00

   CTP      2378.6  (    99.9 %)    CAEQ    0.134    PR      6.909     WFM     7106  (  99.6 %)   CAVEX   25018.0  MWd/mt   KEF      1.0709     NSAL  11
   GMWE      789.1  (   100.7 %)    CAQA   45.18     DPC-M   0.1083    WD     13802  (  84.3 %)   CYCLEX   2811.0  MWd/mt   LMSW          1
   MFLCPR    0.901  ( 23-34    )    CAVF    0.424    DPC-C   0.1396,   WTSUB  25350  (  88.1 %)   CANEX   1.3336E+05           IREF          4
   MFLPD     0.702  ( 17-44-05 )    CAPIR  50.41     KAL     1129      WTBB   27618                CAIDEX  3.3XXE+03            DNDRE        20
   CMPF      2.126                                   DHS    82.52      WT     29032  (  67.5 %)                                ITE           3
                                                                       WTFLG      2

                                                                                                    非対称制御棒情報（右下線記）
                                                                                                    (IT : 0)
```

制御棒位置

```
51                      **  **  **  **  **
47              **  **  **  **  **  **  **  **  **
43          **  10  **  **  **  08  **  **  **  10  **
39          **  **  **  **  **  **  **  **  **  **  **
35      **  **  **  **  10  **  **  **  10  **  **  **  **
31      **  **  **  **  **  **  **  **  **  **  **  **  **
27      **  **  08  **  **  **  06  **  **  **  08  **  **
23      **  **  **  **  **  **  **  **  **  **  **  **  **
19      **  **  **  **  10  **  **  **  10  **  **  **  **
15          **  **  **  **  **  **  **  **  **  **  **
11              10  **  **  **  08  **  **  **  10  **
07              **  **  **  **  **  **  **  **  **
03                      **  **  **  **  **
        02  06  10  14  18  22  26  30  34  38  42  46  50
```

```
LOCATION    KING.R   APRM
             RPF     GAF

  1(A)       0.92    0.990
  2(B)       1.23    0.989
  3(C)       1.35    0.991
  4(D)       1.14    0.990
  5(E)       1.13    0.992
  6(F)       1.17    0.990
  7(G)       0.82
```

```
代替制御棒位置
(IT : 0)

故障センサー
(IT : 0)
```

```
                         ＦＬＣＰＲ及びＦＬＰＤの最大値（全炉心）                                          AXIAL
NO   FLCPR    CPR   FUELID    ( X - Y )  TYPE  NO    FLPD    LHGR    FUELID    ( X - Y - Z )  TYPE     K   RPF
 1   0.901   1.387  AAN033    ( 23 - 34 )   2    1   0.702  33.516  ABN045    ( 17 - 44 - 05 )  5     24  0.26
 2   0.874   1.431  AAN043    ( 31 - 32 )   2    2   0.755  33.236  ABN093    ( 31 - 46 - 05 )  5     23  0.71
 3   0.869   1.438  AAN107    ( 27 - 32 )   3    3   0.754  33.162  AAN025    ( 15 - 44 - 05 )  2     22  0.92
 4   0.860   1.453  AAN103    ( 29 - 30 )   1    4   0.759  33.124  ABN051    ( 33 - 44 - 05 )  5     21  0.98
 5   0.851   1.468  ABN011    ( 31 - 30 )   4    5   0.748  32.925  ABN093    ( 27 - 46 - 04 )  5     20  1.04
                                                                                                   19  1.05
                         ＦＬＣＰＲ及びＦＬＰＤの最大値（燃料タイプ別）                                    18  1.06
TYPE FLCPR    CPR   FUELID    ( X - Y )        TYPE   FLPD    LHGR    FUELID    ( X - Y - Z )        17  1.10
 1   0.860   1.453  AAN103    ( 29 - 30 )        1   0.700  30.809  AAN075    ( 33 - 46 - 01 )       16  1.13
 2   0.901   1.387  AAN033    ( 23 - 34 )        2   0.754  33.162  AAN025    ( 15 - 44 - 05 )       15  1.13
 3   0.869   1.438  AAN107    ( 27 - 32 )        3   0.748  32.890  AAN105    ( 25 - 22 - 12 )       14  1.13
 4   0.851   1.468  ABN011    ( 31 - 30 )        4   0.726  31.884  ABN011    ( 31 - 36 - 12 )       13  1.16
 5   0.830   1.524  ABN075    ( 39 - 34 )        5   0.702  33.516  ABN045    ( 17 - 44 - 05 )       12  1.17
                                                                                                   11  1.10
                                                                                                   10  1.14
                                                                                                    9  1.15
                                                                                                    8  1.16
                                                                                                    7  1.18
                                                                                                    6  1.15
                                                                                                    5  1.14
                                                                                                    4  1.00
                                                                                                    3  0.98
                                                                                                    2  0.80
                                                                                                    1  0.25
```

```
較正後ＬＰＲＭ読み値

45          41  44  30  31  22
            37  47  41  42  19
            41  43  61  38  18
            30  38  52  51  11

37      29  40  45  41  46  33            故障ＬＰＲＭリスト
        38  61  51  57  30  46            (IT : 0)
        25  37  35  61  54  31
        24  60  48  58  46  52

29      30  41  41  43  47  37
        42  60  64  49  51  41
        49  54  58  52  56  50
        53  41  62  45  61  61

21      29  38  47  46  40  31
        48  62  53  58  51  19
        30  58  58  61  53  62
        40  58  48  45  18  27            BASE UNIT CHIF
                                          (IT : 0)
13          38  38  39  42  31
            16  42  46  51  36
            53  38  40  62  39
            52  35  40  67  37

05 D            26  31  28
   C            40  45  33
   B            37  54  34
   A            17  55  28

        04  12  20  28  36  44
```

1F-2-8

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 1 and 2

March 11, 2011, Friday, Shift 1, Shift Supervisor Task Handover Journal（3/4）

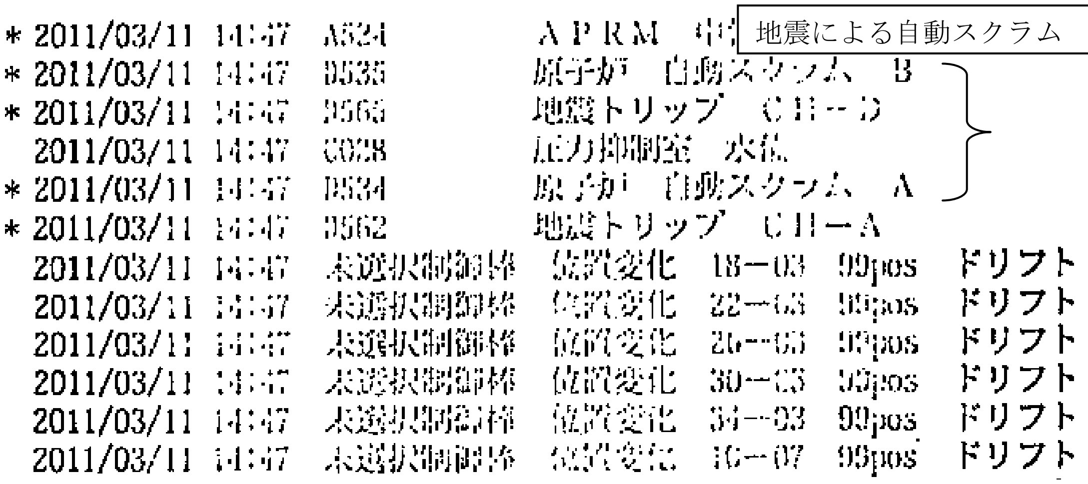
| | | |
|---|---|---|
| Unit 2 | | |
| 1. Operation Status | | |
| (1) Reactor is shutdown | | |
| (2) Alarm “SEISMIC MONITOR TRIP” | | 14:47 |
| (3) Reactor automatic scram, main turbine automatic shutdown (occurrence of the earthquake offshore of Miyagi pref.) | | 14:47 |
| (4) Status of reactor “operation” to “hot shutdown” | | 14:47 |
| (5) Insertion of all control rods | | 14:47 |
| (6) Reactor mode switch “operation” to “shutdown” | | 14:47 |
| (7) D/G 2A automatic start up (Okuma-2 line off site power lost) / trip | | 14:47/15:41 |
| (8) Complete closure of MSIV | | 14:47 |
| (9) M COND Vac break | | 14:55 |
| (10) Reactor in subcriticality | | 15:01 |
| (11) RCIC manual start up | | 15:02 |
| (12) Torus cooling / Torus spray in service | | 15:07/15:25 |
| (13) RPS MG (A)/(B) restart up | | 15:27/15:29 |
| (14) D/G 2B breaker trip (running stand-by) / trip | | 15:40/15:42 |
| (15) M/C2E trip | | 15:41 |
| (16) Loss of all A/C power | | 15:41 |
| | | |
| 2. Compliance status of safety regulation | | |
| (1) Safety regulation, article 17 (procedures at the time of earthquake and fire) | | |
| - report to O&M general manager at the occurrence of earthquake with an intensity of more than lower 5 | | 14:50 |
| (2) Safety regulation, article 76 (basic procedures at the occurrence of abnormal event) | | |
| - report to O&M general manager at the occurrence of reactor automatic scram | | 14:50 |
| (3) Safety regulation, article 77 (procedures at the time of abnormal event) | | |
| - operation following “the operation procedures in case of reactor scram” | | 14:47 |
| (4) Safety regulation, article 113 (report) | | |
| - report to O&M general manager at the occurrence of specific event ( loss of all A/C power) stipulated by clause 1, article 10 of the act on special measures concerning nuclear emergency preparedness | | |
| 3. Periodic test | | |
| (1) T-RFP oil tank oil level alarm test, automatic start up test of oil pump | Passed | 10:05~10:29 |
| (2) MTb safety device test | Passed | 10:33~10:43 |
| (3) Sealed oil system test | Passed | 11:06~11:17 |
| 4. Requested work, non compliance event | | |
| None | | |
| 5. Status of waste treatment facility | | |
| None | | |
| 6. Others (Common) | | |
| (1) Occurrence of the earthquake | | 14:46 |
| Intensity of higher 6: Naraha town (Kitada), Tomioka town (Motooka), Okuma town (Shimonogami, Nogami), Futaba Town (Shinzan) | | |
| (2) Alarm warning for huge Tsunami | | 14:58 |

Printed out main alarm typer of Unit 2 (extract)

○２号機　アラームタイパー主要打ち出し（抜粋）

Automatic scram due to the earthquake

地震による自動スクラム



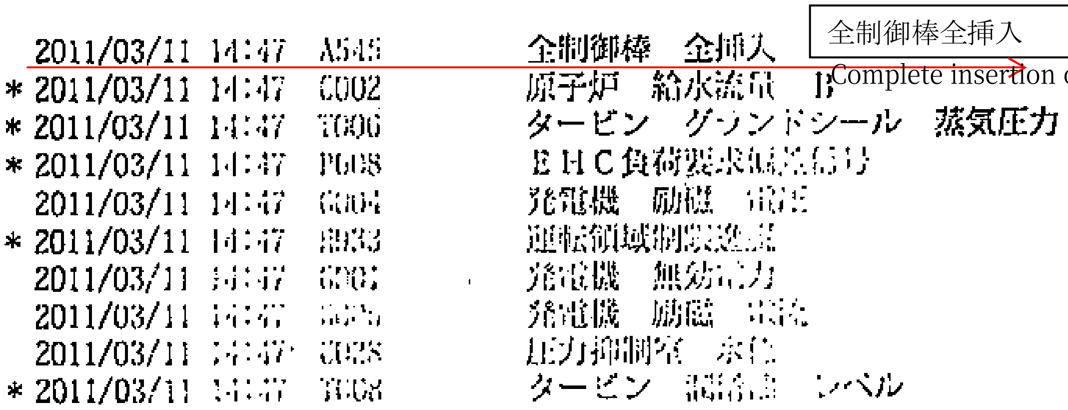
```
* 2011/03/11 14:47  A524         ＡＰＲＭ　中
* 2011/03/11 14:47  D535         原子炉　自動スクラム　B
* 2011/03/11 14:47  D565         地震トリップ　CH－D
  2011/03/11 14:47  C028         圧力抑制室　水位
* 2011/03/11 14:47  D534         原子炉　自動スクラム　A
* 2011/03/11 14:47  D562         地震トリップ　CH－A
  2011/03/11 14:47  未選択制御棒　位置変化　18－03　99pos　ドリフト
  2011/03/11 14:47  未選択制御棒　位置変化　22－03　99pos　ドリフト
  2011/03/11 14:47  未選択制御棒　位置変化　26－03　99pos　ドリフト
  2011/03/11 14:47  未選択制御棒　位置変化　30－03　99pos　ドリフト
  2011/03/11 14:47  未選択制御棒　位置変化　34－03　99pos　ドリフト
  2011/03/11 14:47  未選択制御棒　位置変化　10－07　99pos　ドリフト
```

Control rod drifted due to the scram (the same applies

スクラムに伴う制御棒ドリフト発生（以降同様）

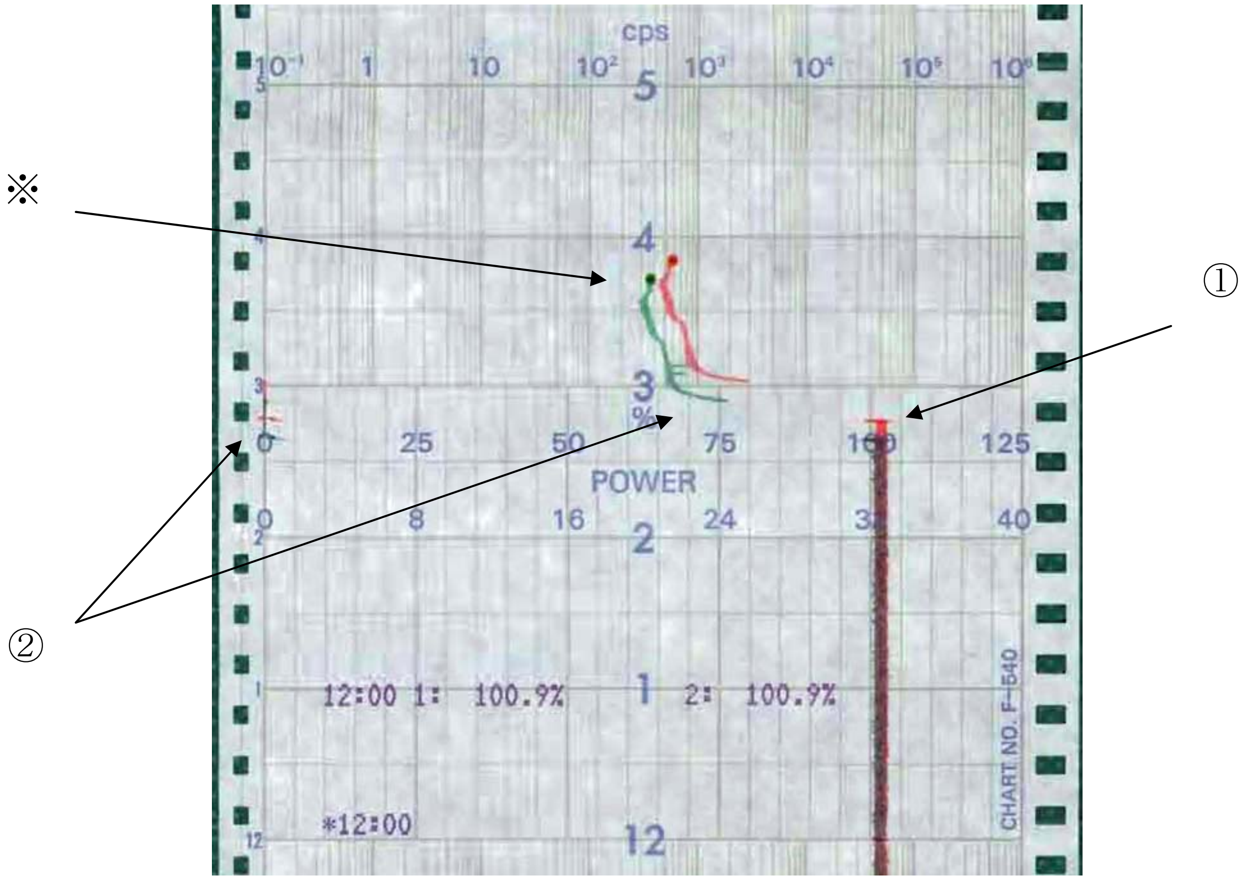
全制御棒全挿入

Complete insertion of all control rods



```
  2011/03/11 14:47  A545         全制御棒　全挿入
* 2011/03/11 14:47  C002         原子炉　給水流量　B
* 2011/03/11 14:47  T006         タービン　グランドシール　蒸気圧力
* 2011/03/11 14:47  P008         ＥＨＣ負荷要求偏差信号
  2011/03/11 14:47  G004         発電機　励磁　電圧
* 2011/03/11 14:47  B933         運転領域制限逸脱
  2011/03/11 14:47  G003         発電機　無効電力
  2011/03/11 14:47  G005         発電機　励磁　電流
  2011/03/11 14:47  C028         圧力抑制室　水位
* 2011/03/11 14:47  T008         タービン　[illegible]　レベル
```

【２号　ＳＲＮＭ、ＡＰＲＭ】



NR-7-46A

赤　SRNM ch.A/APRM ch.A 出力レベル Output Level

緑　SRNM ch.C/APRM ch.C 出力レベル Output Level

①　１４時４７分　地震によるスクラムとスクラムによる出力低下

②　平均出力領域モニタ（ＡＰＲＭ）としてのダウンスケールと起動領域モニタ（ＳＲＮＭ）への切替

※　１５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

①14:47 Scram due to the earthquake and the output decrease due to the scram

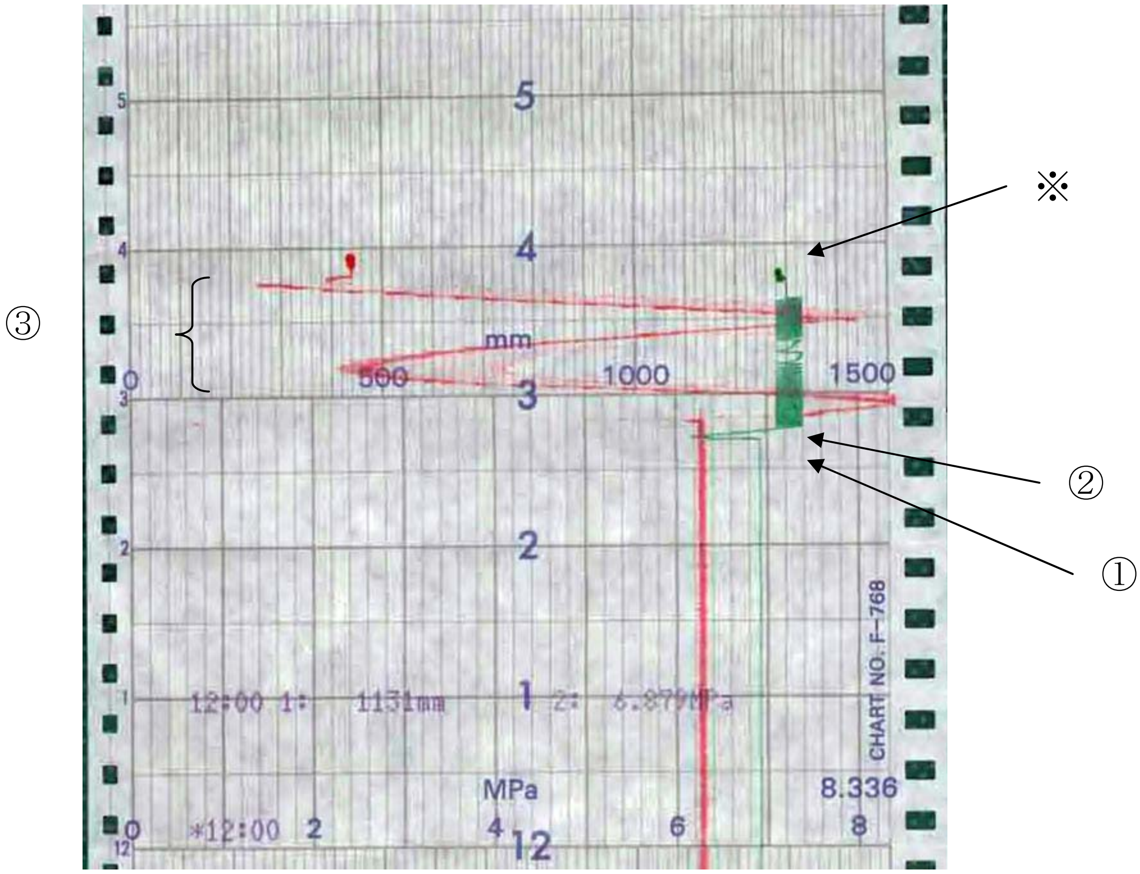
② Below detectable level by Average Power Output Region Monitor (APRM), and switch to Startup Region Monitor (SRNM)

*It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

添付資料－２－８

UNIT2 REACTOR PRESSURE,　REACTOR PRESS

**【２号原子炉水位、原子炉圧力】**



LR/PR-6-97

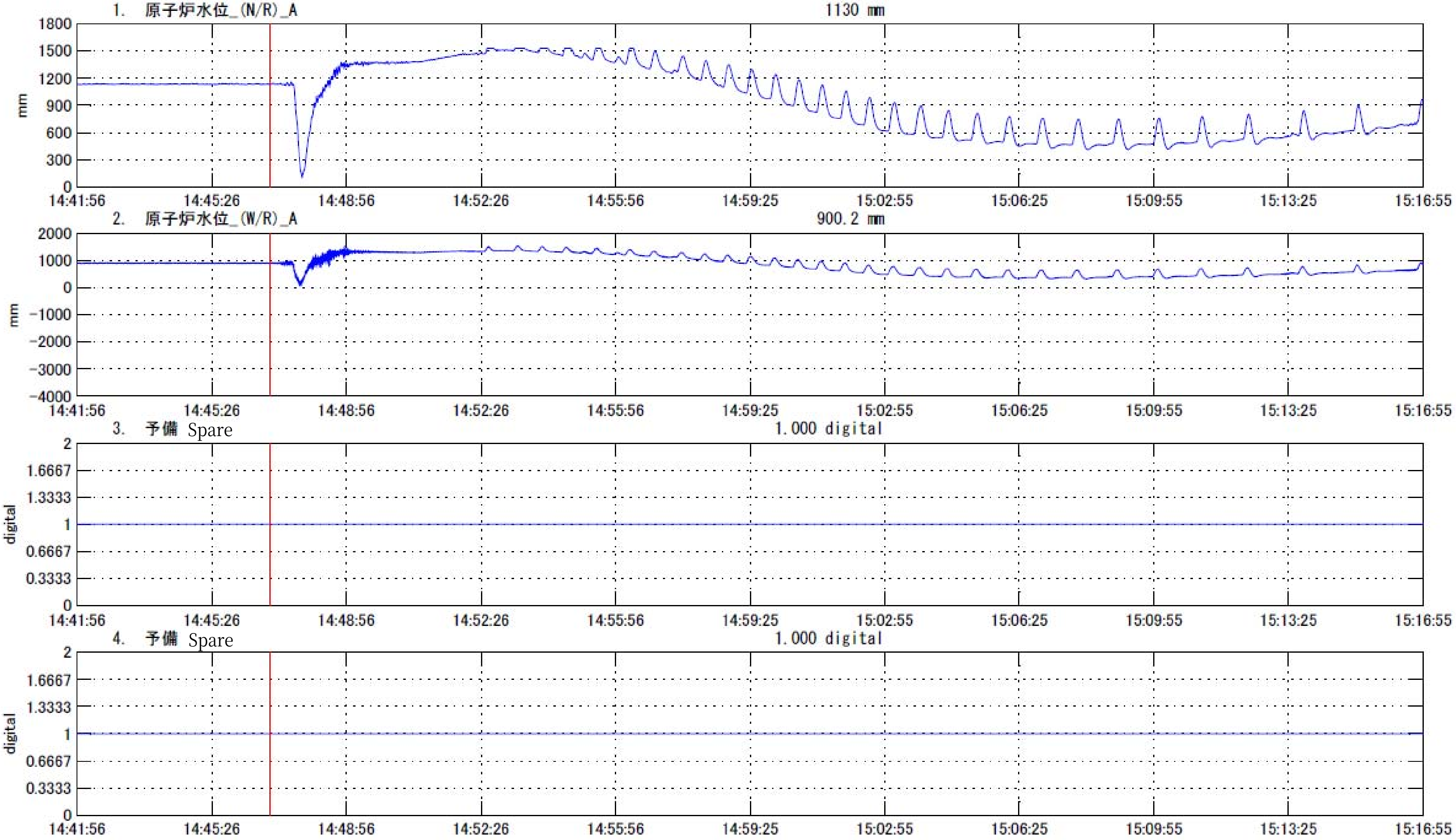
赤　原子炉水位　REACTOR PRESSURE
緑　原子炉圧力　REACTOR PRESS

①　１４時４７分　地震によるスクラム
②　主蒸気隔離弁閉止に伴う圧力上昇とその後の逃し安全弁開閉による圧力制御
③　原子炉隔離時冷却系の起動、停止による水位調整
※　１５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

①14:47 Scram due to the earthquake and the output decrease due to the scram
② Below detectable level by Average Power Output Region Monitor (APRM), and switch to Startup Region Monitor (SRNM)
③Water level adjustment by start/stop of Reactor Core Isolation Cooling System
*It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

Fukushima Daiichi Nuclear Power Station Unit 2　Time-line Event Data Display　File name　1F2_Cy26_EVF_DET_2011_03_11_14_46_56_400.dat　Cycle of data 0.01sec
Term of Data Display: From 2:41:56 pm, Mar 11, 2011 to 3:16:55 pm, Mar 11, 2011　Event Detection Time: 2:41:56:400 pm, Mar 11, 2011
Group Name：1F-2(1)　Reactor water level

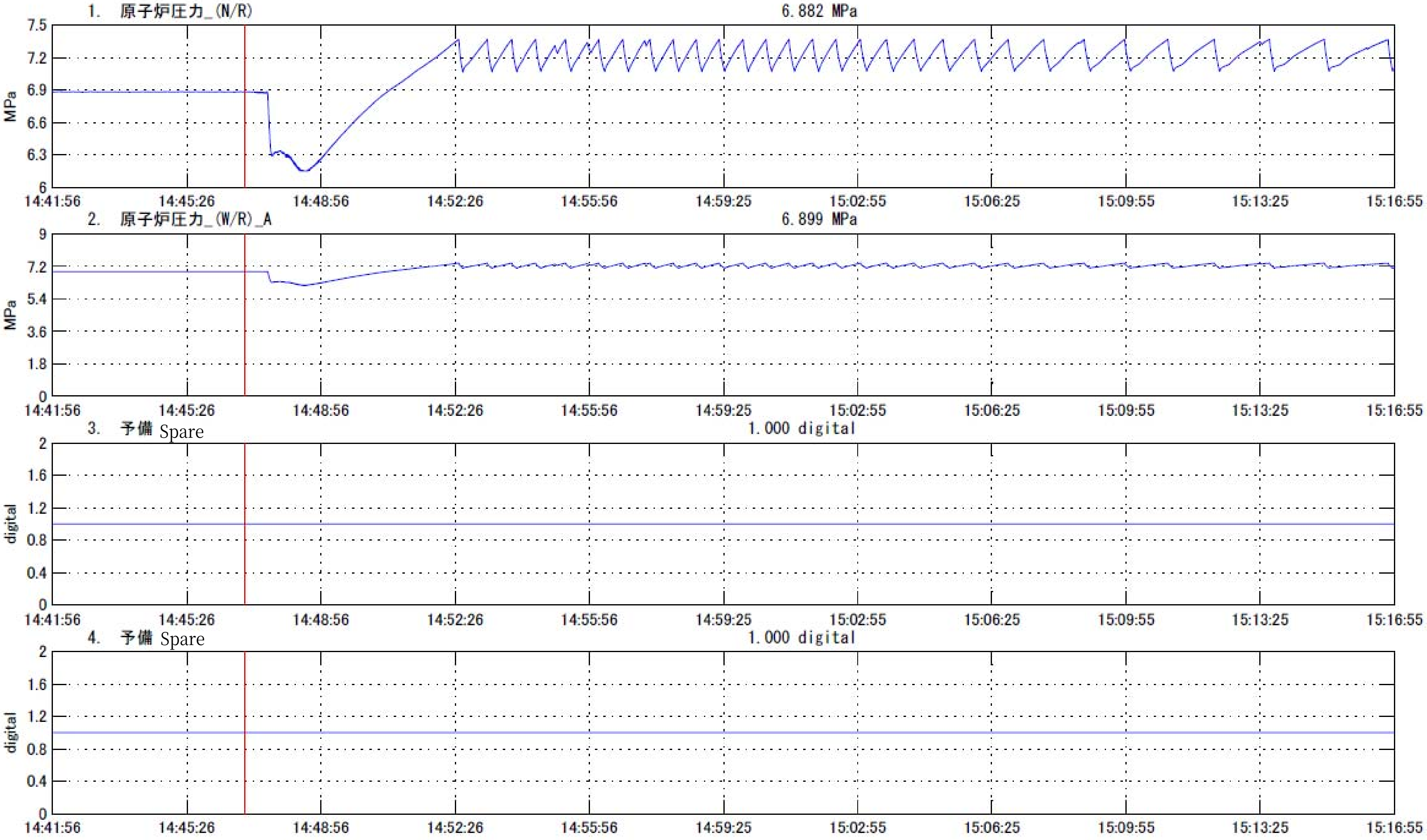
福島第一原子力発電所　２号機　イベントデータ　時系列データ表示　ファイル名　1F2_Cy26_EVF_DET_2011_03_11_14_46_56_400.dat　データ周期　0.01秒
データ表示期間　2011年03月11日14時41分56秒～2011年03月11日15時16分55秒　イベント検出時刻　2011年03月11日14時46分56秒　400　ミリ秒
グループ名称：　１Ｆ－２（１）　原子炉水位



添付資料－２－９

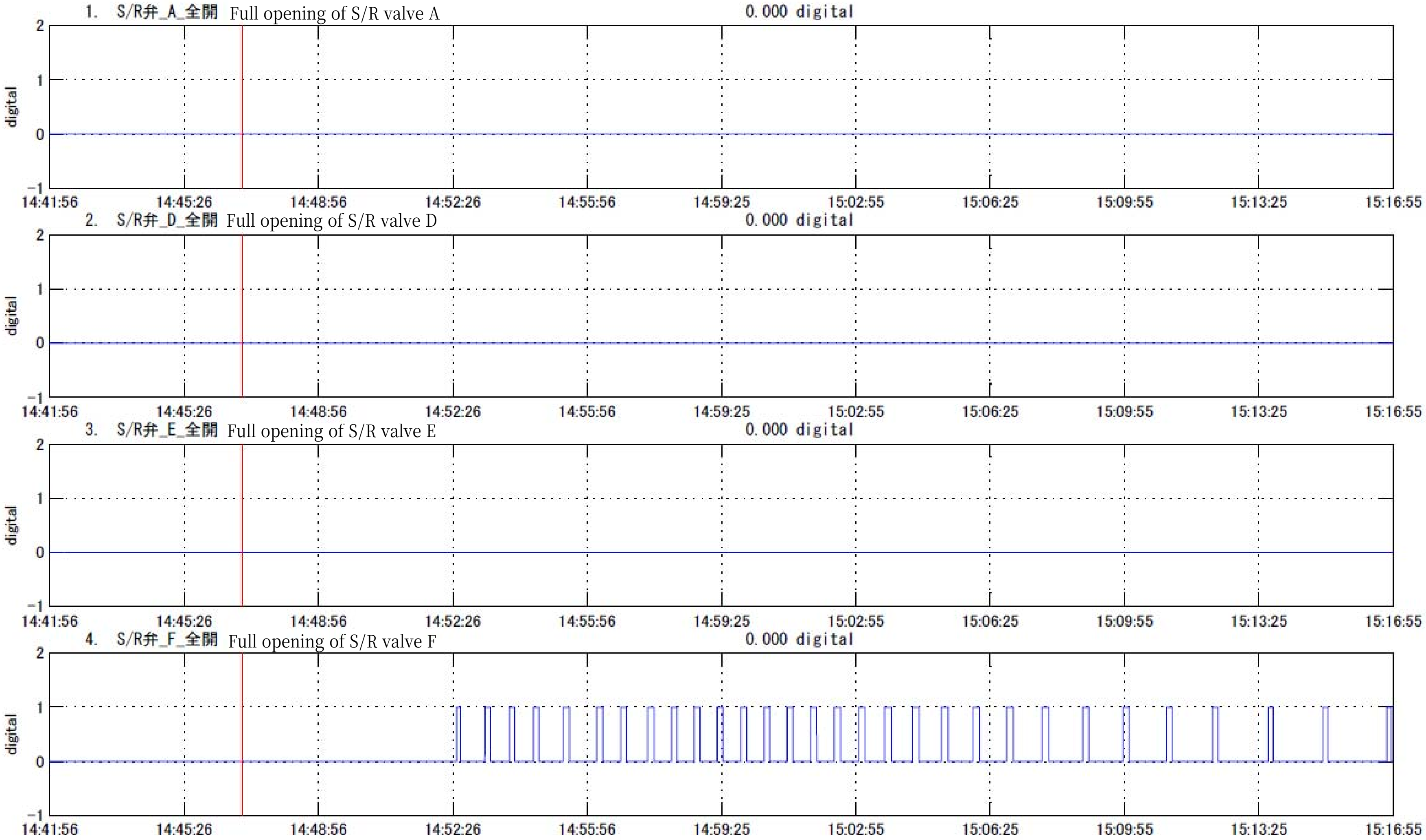
Fukushima Daiichi Nuclear Power Station Unit 2　Time-line Event Data Display　File name　1F2_Cy26_EVF_DET_2011_03_11_14_46_56_400.dat　Cycle of data 0.01sec
Term of Data Display: From 2:41:56 pm, Mar 11, 2011 to 3:16:55 pm, Mar 11, 2011　Event Detection Time: 2:41:56:400 pm, Mar 11, 2011
Group Name：1F-2(1)　Reactor pressure(1)

福島第一原子力発電所 ２号機　イベントデータ 時系列データ表示　ファイル名 1F2_Cy26_EVF_DET_2011_03_11_14_46_56_400.dat　データ周期 0.01秒
データ表示期間 2011年03月11日14時41分56秒～2011年03月11日15時16分55秒　イベント検出時刻 2011年03月11日14時46分56秒 400 ミリ秒
グループ名称 ： １Ｆ－２（１） 原子炉圧力（１）



Fukushima Daiichi Nuclear Power Station Unit 2 Time-line Event Data Display File name 1F2_Cy26_EVF_DET_2011_03_11_14_46_56_400.dat Cycle of data 0.01sec
Term of Data Display: From 2:41:56 pm, Mar 11, 2011 to 3:16:55 pm, Mar 11, 2011 Event Detection Time: 2:41:56:400 pm, Mar 11, 2011
Group Name：1F-2(1) Reactor pressure(2)

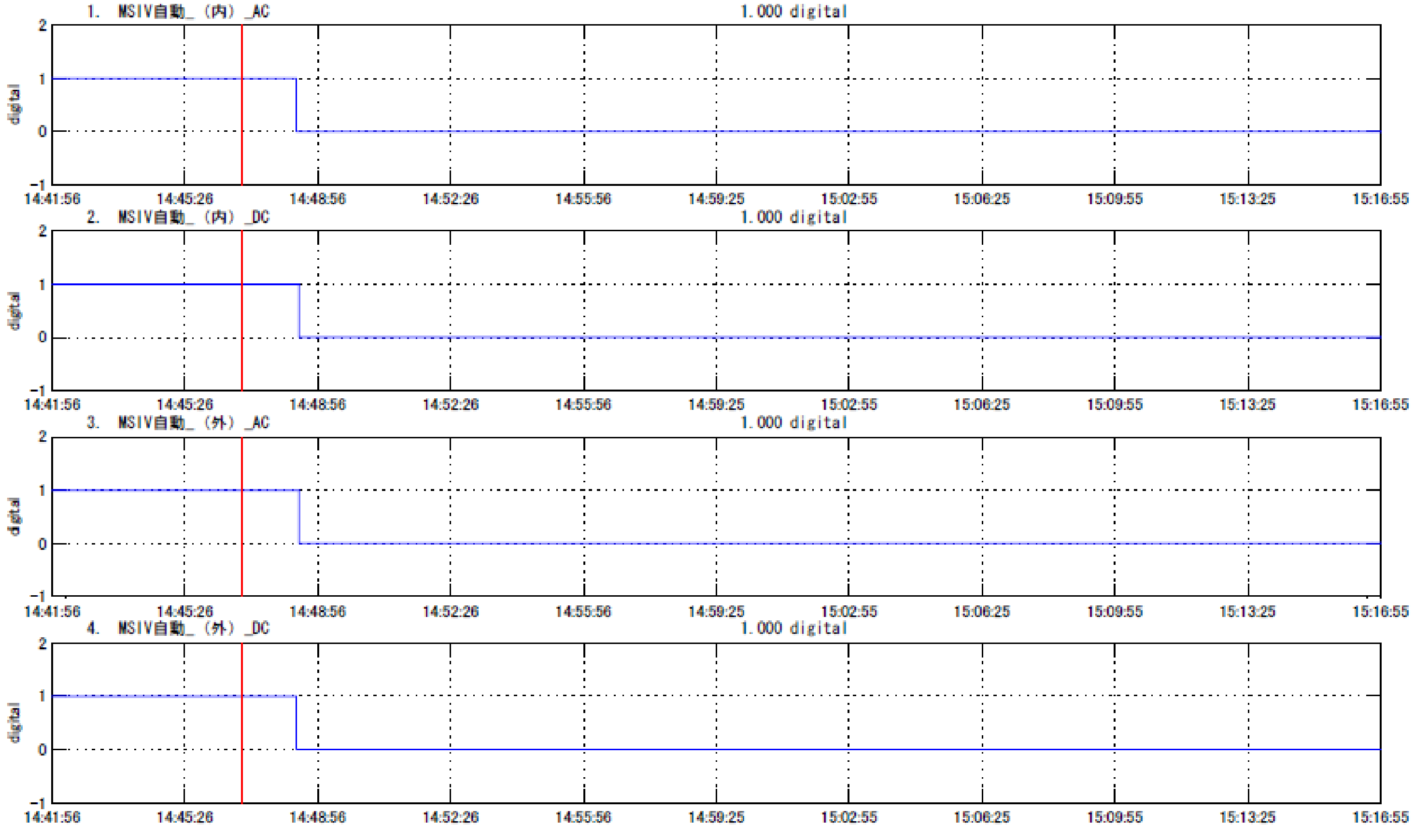
福島第一原子力発電所 ２号機 イベントデータ 時系列データ表示 ファイル名 1F2_Cy26_EVF_DET_2011_03_11_14_46_56_400.dat データ周期 0.01秒
データ表示期間 2011年03月11日14時41分56秒～2011年03月11日15時16分55秒 イベント検出時刻 2011年03月11日14時46分56秒 400 ミリ秒
グループ名称 ： １Ｆ－２（１） 原子炉圧力（２）


1. S/R弁_A_全開 Full opening of S/R valve A 0.000 digital

2. S/R弁_D_全開 Full opening of S/R valve D 0.000 digital

3. S/R弁_E_全開 Full opening of S/R valve E 0.000 digital

4. S/R弁_F_全開 Full opening of S/R valve F 0.000 digital

<table>
<tr><th>パラメータ</th><th>備 考</th></tr>
<tr><td>


主蒸気隔離弁閉鎖  Closure of MSIV

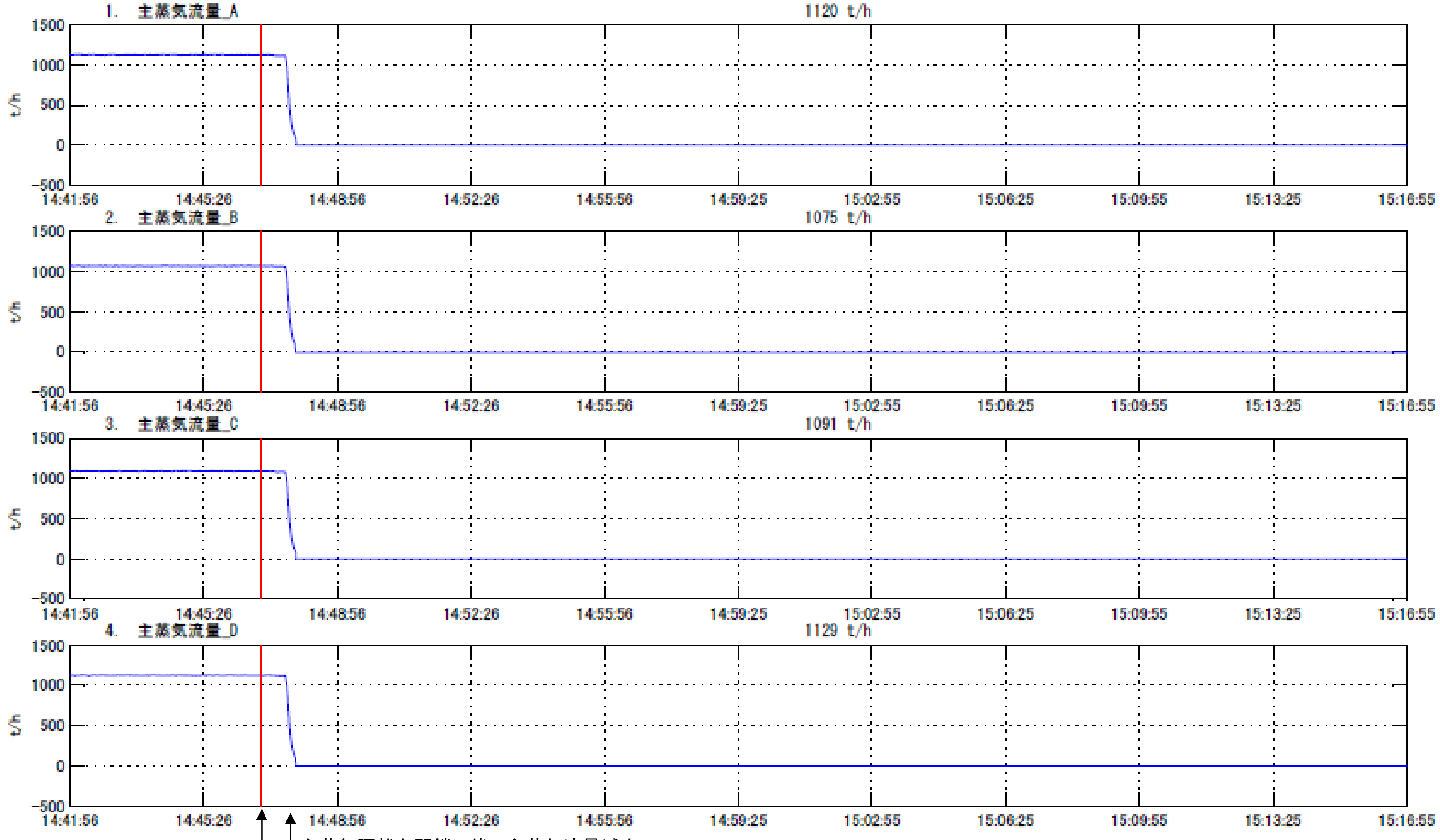
原子炉再循環ポンプ（B）上部振動変動に伴う過渡現象記録装置自動収録開始

Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of  reactor recirculation pump (B)
</td><td>
主蒸気隔離弁（内側・外側）（MSIV）は、閉鎖している。

Main Steam Isolation Valves ("MSIVs") (inner and outer) are closed.
</td></tr>
</table>

図－２（１） 福島第一・2号機 過渡現象記録装置 データ

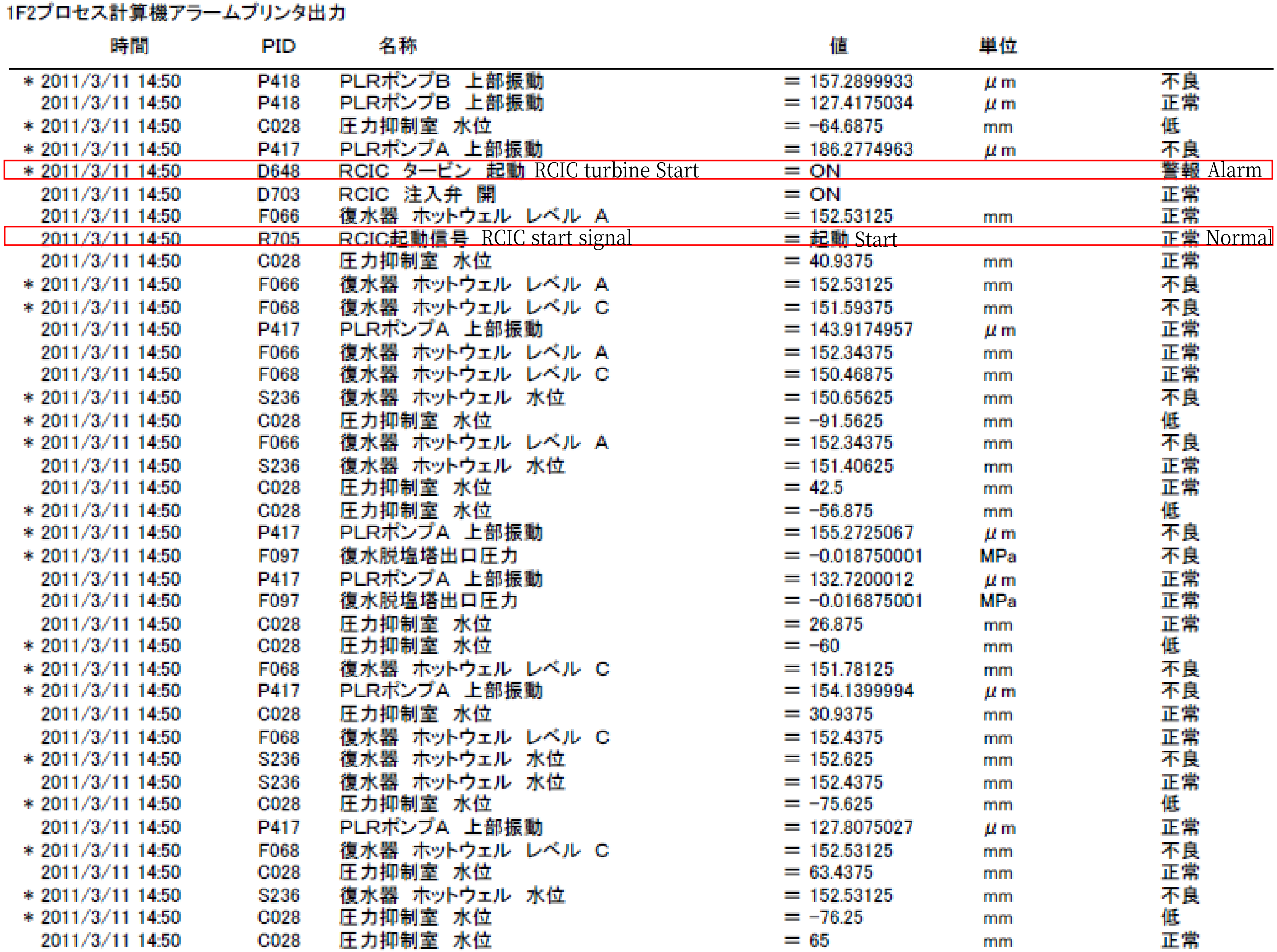
Figure-2(1) Fukushima Daiichi Nuclear Power Station Unit 2 data of transient recorders

| パラメータ | 備　考 |
|---|---|
|  <br>主蒸気隔離弁閉鎖に伴い主蒸気流量減少 Reduction of main steam flow in accordance with Main Steam Valve closure<br>原子炉再循環ポンプ（B）上部振動変動に伴う過渡現象記録装置自動収録開始<br>Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (B) | 主蒸気隔離弁の閉鎖と共に、主蒸気流量は減少している。<br>Main steam flow is reduced in accordance with closing Main Steam Isolation Valve |

図－２（１）　福島第一・2号機　過渡現象記録装置　データ

Figure-2(1) Fukushima Daiichi Nuclear Power Station Unit 2 data of transient recorders

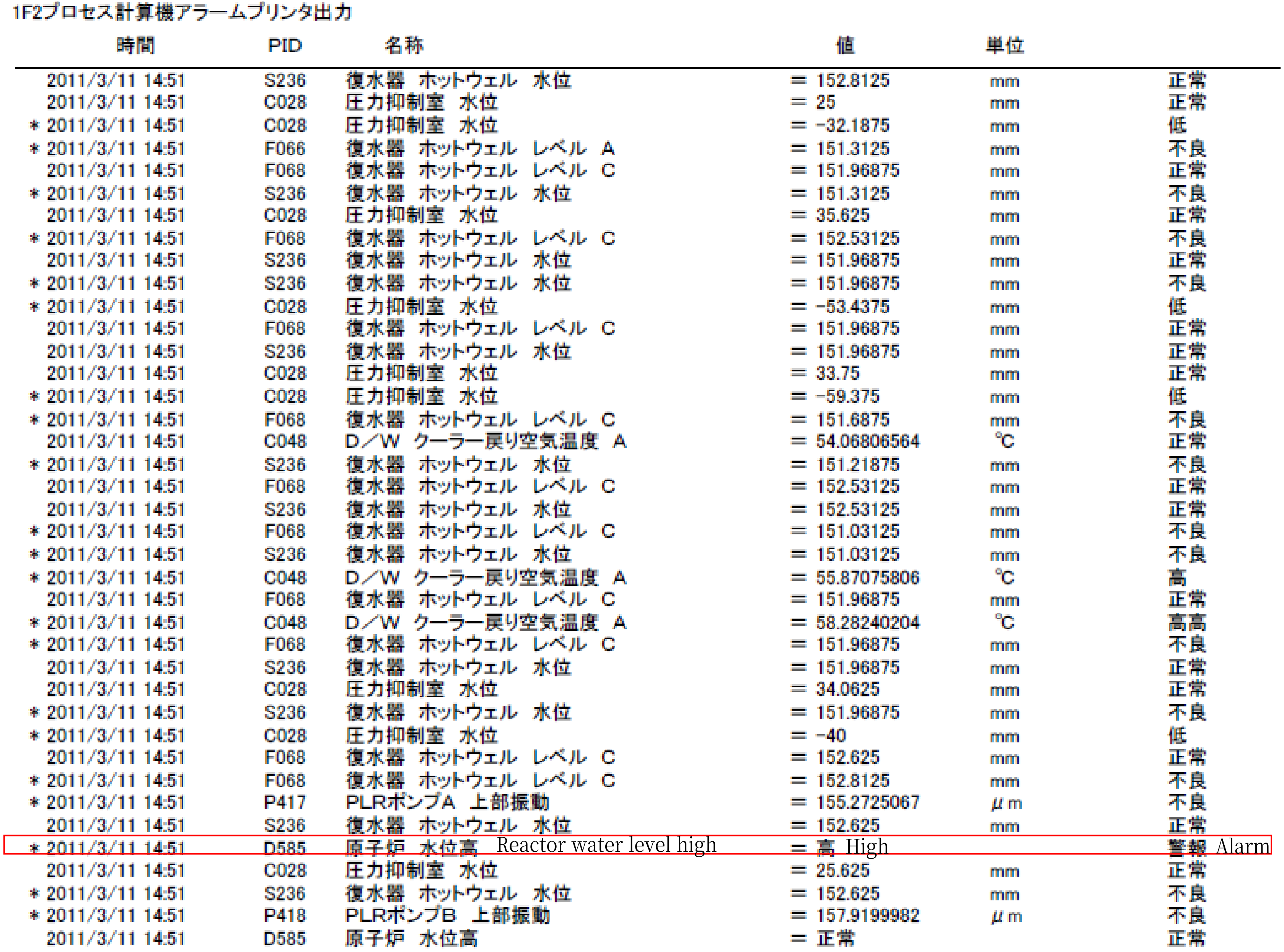
Alarm records printed out from process computer of Unit 2, Fukushima Daiichi Nuclear Power Station



1F2プロセス計算機アラームプリンタ出力

| 時間 | PID | 名称 | 値 | 単位 | |
|---|---|---|---|---|---|
| * 2011/3/11 14:50 | P418 | PLRポンプB 上部振動 | = 157.2899933 | μm | 不良 |
| 2011/3/11 14:50 | P418 | PLRポンプB 上部振動 | = 127.4175034 | μm | 正常 |
| * 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = -64.6875 | mm | 低 |
| * 2011/3/11 14:50 | P417 | PLRポンプA 上部振動 | = 186.2774963 | μm | 不良 |
| * 2011/3/11 14:50 | D648 | RCIC タービン 起動 RCIC turbine Start | = ON | | 警報 Alarm |
| 2011/3/11 14:50 | D703 | RCIC 注入弁 開 | = ON | | 正常 |
| 2011/3/11 14:50 | F066 | 復水器 ホットウェル レベル A | = 152.53125 | mm | 正常 |
| 2011/3/11 14:50 | R705 | RCIC起動信号 RCIC start signal | = 起動 Start | | 正常 Normal |
| 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = 40.9375 | mm | 正常 |
| * 2011/3/11 14:50 | F066 | 復水器 ホットウェル レベル A | = 152.53125 | mm | 不良 |
| * 2011/3/11 14:50 | F068 | 復水器 ホットウェル レベル C | = 151.59375 | mm | 不良 |
| 2011/3/11 14:50 | P417 | PLRポンプA 上部振動 | = 143.9174957 | μm | 正常 |
| 2011/3/11 14:50 | F066 | 復水器 ホットウェル レベル A | = 152.34375 | mm | 正常 |
| 2011/3/11 14:50 | F068 | 復水器 ホットウェル レベル C | = 150.46875 | mm | 正常 |
| * 2011/3/11 14:50 | S236 | 復水器 ホットウェル 水位 | = 150.65625 | mm | 不良 |
| * 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = -91.5625 | mm | 低 |
| * 2011/3/11 14:50 | F066 | 復水器 ホットウェル レベル A | = 152.34375 | mm | 不良 |
| 2011/3/11 14:50 | S236 | 復水器 ホットウェル 水位 | = 151.40625 | mm | 正常 |
| 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = 42.5 | mm | 正常 |
| * 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = -56.875 | mm | 低 |
| * 2011/3/11 14:50 | P417 | PLRポンプA 上部振動 | = 155.2725067 | μm | 不良 |
| * 2011/3/11 14:50 | F097 | 復水脱塩塔出口圧力 | = -0.018750001 | MPa | 不良 |
| 2011/3/11 14:50 | P417 | PLRポンプA 上部振動 | = 132.7200012 | μm | 正常 |
| 2011/3/11 14:50 | F097 | 復水脱塩塔出口圧力 | = -0.016875001 | MPa | 正常 |
| 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = 26.875 | mm | 正常 |
| * 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = -60 | mm | 低 |
| * 2011/3/11 14:50 | F068 | 復水器 ホットウェル レベル C | = 151.78125 | mm | 不良 |
| * 2011/3/11 14:50 | P417 | PLRポンプA 上部振動 | = 154.1399994 | μm | 不良 |
| 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = 30.9375 | mm | 正常 |
| 2011/3/11 14:50 | F068 | 復水器 ホットウェル レベル C | = 152.4375 | mm | 正常 |
| * 2011/3/11 14:50 | S236 | 復水器 ホットウェル 水位 | = 152.625 | mm | 不良 |
| 2011/3/11 14:50 | S236 | 復水器 ホットウェル 水位 | = 152.4375 | mm | 正常 |
| * 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = -75.625 | mm | 低 |
| 2011/3/11 14:50 | P417 | PLRポンプA 上部振動 | = 127.8075027 | μm | 正常 |
| * 2011/3/11 14:50 | F068 | 復水器 ホットウェル レベル C | = 152.53125 | mm | 不良 |
| 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = 63.4375 | mm | 正常 |
| * 2011/3/11 14:50 | S236 | 復水器 ホットウェル 水位 | = 152.53125 | mm | 不良 |
| * 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = -76.25 | mm | 低 |
| 2011/3/11 14:50 | C028 | 圧力抑制室 水位 | = 65 | mm | 正常 |

Alarm records printed out from process computer of Unit 2, Fukushima Daiichi Nuclear Power Station



1F2プロセス計算機アラームプリンタ出力

| 時間 | PID | 名称 | 値 | 単位 | |
|---|---|---|---|---|---|
| 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 152.8125 | mm | 正常 |
| 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = 25 | mm | 正常 |
| * 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = -32.1875 | mm | 低 |
| * 2011/3/11 14:51 | F066 | 復水器 ホットウェル レベル A | = 151.3125 | mm | 不良 |
| 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 151.96875 | mm | 正常 |
| * 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.3125 | mm | 不良 |
| 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = 35.625 | mm | 正常 |
| * 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 152.53125 | mm | 不良 |
| 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.96875 | mm | 正常 |
| * 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.96875 | mm | 不良 |
| * 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = -53.4375 | mm | 低 |
| 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 151.96875 | mm | 正常 |
| 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.96875 | mm | 正常 |
| 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = 33.75 | mm | 正常 |
| * 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = -59.375 | mm | 低 |
| * 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 151.6875 | mm | 不良 |
| 2011/3/11 14:51 | C048 | D／W クーラー戻り空気温度 A | = 54.06806564 | ℃ | 正常 |
| * 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.21875 | mm | 不良 |
| 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 152.53125 | mm | 正常 |
| 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 152.53125 | mm | 正常 |
| * 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 151.03125 | mm | 不良 |
| * 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.03125 | mm | 不良 |
| * 2011/3/11 14:51 | C048 | D／W クーラー戻り空気温度 A | = 55.87075806 | ℃ | 高 |
| 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 151.96875 | mm | 正常 |
| * 2011/3/11 14:51 | C048 | D／W クーラー戻り空気温度 A | = 58.28240204 | ℃ | 高高 |
| * 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 151.96875 | mm | 不良 |
| 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.96875 | mm | 正常 |
| 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = 34.0625 | mm | 正常 |
| * 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 151.96875 | mm | 不良 |
| * 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = -40 | mm | 低 |
| 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 152.625 | mm | 正常 |
| * 2011/3/11 14:51 | F068 | 復水器 ホットウェル レベル C | = 152.8125 | mm | 不良 |
| * 2011/3/11 14:51 | P417 | PLRポンプA 上部振動 | = 155.2725067 | μm | 不良 |
| 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 152.625 | mm | 正常 |
| * 2011/3/11 14:51 | D585 | 原子炉 水位高 Reactor water level high | = 高 High | | 警報 Alarm |
| 2011/3/11 14:51 | C028 | 圧力抑制室 水位 | = 25.625 | mm | 正常 |
| * 2011/3/11 14:51 | S236 | 復水器 ホットウェル 水位 | = 152.625 | mm | 不良 |
| * 2011/3/11 14:51 | P418 | PLRポンプB 上部振動 | = 157.9199982 | μm | 不良 |
| 2011/3/11 14:51 | D585 | 原子炉 水位高 | = 正常 | | 正常 |

Alarm records printed out from process computer of Unit 2, Fukushima Daiichi Nuclear Power Station

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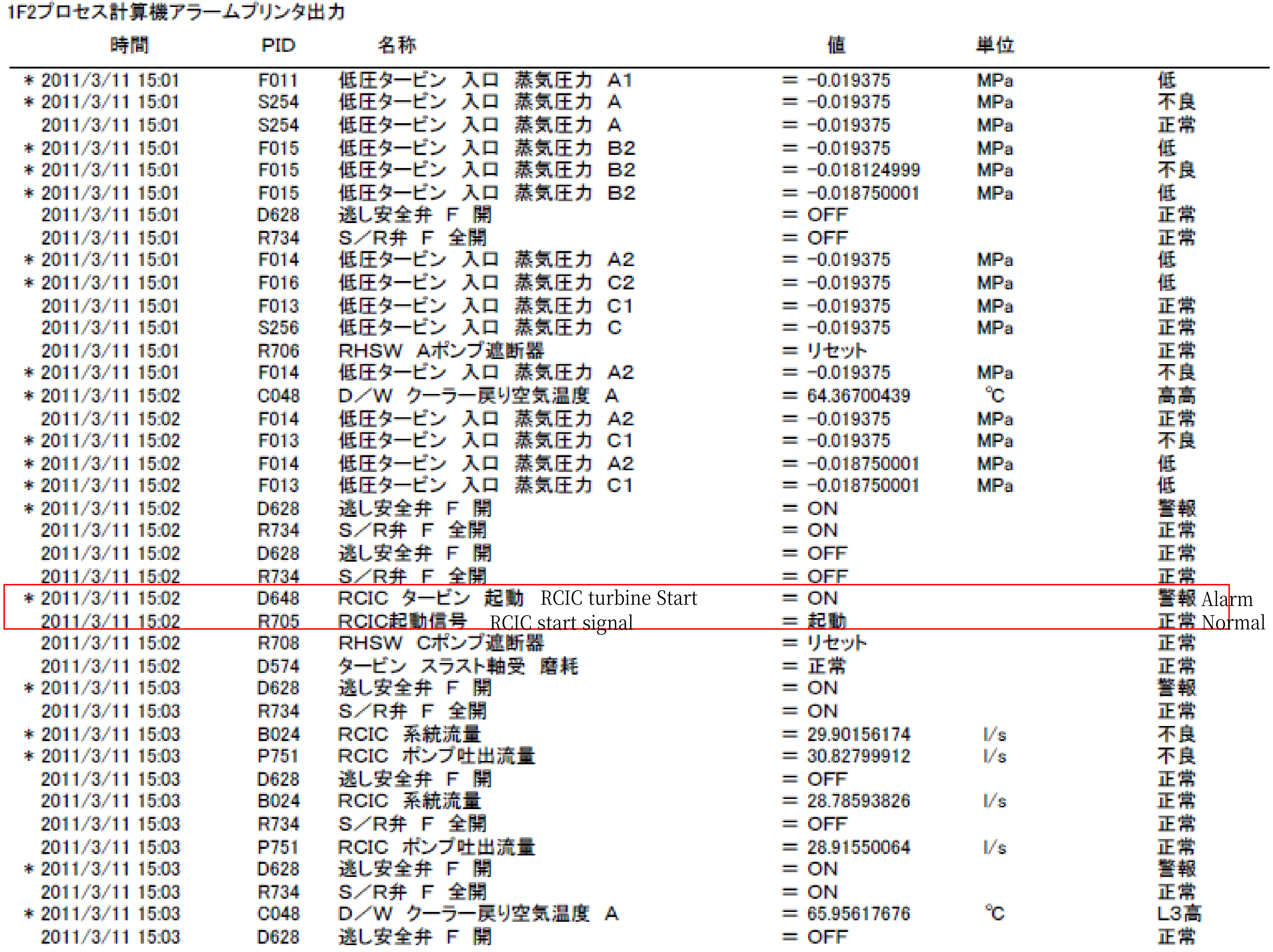
1F2プロセス計算機アラームプリンタ出力
        時間              PID       名称                                          値                 単位
   2011/3/11 14:51      D648      RCIC タービン 起動  RCIC turbine Start     = OFF                              正常  Normal
 * 2011/3/11 14:51      C028      圧力抑制室 水位                             = -51.25            mm           低
   2011/3/11 14:51      P417      PLRポンプA 上部振動                         = 147.75            μm           正常
   2011/3/11 14:51      P418      PLRポンプB 上部振動                         = 139.0950012       μm           正常
 * 2011/3/11 14:51      D574      タービン スラスト軸受 磨耗                  = 異常                           警報
   2011/3/11 14:51      B036      主排気筒放射線モニタ 高レンジ               = -1.60100019       mSv/h        正常
 * 2011/3/11 14:52      D585      原子炉 水位高                               = 高                             警報
   2011/3/11 14:52      C028      圧力抑制室 水位                             = 16.875            mm           正常
 * 2011/3/11 14:52      P417      PLRポンプA 上部振動                         = 172.3500061       μm           不良
 * 2011/3/11 14:52      C028      圧力抑制室 水位                             = -64.375           mm           低
   2011/3/11 14:52      P417      PLRポンプA 上部振動                         = 141.4275055       μm           正常
   2011/3/11 14:52      D585      原子炉 水位高                               = 正常                           正常
 * 2011/3/11 14:52      F097      復水脱塩塔出口圧力                          = -0.0175           MPa          不良
 * 2011/3/11 14:52      P417      PLRポンプA 上部振動                         = 192.3825073       μm           不良
 * 2011/3/11 14:52      P418      PLRポンプB 上部振動                         = 162.2400055       μm           不良
   2011/3/11 14:52      F097      復水脱塩塔出口圧力                          = -0.0175           MPa          正常
   2011/3/11 14:52      P418      PLRポンプB 上部振動                         = 128.5724945       μm           正常
 * 2011/3/11 14:52      D585      原子炉 水位高                               = 高                             警報
 * 2011/3/11 14:52      P418      PLRポンプB 上部振動                         = 188.8874969       μm           不良
   2011/3/11 14:52      D585      原子炉 水位高                               = 正常                           正常
   2011/3/11 14:52      C028      圧力抑制室 水位                             = 20.3125           mm           正常
 * 2011/3/11 14:52      D585      原子炉 水位高                               = 高                             警報
 * 2011/3/11 14:52      C028      圧力抑制室 水位                             = -64.6875          mm           低
   2011/3/11 14:52      F068      復水器 ホットウェル レベル C                = 152.71875         mm           正常
 * 2011/3/11 14:52      F068      復水器 ホットウェル レベル C                = 152.71875         mm           不良
   2011/3/11 14:52      S236      復水器 ホットウェル 水位                    = 152.71875         mm           正常
   2011/3/11 14:52      C028      圧力抑制室 水位                             = 32.1875           mm           正常
 * 2011/3/11 14:52      S236      復水器 ホットウェル 水位                    = 152.71875         mm           不良
 * 2011/3/11 14:52      C028      圧力抑制室 水位                             = -23.4375          mm           低
   2011/3/11 14:52      C028      圧力抑制室 水位                             = 26.5625           mm           正常
   2011/3/11 14:52      D585      原子炉 水位高                               = 正常                           正常
 * 2011/3/11 14:52      C028      圧力抑制室 水位                             = -39.6875          mm           低
   2011/3/11 14:52      F068      復水器 ホットウェル レベル C                = 152.90625         mm           正常
 * 2011/3/11 14:52      F097      復水脱塩塔出口圧力                          = -0.019375         MPa          不良
 * 2011/3/11 14:52      D585      原子炉 水位高                               = 高                             警報
   2011/3/11 14:52      C028      圧力抑制室 水位                             = 24.375            mm           正常
   2011/3/11 14:52      F097      復水脱塩塔出口圧力                          = -0.016875001      MPa          正常
   2011/3/11 14:52      S236      復水器 ホットウェル 水位                    = 152.90625         mm           正常
 * 2011/3/11 14:52      F068      復水器 ホットウェル レベル C                = 152.0625          mm           不良
```

1F-2-20

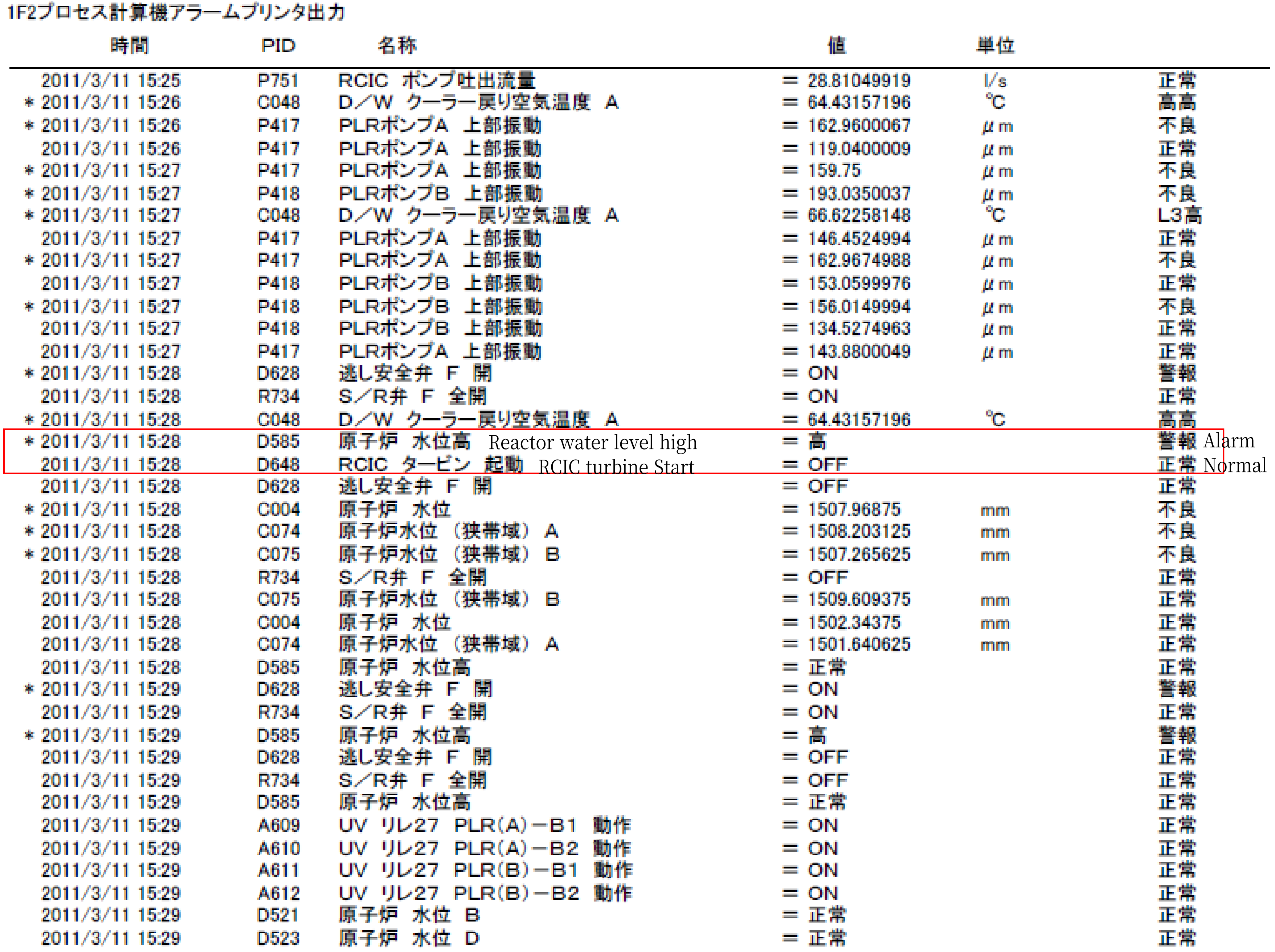
Alarm records printed out from process computer of Unit 2, Fukushima Daiichi Nuclear Power Station



1F2プロセス計算機アラームプリンタ出力

| 時間 | PID | 名称 | 値 | 単位 | |
|---|---|---|---|---|---|
| * 2011/3/11 15:01 | F011 | 低圧タービン 入口 蒸気圧力 A1 | = -0.019375 | MPa | 低 |
| * 2011/3/11 15:01 | S254 | 低圧タービン 入口 蒸気圧力 A | = -0.019375 | MPa | 不良 |
| 2011/3/11 15:01 | S254 | 低圧タービン 入口 蒸気圧力 A | = -0.019375 | MPa | 正常 |
| * 2011/3/11 15:01 | F015 | 低圧タービン 入口 蒸気圧力 B2 | = -0.019375 | MPa | 低 |
| * 2011/3/11 15:01 | F015 | 低圧タービン 入口 蒸気圧力 B2 | = -0.018124999 | MPa | 不良 |
| * 2011/3/11 15:01 | F015 | 低圧タービン 入口 蒸気圧力 B2 | = -0.018750001 | MPa | 低 |
| 2011/3/11 15:01 | D628 | 逃し安全弁 F 開 | = OFF | | 正常 |
| 2011/3/11 15:01 | R734 | S／R弁 F 全開 | = OFF | | 正常 |
| * 2011/3/11 15:01 | F014 | 低圧タービン 入口 蒸気圧力 A2 | = -0.019375 | MPa | 低 |
| * 2011/3/11 15:01 | F016 | 低圧タービン 入口 蒸気圧力 C2 | = -0.019375 | MPa | 低 |
| 2011/3/11 15:01 | F013 | 低圧タービン 入口 蒸気圧力 C1 | = -0.019375 | MPa | 正常 |
| 2011/3/11 15:01 | S256 | 低圧タービン 入口 蒸気圧力 C | = -0.019375 | MPa | 正常 |
| 2011/3/11 15:01 | R706 | RHSW Aポンプ遮断器 | = リセット | | 正常 |
| * 2011/3/11 15:01 | F014 | 低圧タービン 入口 蒸気圧力 A2 | = -0.019375 | MPa | 不良 |
| * 2011/3/11 15:02 | C048 | D／W クーラー戻り空気温度 A | = 64.36700439 | ℃ | 高高 |
| 2011/3/11 15:02 | F014 | 低圧タービン 入口 蒸気圧力 A2 | = -0.019375 | MPa | 正常 |
| * 2011/3/11 15:02 | F013 | 低圧タービン 入口 蒸気圧力 C1 | = -0.019375 | MPa | 不良 |
| * 2011/3/11 15:02 | F014 | 低圧タービン 入口 蒸気圧力 A2 | = -0.018750001 | MPa | 低 |
| * 2011/3/11 15:02 | F013 | 低圧タービン 入口 蒸気圧力 C1 | = -0.018750001 | MPa | 低 |
| * 2011/3/11 15:02 | D628 | 逃し安全弁 F 開 | = ON | | 警報 |
| 2011/3/11 15:02 | R734 | S／R弁 F 全開 | = ON | | 正常 |
| 2011/3/11 15:02 | D628 | 逃し安全弁 F 開 | = OFF | | 正常 |
| 2011/3/11 15:02 | R734 | S／R弁 F 全開 | = OFF | | 正常 |
| * 2011/3/11 15:02 | D648 | RCIC タービン 起動 RCIC turbine Start | = ON | | 警報 Alarm |
| 2011/3/11 15:02 | R705 | RCIC起動信号 RCIC start signal | = 起動 | | 正常 Normal |
| 2011/3/11 15:02 | R708 | RHSW Cポンプ遮断器 | = リセット | | 正常 |
| 2011/3/11 15:02 | D574 | タービン スラスト軸受 磨耗 | = 正常 | | 正常 |
| * 2011/3/11 15:03 | D628 | 逃し安全弁 F 開 | = ON | | 警報 |
| 2011/3/11 15:03 | R734 | S／R弁 F 全開 | = ON | | 正常 |
| * 2011/3/11 15:03 | B024 | RCIC 系統流量 | = 29.90156174 | l/s | 不良 |
| * 2011/3/11 15:03 | P751 | RCIC ポンプ吐出流量 | = 30.82799912 | l/s | 不良 |
| 2011/3/11 15:03 | D628 | 逃し安全弁 F 開 | = OFF | | 正常 |
| 2011/3/11 15:03 | B024 | RCIC 系統流量 | = 28.78593826 | l/s | 正常 |
| 2011/3/11 15:03 | R734 | S／R弁 F 全開 | = OFF | | 正常 |
| 2011/3/11 15:03 | P751 | RCIC ポンプ吐出流量 | = 28.91550064 | l/s | 正常 |
| * 2011/3/11 15:03 | D628 | 逃し安全弁 F 開 | = ON | | 警報 |
| 2011/3/11 15:03 | R734 | S／R弁 F 全開 | = ON | | 正常 |
| * 2011/3/11 15:03 | C048 | D／W クーラー戻り空気温度 A | = 65.95617676 | ℃ | L3高 |
| 2011/3/11 15:03 | D628 | 逃し安全弁 F 開 | = OFF | | 正常 |

Alarm records printed out from process computer of Unit 2, Fukushima Daiichi Nuclear Power Station



1F2プロセス計算機アラームプリンタ出力

| 時間 | PID | 名称 | 値 | 単位 | |
|---|---|---|---|---|---|
| 2011/3/11 15:25 | P751 | RCIC ポンプ吐出流量 | = 28.81049919 | l/s | 正常 |
| * 2011/3/11 15:26 | C048 | D／W クーラー戻り空気温度 A | = 64.43157196 | ℃ | 高高 |
| * 2011/3/11 15:26 | P417 | PLRポンプA 上部振動 | = 162.9600067 | μm | 不良 |
| 2011/3/11 15:26 | P417 | PLRポンプA 上部振動 | = 119.0400009 | μm | 正常 |
| * 2011/3/11 15:27 | P417 | PLRポンプA 上部振動 | = 159.75 | μm | 不良 |
| * 2011/3/11 15:27 | P418 | PLRポンプB 上部振動 | = 193.0350037 | μm | 不良 |
| * 2011/3/11 15:27 | C048 | D／W クーラー戻り空気温度 A | = 66.62258148 | ℃ | L3高 |
| 2011/3/11 15:27 | P417 | PLRポンプA 上部振動 | = 146.4524994 | μm | 正常 |
| * 2011/3/11 15:27 | P417 | PLRポンプA 上部振動 | = 162.9674988 | μm | 不良 |
| 2011/3/11 15:27 | P418 | PLRポンプB 上部振動 | = 153.0599976 | μm | 正常 |
| * 2011/3/11 15:27 | P418 | PLRポンプB 上部振動 | = 156.0149994 | μm | 不良 |
| 2011/3/11 15:27 | P418 | PLRポンプB 上部振動 | = 134.5274963 | μm | 正常 |
| 2011/3/11 15:27 | P417 | PLRポンプA 上部振動 | = 143.8800049 | μm | 正常 |
| * 2011/3/11 15:28 | D628 | 逃し安全弁 F 開 | = ON | | 警報 |
| 2011/3/11 15:28 | R734 | S／R弁 F 全開 | = ON | | 正常 |
| * 2011/3/11 15:28 | C048 | D／W クーラー戻り空気温度 A | = 64.43157196 | ℃ | 高高 |
| * 2011/3/11 15:28 | D585 | 原子炉 水位高 Reactor water level high | = 高 | | 警報 Alarm |
| 2011/3/11 15:28 | D648 | RCIC タービン 起動 RCIC turbine Start | = OFF | | 正常 Normal |
| 2011/3/11 15:28 | D628 | 逃し安全弁 F 開 | = OFF | | 正常 |
| * 2011/3/11 15:28 | C004 | 原子炉 水位 | = 1507.96875 | mm | 不良 |
| * 2011/3/11 15:28 | C074 | 原子炉水位（狭帯域） A | = 1508.203125 | mm | 不良 |
| * 2011/3/11 15:28 | C075 | 原子炉水位（狭帯域） B | = 1507.265625 | mm | 不良 |
| 2011/3/11 15:28 | R734 | S／R弁 F 全開 | = OFF | | 正常 |
| 2011/3/11 15:28 | C075 | 原子炉水位（狭帯域） B | = 1509.609375 | mm | 正常 |
| 2011/3/11 15:28 | C004 | 原子炉 水位 | = 1502.34375 | mm | 正常 |
| 2011/3/11 15:28 | C074 | 原子炉水位（狭帯域） A | = 1501.640625 | mm | 正常 |
| 2011/3/11 15:28 | D585 | 原子炉 水位高 | = 正常 | | 正常 |
| * 2011/3/11 15:29 | D628 | 逃し安全弁 F 開 | = ON | | 警報 |
| 2011/3/11 15:29 | R734 | S／R弁 F 全開 | = ON | | 正常 |
| * 2011/3/11 15:29 | D585 | 原子炉 水位高 | = 高 | | 警報 |
| 2011/3/11 15:29 | D628 | 逃し安全弁 F 開 | = OFF | | 正常 |
| 2011/3/11 15:29 | R734 | S／R弁 F 全開 | = OFF | | 正常 |
| 2011/3/11 15:29 | D585 | 原子炉 水位高 | = 正常 | | 正常 |
| 2011/3/11 15:29 | A609 | UV リレ27 PLR(A)−B1 動作 | = ON | | 正常 |
| 2011/3/11 15:29 | A610 | UV リレ27 PLR(A)−B2 動作 | = ON | | 正常 |
| 2011/3/11 15:29 | A611 | UV リレ27 PLR(B)−B1 動作 | = ON | | 正常 |
| 2011/3/11 15:29 | A612 | UV リレ27 PLR(B)−B2 動作 | = ON | | 正常 |
| 2011/3/11 15:29 | D521 | 原子炉 水位 B | = 正常 | | 正常 |
| 2011/3/11 15:29 | D523 | 原子炉 水位 D | = 正常 | | 正常 |

1F-2-22

1F-2-23

Alarm records printed out from process computer of Unit 2, Fukushima Daiichi Nuclear Power Station

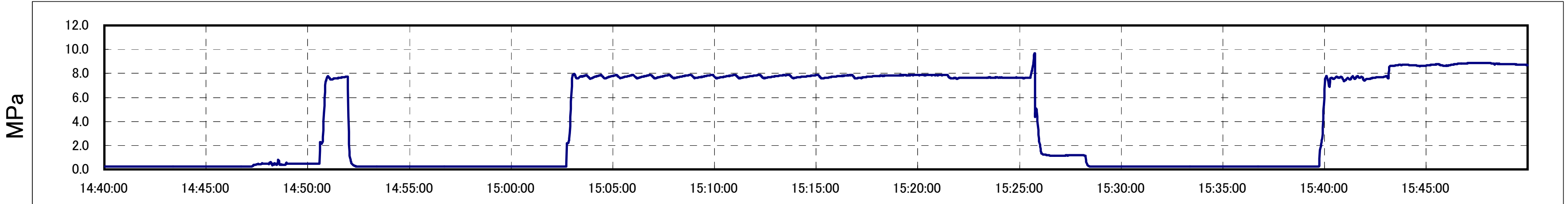
1F2プロセス計算機アラームプリンタ出力

| 時間 | PID | 名称 | 値 | 単位 | |
|---|---|---|---|---|---|
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | 低 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | RL下限逸脱 |
| 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | 正常 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | 低 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | RL下限逸脱 |
| 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | 正常 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | RL下限逸脱 |
| * 2011/3/11 15:39 | D519 | 原子炉 圧力 D | = 高域 | | 警報 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | 低 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | RL下限逸脱 |
| * 2011/3/11 15:39 | D517 | 原子炉 圧力 B | = 高域 | | 警報 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | 低 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | RL下限逸脱 |
| 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | 正常 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | 低 |
| 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | 正常 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | RL下限逸脱 |
| 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | 正常 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | 低 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.644062459 | kPa | RL下限逸脱 |
| 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | 正常 |
| * 2011/3/11 15:39 | D648 | RCIC タービン 起動 RCIC turbine Start | = ON | | 警報 Alarm |
| * 2011/3/11 15:39 | D672 | 発電機 モータリング トリップ | = ON | | 警報 |
| 2011/3/11 15:39 | D703 | RCIC 注入弁 開 | = ON | | 正常 |
| * 2011/3/11 15:39 | C048 | D／W クーラー戻り空気温度 A | = 66.72718811 | ℃ | L3高 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | 低 |
| 2011/3/11 15:39 | R705 | RCIC起動信号 RCIC start signal | = 起動 Start | | 正常 Normal |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | RL下限逸脱 |
| 2011/3/11 15:39 | D672 | 発電機 モータリング トリップ | = OFF | | 正常 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.622593701 | kPa | 低 |
| 2011/3/11 15:39 | D583 | 所内電源 2A 喪失 | = 正常 | | 正常 |
| 2011/3/11 15:39 | D592 | 6．9KV M／C 遮断器 2A−1B | = ON | | 正常 |
| 2011/3/11 15:39 | D593 | 6．9KV M／C 遮断器 2A−3B | = ON | | 正常 |
| * 2011/3/11 15:39 | D672 | 発電機 モータリング トリップ | = ON | | 警報 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | RL下限逸脱 |
| * 2011/3/11 15:39 | D583 | 所内電源 2A 喪失 | = トリップ | | 警報 |
| 2011/3/11 15:39 | D592 | 6．9KV M／C 遮断器 2A−1B | = OFF | | 正常 |
| * 2011/3/11 15:39 | T006 | タービン グランドシール 蒸気圧力 | = -0.665531218 | kPa | 低 |
| 2011/3/11 15:39 | D593 | 6．9KV M／C 遮断器 2A−3B | = OFF | | 正常 |

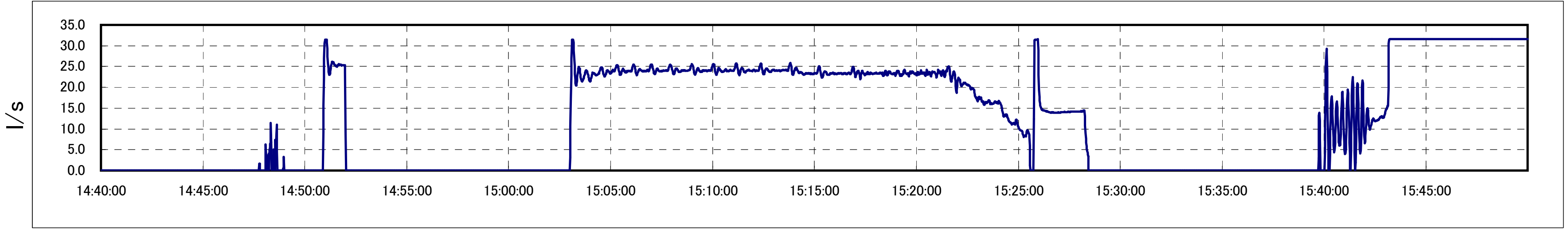
Record of the processes computer at Unit 2

福島第一原子力発電所　２号機プロセス計算機履歴データ
データ表示期間　　2011年3月11日 14:40:00 ～ 2011年3月11日 15:50:00
データ周期　　　　１秒

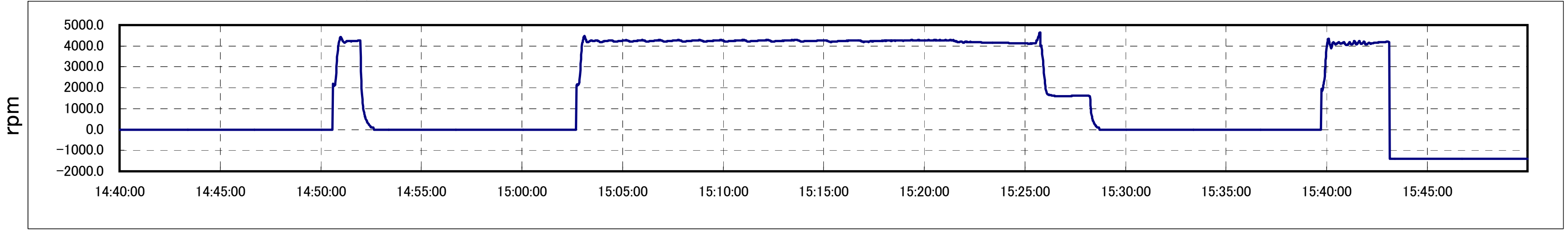
## 1. P750 RCIC　ポンプ吐出圧力



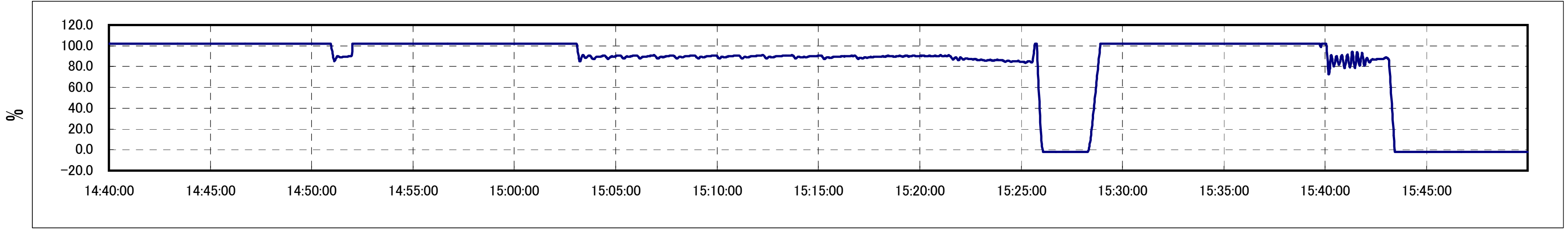
## 2. P751 RCIC　ポンプ吐出流量



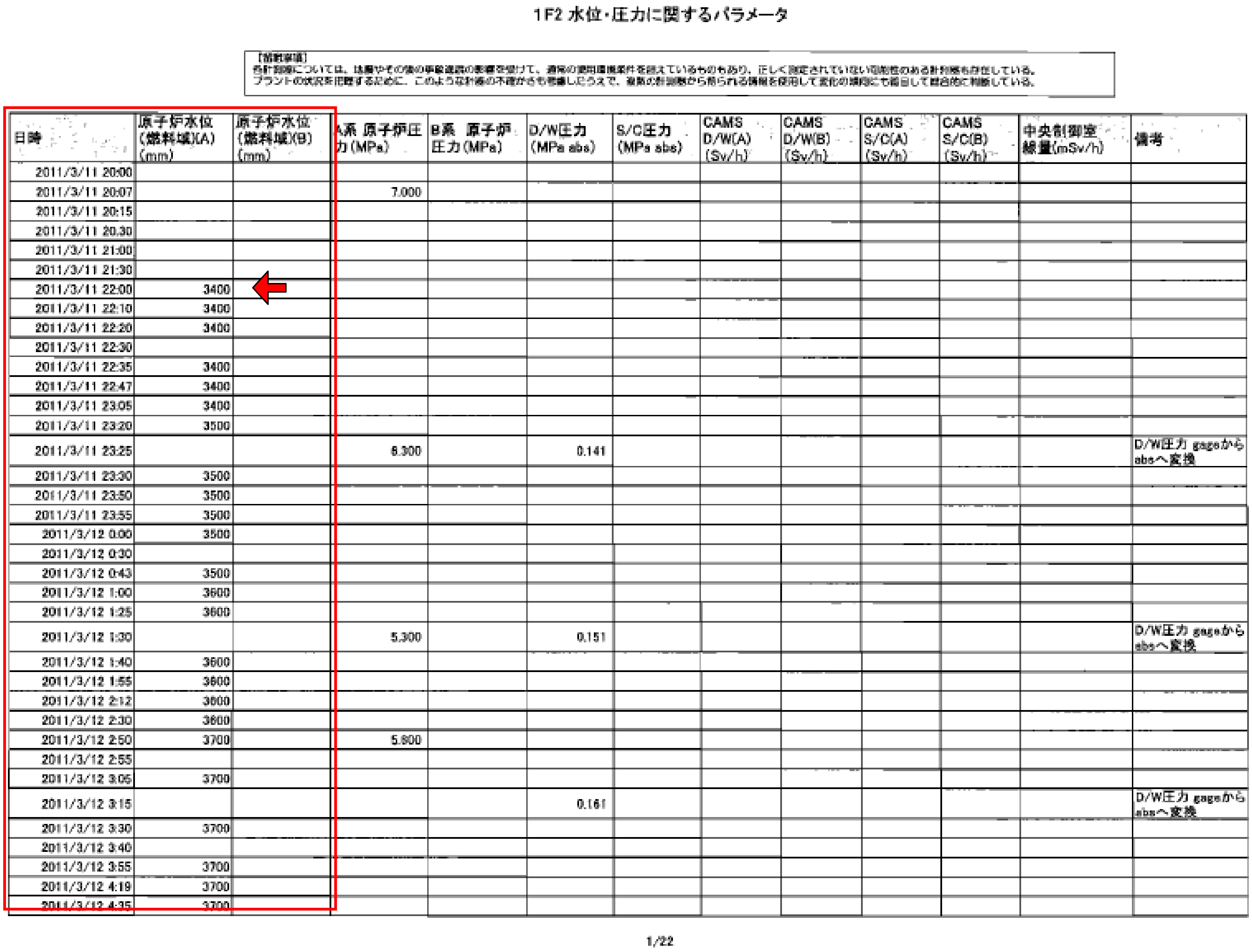
## 3. P752 RCIC　タービン回転速度



## 4. P753 RCIC　流量調節計出力



# Parameters regarding the water levels and the pressures of Unit2 at 1F

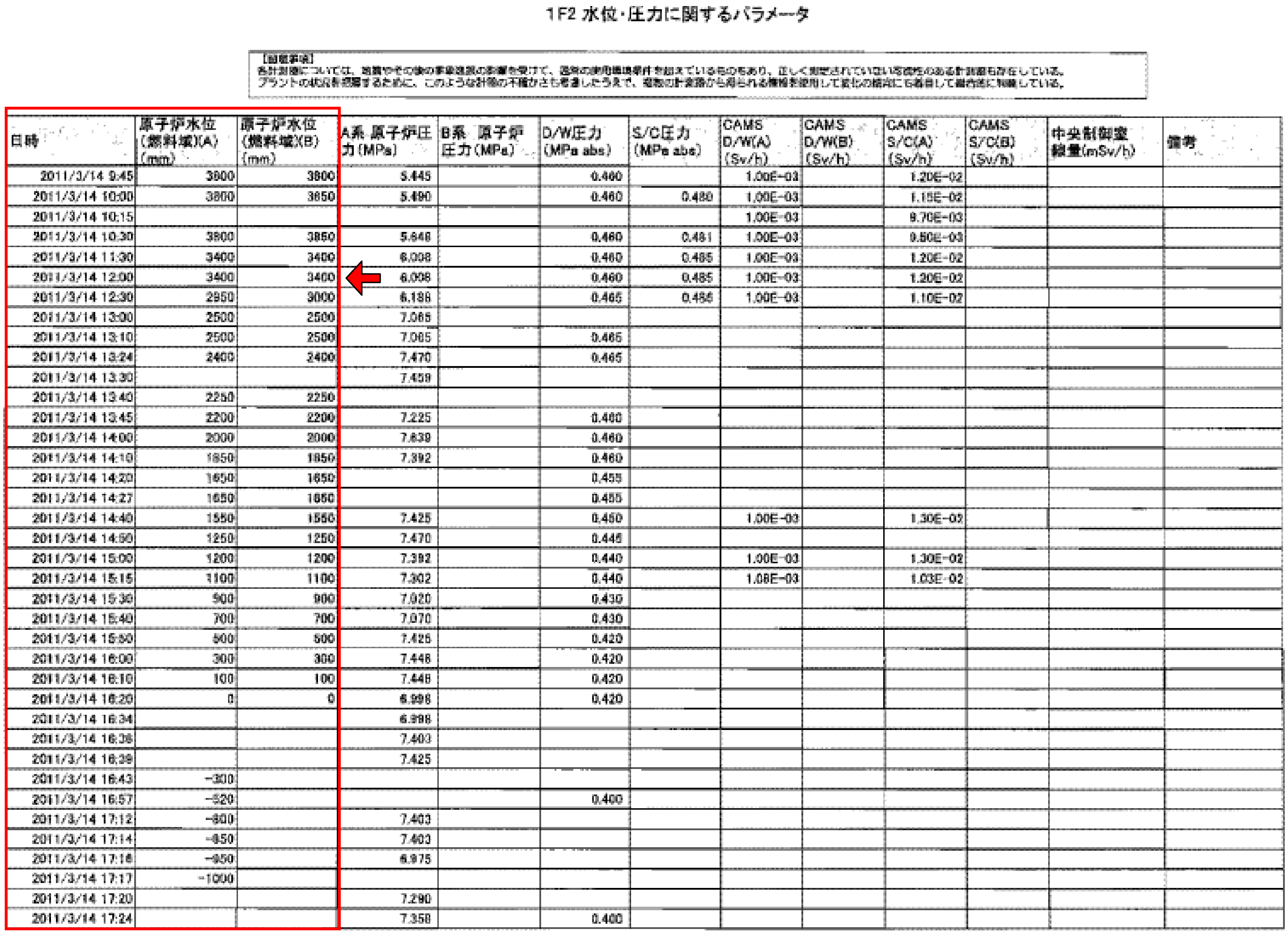


## 1F2 水位･圧力に関するパラメータ

【留意事項】
各計測値については、地震やその後の事象進展の影響を受けて、通常の使用環境条件を超えているものもあり、正しく測定されていない可能性のある計測器も存在している。
プラントの状況を把握するために、このような計器の不確かさも考慮したうえで、複数の計測器から得られる情報を使用して変化の傾向にも着目して総合的に判断している。

| 日時 | 原子炉水位(燃料域)(A)(mm) | 原子炉水位(燃料域)(B)(mm) | A系 原子炉圧力(MPa) | B系 原子炉圧力(MPa) | D/W圧力(MPa abs) | S/C圧力(MPa abs) | CAMS D/W(A)(Sv/h) | CAMS D/W(B)(Sv/h) | CAMS S/C(A)(Sv/h) | CAMS S/C(B)(Sv/h) | 中央制御室線量(mSv/h) | 備考 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011/3/11 20:00 | | | | | | | | | | | | |
| 2011/3/11 20:07 | | | 7.000 | | | | | | | | | |
| 2011/3/11 20:15 | | | | | | | | | | | | |
| 2011/3/11 20:30 | | | | | | | | | | | | |
| 2011/3/11 21:00 | | | | | | | | | | | | |
| 2011/3/11 21:30 | | | | | | | | | | | | |
| 2011/3/11 22:00 | 3400 | | | | | | | | | | | |
| 2011/3/11 22:10 | 3400 | | | | | | | | | | | |
| 2011/3/11 22:20 | 3400 | | | | | | | | | | | |
| 2011/3/11 22:30 | | | | | | | | | | | | |
| 2011/3/11 22:35 | 3400 | | | | | | | | | | | |
| 2011/3/11 22:47 | 3400 | | | | | | | | | | | |
| 2011/3/11 23:05 | 3400 | | | | | | | | | | | |
| 2011/3/11 23:20 | 3500 | | | | | | | | | | | |
| 2011/3/11 23:25 | | | 6.300 | | 0.141 | | | | | | | D/W圧力 gageからabsへ変換 |
| 2011/3/11 23:30 | 3500 | | | | | | | | | | | |
| 2011/3/11 23:50 | 3500 | | | | | | | | | | | |
| 2011/3/11 23:55 | 3500 | | | | | | | | | | | |
| 2011/3/12 0:00 | 3500 | | | | | | | | | | | |
| 2011/3/12 0:30 | | | | | | | | | | | | |
| 2011/3/12 0:43 | 3500 | | | | | | | | | | | |
| 2011/3/12 1:00 | 3600 | | | | | | | | | | | |
| 2011/3/12 1:25 | 3600 | | | | | | | | | | | |
| 2011/3/12 1:30 | | | 5.300 | | 0.151 | | | | | | | D/W圧力 gageからabsへ変換 |
| 2011/3/12 1:40 | 3600 | | | | | | | | | | | |
| 2011/3/12 1:55 | 3600 | | | | | | | | | | | |
| 2011/3/12 2:12 | 3600 | | | | | | | | | | | |
| 2011/3/12 2:30 | 3600 | | | | | | | | | | | |
| 2011/3/12 2:50 | 3700 | | 5.600 | | | | | | | | | |
| 2011/3/12 2:55 | | | | | | | | | | | | |
| 2011/3/12 3:05 | 3700 | | | | | | | | | | | |
| 2011/3/12 3:15 | | | | | 0.161 | | | | | | | D/W圧力 gageからabsへ変換 |
| 2011/3/12 3:30 | 3700 | | | | | | | | | | | |
| 2011/3/12 3:40 | | | | | | | | | | | | |
| 2011/3/12 3:55 | 3700 | | | | | | | | | | | |
| 2011/3/12 4:19 | 3700 | | | | | | | | | | | |
| 2011/3/12 4:35 | 3700 | | | | | | | | | | | |

# Parameters regarding the water levels and the pressures of Unit2 at 1F



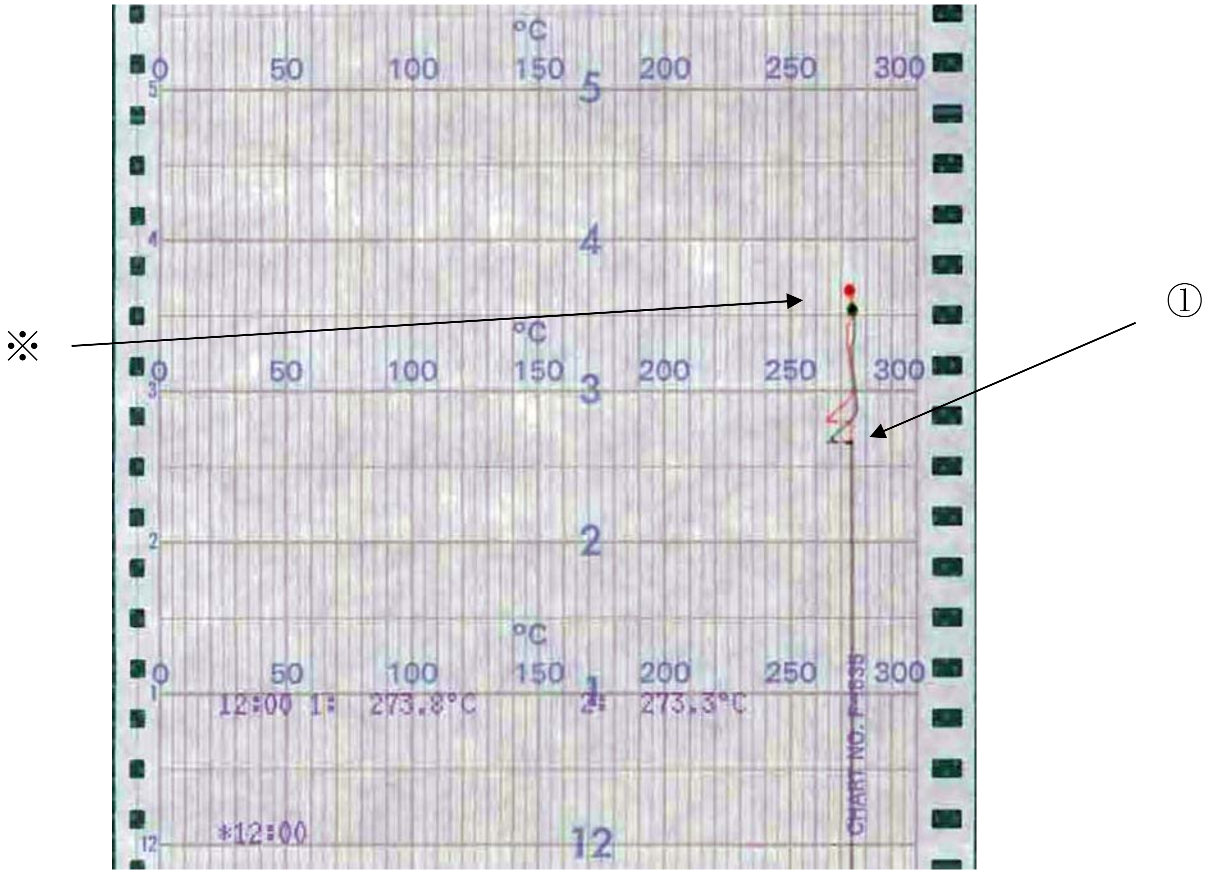
## 1F2 水位･圧力に関するパラメータ

【留意事項】
各計器類については、地震やその後の事象進展の影響を受けて、通常の使用環境条件を超えているものもあり、正しく測定されていない可能性のある計器類も存在している。
プラントの状況を把握するために、このような計器の不確かさも考慮したうえで、複数の計測器から得られる情報を使用して変化の傾向にも着目して総合的に判断している。

| 日時 | 原子炉水位（燃料域）(A)（mm） | 原子炉水位（燃料域）(B)（mm） | A系 原子炉圧力（MPa） | B系 原子炉圧力（MPa） | D/W圧力（MPa abs） | S/C圧力（MPa abs） | CAMS D/W(A)（Sv/h） | CAMS D/W(B)（Sv/h） | CAMS S/C(A)（Sv/h） | CAMS S/C(B)（Sv/h） | 中央制御室線量(mSv/h) | 備考 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011/3/14 9:45 | 3800 | 3800 | 5.445 |  | 0.460 |  | 1.00E-03 |  | 1.20E-02 |  |  |  |
| 2011/3/14 10:00 | 3800 | 3650 | 5.490 |  | 0.460 | 0.480 | 1.00E-03 |  | 1.15E-02 |  |  |  |
| 2011/3/14 10:15 |  |  |  |  |  |  | 1.00E-03 |  | 9.70E-03 |  |  |  |
| 2011/3/14 10:30 | 3800 | 3850 | 5.648 |  | 0.460 | 0.481 | 1.00E-03 |  | 9.50E-03 |  |  |  |
| 2011/3/14 11:30 | 3400 | 3400 | 6.008 |  | 0.460 | 0.485 | 1.00E-03 |  | 1.20E-02 |  |  |  |
| 2011/3/14 12:00 | 3400 | 3400 | 6.008 |  | 0.460 | 0.485 | 1.00E-03 |  | 1.20E-02 |  |  |  |
| 2011/3/14 12:30 | 2950 | 3000 | 6.188 |  | 0.465 | 0.486 | 1.00E-03 |  | 1.10E-02 |  |  |  |
| 2011/3/14 13:00 | 2500 | 2500 | 7.065 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 13:10 | 2500 | 2500 | 7.065 |  | 0.465 |  |  |  |  |  |  |  |
| 2011/3/14 13:24 | 2400 | 2400 | 7.470 |  | 0.465 |  |  |  |  |  |  |  |
| 2011/3/14 13:30 |  |  | 7.459 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 13:40 | 2250 | 2250 |  |  |  |  |  |  |  |  |  |  |
| 2011/3/14 13:45 | 2200 | 2200 | 7.225 |  | 0.460 |  |  |  |  |  |  |  |
| 2011/3/14 14:00 | 2000 | 2000 | 7.639 |  | 0.460 |  |  |  |  |  |  |  |
| 2011/3/14 14:10 | 1850 | 1850 | 7.392 |  | 0.460 |  |  |  |  |  |  |  |
| 2011/3/14 14:20 | 1650 | 1650 |  |  | 0.455 |  |  |  |  |  |  |  |
| 2011/3/14 14:27 | 1650 | 1650 |  |  | 0.455 |  |  |  |  |  |  |  |
| 2011/3/14 14:40 | 1550 | 1550 | 7.425 |  | 0.450 |  | 1.00E-03 |  | 1.30E-02 |  |  |  |
| 2011/3/14 14:50 | 1250 | 1250 | 7.470 |  | 0.445 |  |  |  |  |  |  |  |
| 2011/3/14 15:00 | 1200 | 1200 | 7.392 |  | 0.440 |  | 1.00E-03 |  | 1.30E-02 |  |  |  |
| 2011/3/14 15:15 | 1100 | 1100 | 7.302 |  | 0.440 |  | 1.08E-03 |  | 1.03E-02 |  |  |  |
| 2011/3/14 15:30 | 900 | 900 | 7.020 |  | 0.430 |  |  |  |  |  |  |  |
| 2011/3/14 15:40 | 700 | 700 | 7.070 |  | 0.430 |  |  |  |  |  |  |  |
| 2011/3/14 15:50 | 500 | 500 | 7.425 |  | 0.420 |  |  |  |  |  |  |  |
| 2011/3/14 16:00 | 300 | 300 | 7.446 |  | 0.420 |  |  |  |  |  |  |  |
| 2011/3/14 16:10 | 100 | 100 | 7.446 |  | 0.420 |  |  |  |  |  |  |  |
| 2011/3/14 16:20 | 0 | 0 | 6.998 |  | 0.420 |  |  |  |  |  |  |  |
| 2011/3/14 16:34 |  |  | 6.998 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 16:36 |  |  | 7.403 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 16:39 |  |  | 7.425 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 16:43 | -300 |  |  |  |  |  |  |  |  |  |  |  |
| 2011/3/14 16:57 | -520 |  |  |  | 0.400 |  |  |  |  |  |  |  |
| 2011/3/14 17:12 | -800 |  | 7.403 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 17:14 | -850 |  | 7.403 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 17:16 | -950 |  | 6.975 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 17:17 | -1000 |  |  |  |  |  |  |  |  |  |  |  |
| 2011/3/14 17:20 |  |  | 7.290 |  |  |  |  |  |  |  |  |  |
| 2011/3/14 17:24 |  |  | 7.358 |  | 0.400 |  |  |  |  |  |  |  |

Unit 2 PLR pump inlet temperature

【２号　ＰＬＲポンプ入口温度】



| TR-2-165 |
|---|

赤　PLR PUMP A SUCTION TEMP

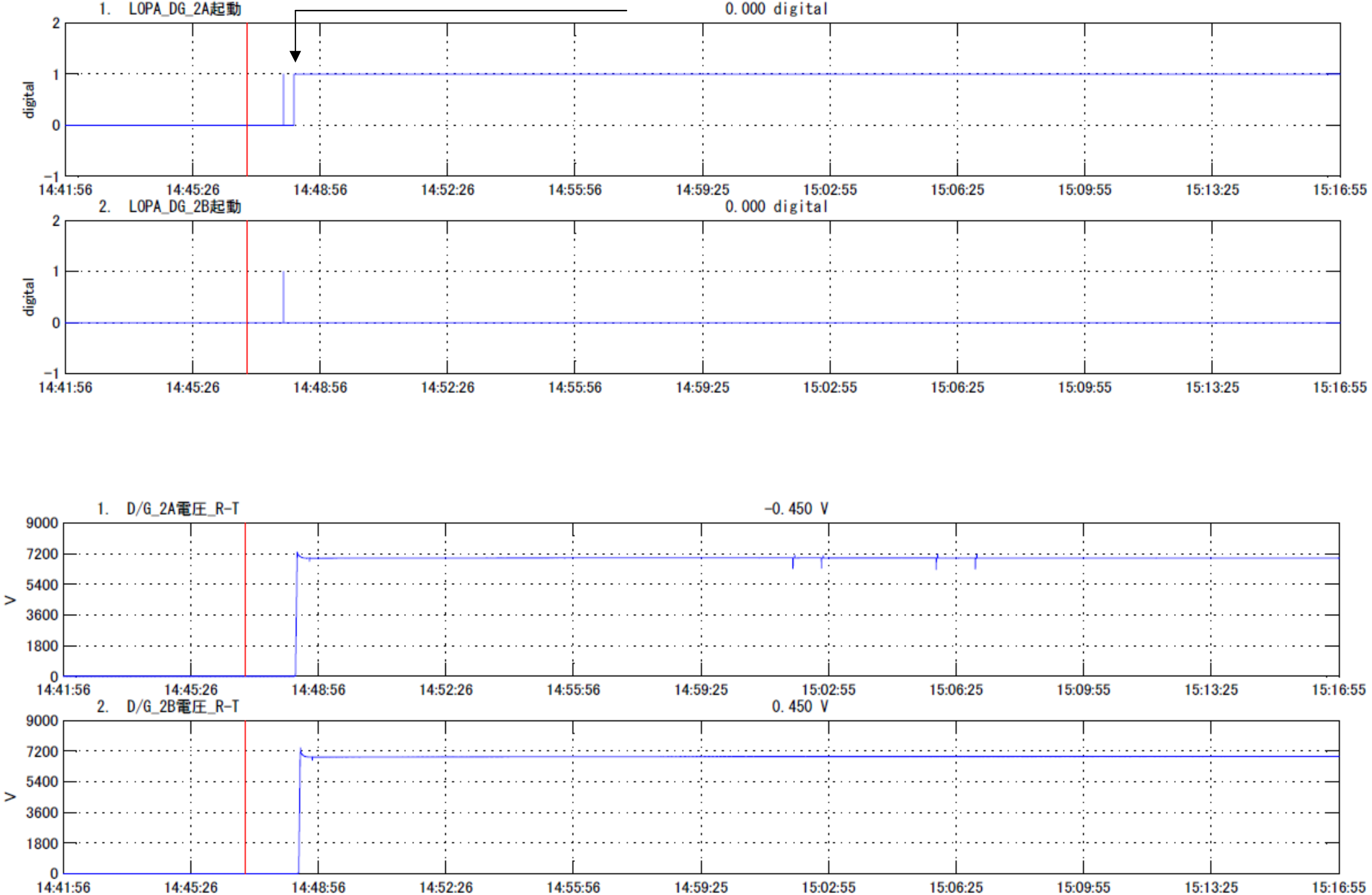
緑　PLR PUMP B SUCTION TEMP

①　１４時４７分　地震によるスクラム

※　１５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

14:47 Scram due to the earthquake

*It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

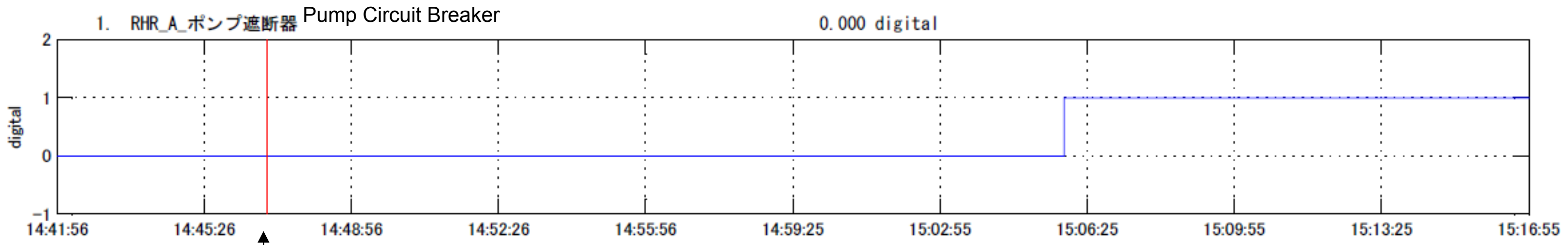
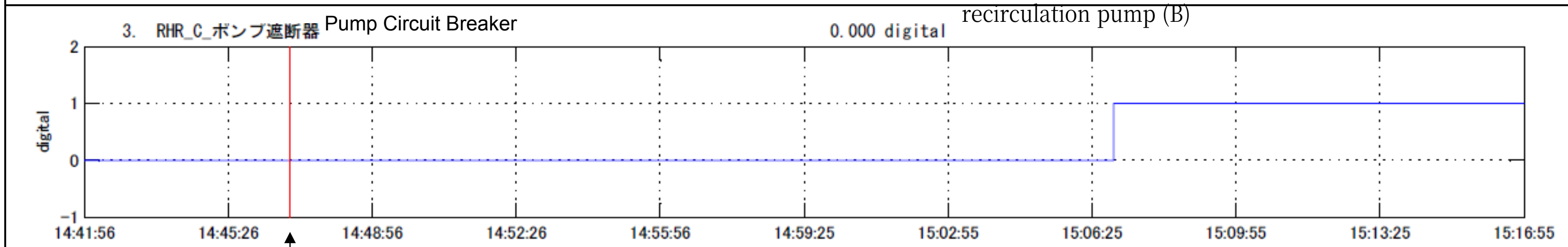
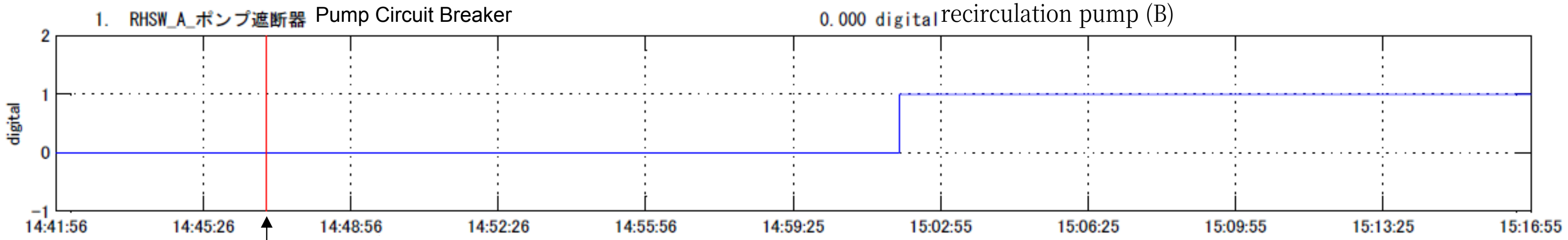
| パラメータ | 備　考 |
|---|---|
| 非常用ディーゼル発電機起動　Emergency diesel generator start<br> <br>非常用ディーゼル発電機電圧確立　Voltage applied by emergency diesel generator<br>原子炉再循環ポンプ（B）上部振動変動に伴う過渡現象記録装置自動収録開始 | 14時47分頃、非常用ディーゼル発電機起動し、電圧が確立している。<br>At around 14:47, emergency diesel generator started and voltage is applied. |

Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of  reactor recirculation pump (B)

図－２（１）　福島第一・2号機　過渡現象記録装置　データ

Figure-2(1) Fukushima Daiichi Nuclear Power Station Unit 2 data of transient recorders

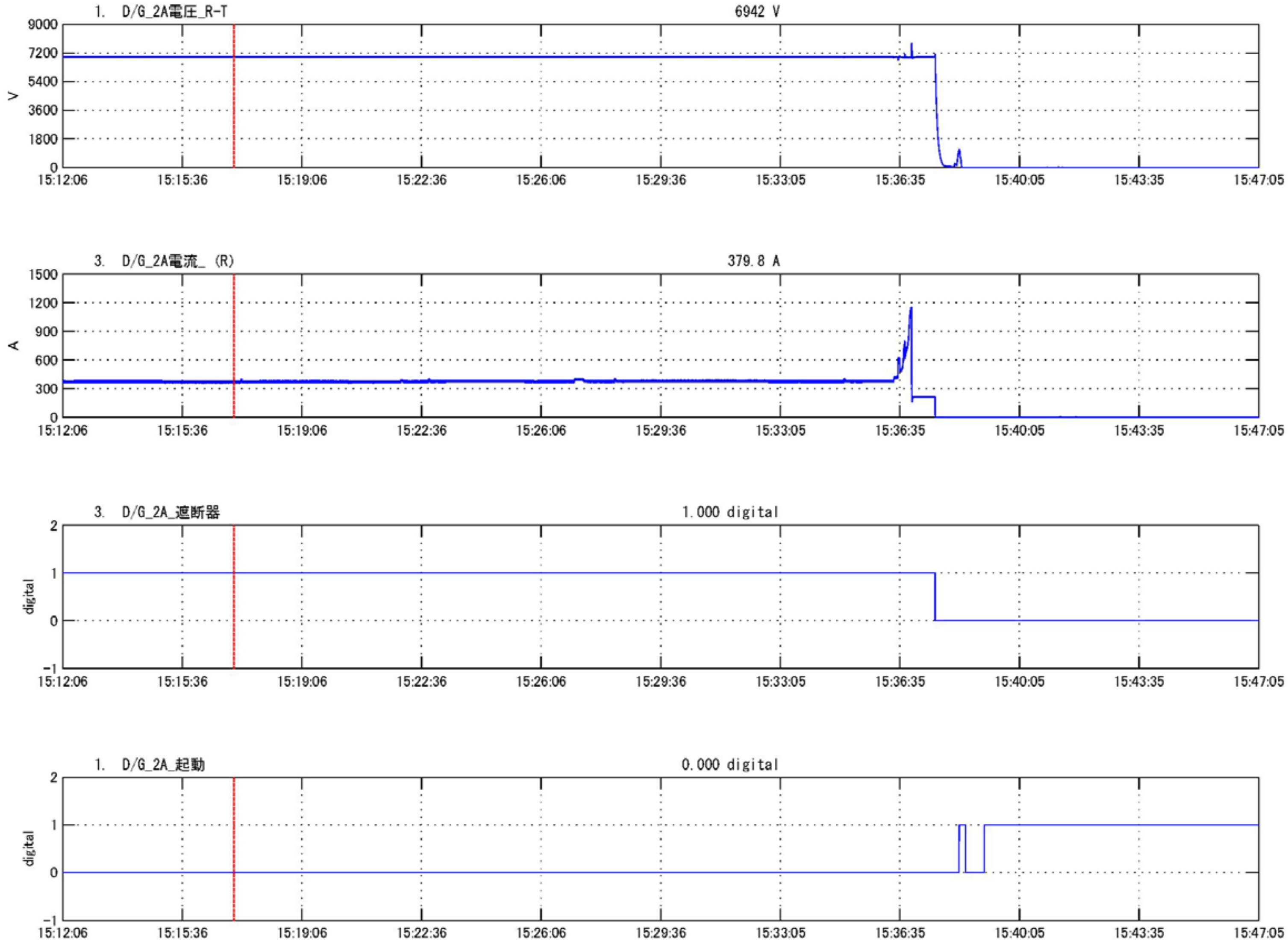
1F-2-29

| パラメータ | 備　考 |
|---|---|
|  <br>原子炉再循環ポンプ（B）上部振動変動に伴う過渡現象記録装置自動収録開始<br>Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (B) | 圧力抑制室プール水冷却のため、15時04分頃、残留熱除去系（RHR）ポンプAを起動したものと推定される。<br>It is estimated that residual heat removal system (RHR) pump A was started at around 15:04 to cool the water in the suppression pool. |
|  <br>原子炉再循環ポンプ（B）上部振動変動に伴う過渡現象記録装置自動収録開始<br>Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (B) | 圧力抑制室プール水冷却のため、15時07分頃、残留熱除去系（RHR）ポンプCを起動したものと推定される。<br>It is estimated that residual heat removal system (RHR) pump A was started at around 15:07 to cool the water in the suppression pool. |
|  <br>原子炉再循環ポンプ（B）上部振動変動に伴う過渡現象記録装置自動収録開始<br>Recording of transient phenomena recorder is automatically started by vibration and fluctuation of upper side of reactor recirculation pump (B) | 圧力抑制室プール水冷却のため、15時00分頃、残留熱除去海水系ポンプAを起動したものと推定される。<br>It is estimated that residual heat removal system (RHR) pump A was started at around 15:00 to cool the water in the suppression pool. |

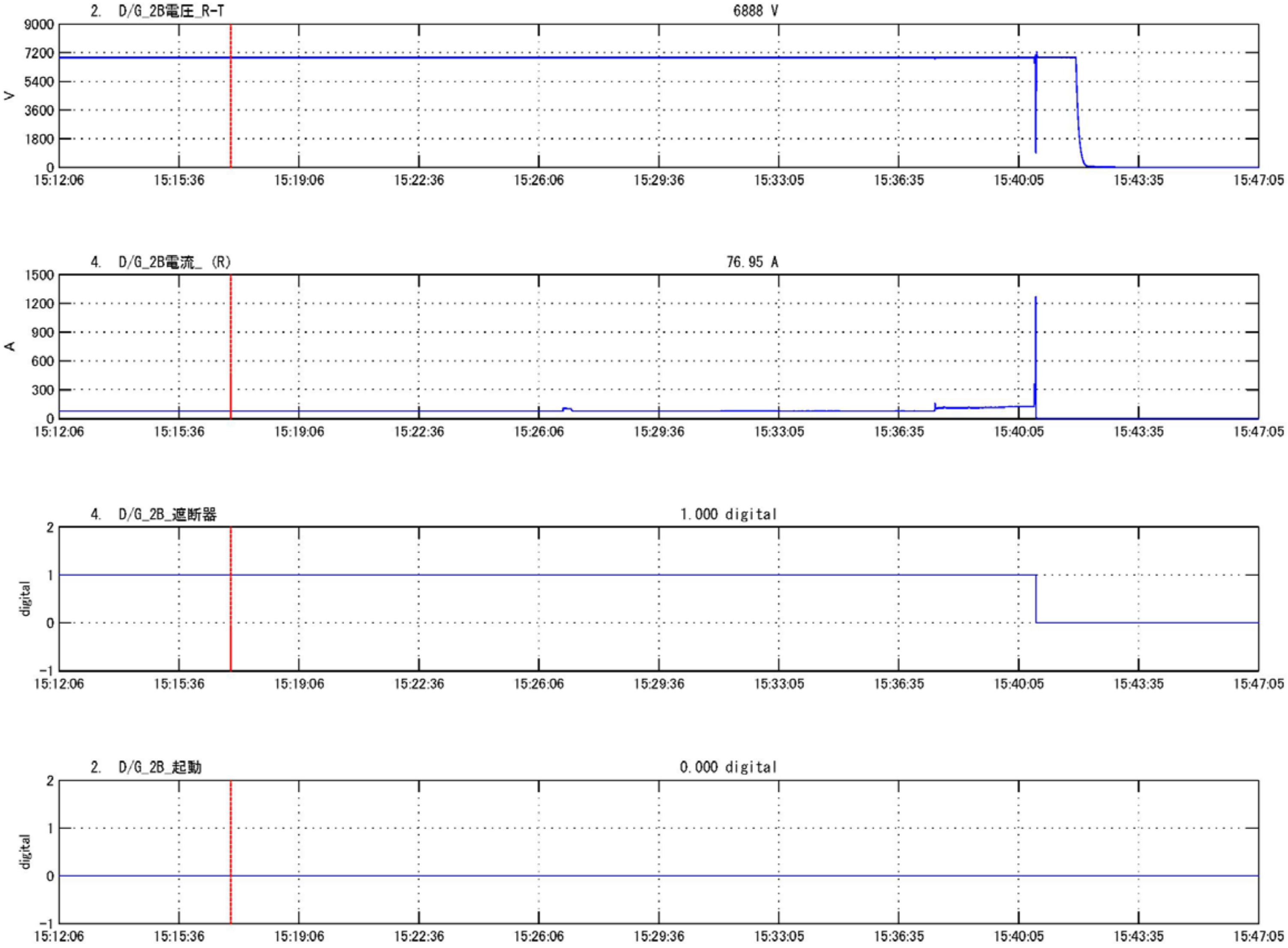
添付資料－２－１７

図－２（１）　福島第一・2号機　過渡現象記録装置　データ

Figure-2(1) Fukushima Daiichi Nuclear Power Station Unit 2 data of transient recorders

| パラメータ | 備　考 |
|---|---|
|  | D/G 2Aは動作していたが，津波の影響により停止している。<br>15:38頃に再度起動信号が発信された形跡があるが，起動には至っていない。<br>D/G 2A had operated, but shutdown due to the effect of tsumani.<br>There is a sign that start signal was sent out again at around 15:38, but it has not been started. |

図－２(２)　福島第一・2号機　過渡現象記録装置　データ
Figure-2(2) Fukushima Daiichi Nuclear Power Station Unit 2 data of transient recorders

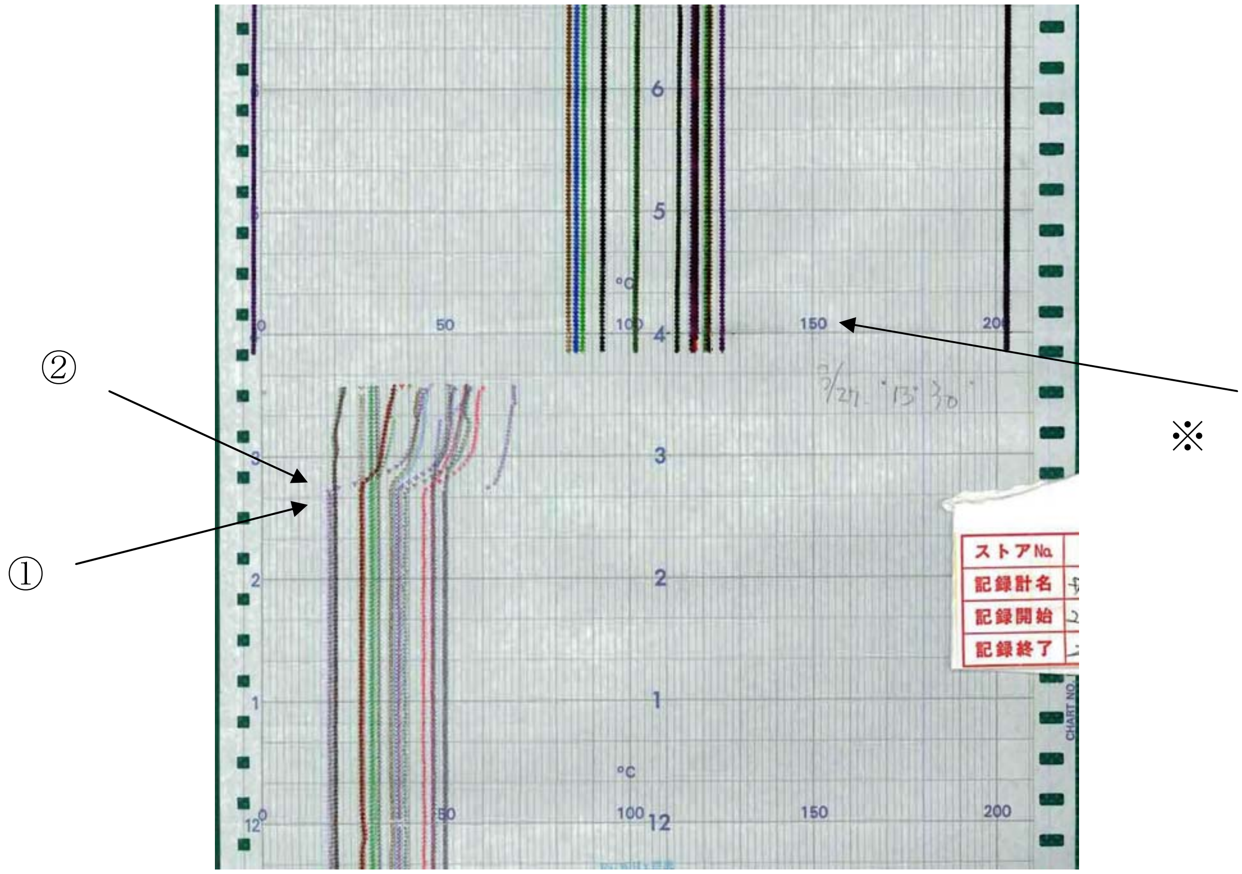
<table>
<tr><th>パラメータ</th><th>備　考</th></tr>
<tr><td>
</td>
<td>D/G 2Bは動作していたが，津波の影響により停止している。<br>2Aとの時間差は，設置位置の違い（2Bは陸側の運用補助共用建屋に設置）のためと推察される。<br><br>D/G 2B had operated, but shutdown due to the effect of tsumani.<br>It is presumed that the time difference from 2A is due to the installed location (2B is installed at Operation support common building on the landside).</td></tr>
</table>

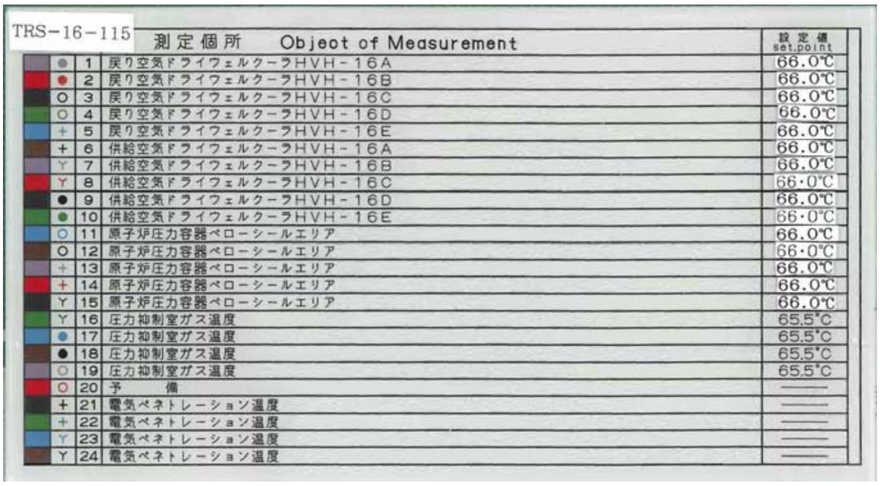
図－２(２)　福島第一・2号機　過渡現象記録装置　データ

Figure-2(2) Fukushima Daiichi Nuclear Power Station Unit 2 data of transient recorders

## Unit 2-7 Temperature of various parts in Primary Containment Vessel

## 【２号－７　原子炉格納容器内各部温度】





TRS-16-115

| | | | 測定個所　Objeot of Measurement | 設定値 set.point |
|---|---|---|---|---|
| 🟪 | ● | 1 | 戻り空気ドライウェルクーラHVH－16A | 66.0℃ |
| 🟥 | ● | 2 | 戻り空気ドライウェルクーラHVH－16B | 66.0℃ |
| ⬛ | ○ | 3 | 戻り空気ドライウェルクーラHVH－16C | 66.0℃ |
| 🟩 | ○ | 4 | 戻り空気ドライウェルクーラHVH－16D | 66.0℃ |
| 🟦 | + | 5 | 戻り空気ドライウェルクーラHVH－16E | 66.0℃ |
| 🟫 | + | 6 | 供給空気ドライウェルクーラHVH－16A | 66.0℃ |
| 🟪 | Y | 7 | 供給空気ドライウェルクーラHVH－16B | 66.0℃ |
| 🟥 | Y | 8 | 供給空気ドライウェルクーラHVH－16C | 66·0℃ |
| ⬛ | ● | 9 | 供給空気ドライウェルクーラHVH－16D | 66.0℃ |
| 🟩 | ● | 10 | 供給空気ドライウェルクーラHVH－16E | 66·0℃ |
| 🟦 | ○ | 11 | 原子炉圧力容器ベローシールエリア | 66.0℃ |
| 🟫 | ○ | 12 | 原子炉圧力容器ベローシールエリア | 66·0℃ |
| 🟪 | + | 13 | 原子炉圧力容器ベローシールエリア | 66.0℃ |
| 🟥 | + | 14 | 原子炉圧力容器ベローシールエリア | 66.0℃ |
| ⬛ | Y | 15 | 原子炉圧力容器ベローシールエリア | 66.0℃ |
| 🟩 | Y | 16 | 圧力抑制室ガス温度 | 65.5°C |
| 🟦 | ● | 17 | 圧力抑制室ガス温度 | 65.5°C |
| 🟫 | ● | 18 | 圧力抑制室ガス温度 | 65.5°C |
| 🟪 | ○ | 19 | 圧力抑制室ガス温度 | 65.5°C |
| 🟥 | ○ | 20 | 予　　備 | ―― |
| ⬛ | + | 21 | 電気ペネトレーション温度 | ―― |
| 🟩 | + | 22 | 電気ペネトレーション温度 | ―― |
| 🟦 | Y | 23 | 電気ペネトレーション温度 | ―― |
| 🟫 | Y | 24 | 電気ペネトレーション温度 | ―― |

①　１４時４７分　地震によるスクラム

②　電源喪失による格納容器空調停止に伴う格納容器の温度上昇（配管破断等に起因する極端な温度上昇は認められず）

※　１５時３０分過ぎに津波が到来により記録計電源が喪失し記録計が一旦停止。３月２７日１３時３０分に記録計電源復旧に伴い記録再開。

14:47 Scram due to the earthquake

PCV temperature rise by shutdown of PCV air conditioner due to power outage (Rapid temperature rise caused by such as pipe rupture was not shown.)

Just after 15:30, recorder suspended due to recorder's power outage by tsunami arrival. At 13:30 on March 27, recording resumed with recorder's power souce recovery.

## 4. Overview of data analysis of Unit 3

### (1) Plant data

Plant behavior represented by using data collected from Unit 1 is shown as follows.

The chart of Unit 3 recorded data when the earthquake and tsunami attacked. However, due to the loss of power sources and signals caused by the effects of inundation by tsunami, the chart stopped after a certain period of time. The annunciator output data for about 3 hours and 30 minutes after the occurrence of scram and then stopped. Regarding the operation log which is the record by the operators on duty the records before the earthquake are kept, however, the records after the occurrence of the earthquake are not complete with some parts missing due to the blackout and working environment in such severe conditions. The data of the transient phenomenon recorder of Unit 3 was collected by using temporary power source even though it took more time compared with other units since measures such as uninstalling hard disk etc. failed.

### (2) Plant behavior

① Before the occurrence of the earthquake at 14:46 on March 11, 2011, Unit 3 had been operated in the rated heat output and the data indicated it was under normal conditions. According to Shift Supervisor Task Handover Journal, the supervisor confirmed that the water level of the spent fuel pool was full (near overflow line) and the temperature of the pool was 25℃, i.e. under normal conditions. (Attachment-3-1～4)

② Unit 3 scrammed by the earthquake, at 14:47 on the same day.

③ All control rods were inserted at 14:47 on the same day.

④ Immediately after the scram, Average Power Range Monitor (APRM) indicated sudden decrease. It means that the output surely decreased with a normal operation. (Attachement-3-5～7)

⑤ Transition of water level in the reactor indicated slight decrease of water level by crashing void immediately after the scram. However, the water level was recovered and maintained within the normal level range without reaching automatic starting level of ECCS (L-1 regarding core spray system and RHR, L-2 for high pressure water injection system). After that, although the level fluctuated due to opening/closing of the main steam safety relief valves and start/stop of RCIC, it stably remained within the narrow band range (the measurable range by the indicators approx. 4 meter above the top of active fuel, used for the normal operation).

⑥ The pressure of the reactor was also decreased after the scram. However, since the main steam isolation valve was closed on 14:48 on the same day, the pressure increased.

⑦ In response to the increase of pressure of reactor, the main steam safety relief valves have worked and stably controlled the pressure. (Attachment-3--8～11)

⑧ In the record of the annunciator, the isolation signals indicated a rapture of main steam pipeline were printed out before and after the close of main steam isolation valves. However, the data collected from the transient phenomenon recorder showed that the main steam flow was zero (0) as a result of the closure of the main steam isolation valve, and did not indicate any increase of steam flow caused by the rapture of pipeline in the process. From abovementioned data and phenomena, it is estimated that the incorrect alarm regarding the rapture of main steam pipeline was made by closing signal according to the fail safe system caused by loss of external power sources for indicators by the earthquake. (Attachment-3-12～13)

⑨ Amid the water level transiently-changed due to the scram after the occurrence of the earthquake as well as opening/closing of main steam isolation valve and main steam safety relief valves, RCIC was manually started at 15:05※2 on the same day in accordance with the response manual in case of reactor isolation (close of main steam isolation valve) by loss of external power source, and the water level increased. However, RICI automatically stopped at 15:25 due to the high water level in the reactor. This led to the drop of the water level and then RCIC was manually started at 16:03. Those start and stop processes were recorded in the alarm’s record worked by the earthquake and the process calculation data, etc. (Attachement-3-14～15)

⑩ According to the recorder chart, the pressure in the reactor was stable at approx. 7 MPa (normal operation level) until 12:00 on March 12. However, the chart indicates significant changes (6 MPa decrease in approx. 6 hours) after that. It implies that RCIC was continuously operated until about 12:00 on March 12 and that there were some sort of changes to operating conditions of each equipment. It was reported in the plant related parameters (as of 12:55) attached to the 22nd report pursuant to the article 15 that RCIC stopped at 11:36 on March 12 for some reason and high pressure coolant injection system started following a decrease in water level at 12:35 on the same day. (Attachement-3-9)

⑪ At 2:42 on March 13, high pressure coolant system stopped because of a decrease in reactor pressure. After that, it became inoperative presumably due to the loss of DC power source. At 9:25 on the same day, fresh water injection containing boric acid was started through fire extinguishing system. (Attachement-3-15)

⑫ After the pressure in reactor was stably maintained at approx. 1 MPa until around 19:00 on March 12, it increased to approx. 7MPa in 2 hours from 2:00 on March 13. The pressure was maintained at that level for a while but from 9:00 on the same day, significant decrease was seen. The reason for this has not been identified yet.

⑬ As previously mentioned, since immediately after the reactor scram, main steam isolation valve was closed and the reactor was isolated, RCIC, which was driven by steam from reactor, was used for water injection to the reactor in the early time after the earthquake. After RCIC stopped its function, high pressure coolant system was used.

⑭ Besides, in the case that the reactor pressure increased by decay heat, the reactor pressure was controlled by opening and closing of main steam safety relief valve in order avoid too much increase of pressure.

⑮ It is stipulated in the safety regulation that the change rate of the water temperature in the reactor (temperature at PLR pump inlet) should be under 55℃/h in order to avoid sudden change of temperature. As the chart indicated, the water temperature in the reactor had been stable within several tens of degree in an hour until stop of recording by the tsunami after the earthquake. (Attachement-3-16)

⑯ Meanwhile, external power sources were lost due the earthquake, 2 emergency diesel generators started at around 14:48 on the same day. By these units, voltage was kept at normal level. It is estimated that necessary power was secured. (Attachement-3-17)

⑰ After the reactor scram, temperature change of cooling system for the primary containment vessel until power sources for indicators stopped has a trend that the increase was moderate and saturated within several tens of degree. At that time, any sudden change of temperature caused by rupture of pipeline, etc. was not recognized in the primary containment vessel. In addition, the reactor pressure was controlled by safety relief valves, etc. and kept at around 7 Mpa. It is assumed that there was no rupture. (Attachement-3-9, 10, 18)

⑱ No records which show the operation of ECCS were found (including manual operation) during the period after the earthquake until the loss of all alternative power sources, because the water level of the reactor did not draw down below the level ECCS would be the automatically activated. After the earthquake, the external power sources were lost and then Fuel Pool Cooling and Filtering System were stopped, however, emergency diesel generators were started. Cooling the pool using the pumps of RHR whose power is supplied from emergency diesel generators was not conducted before the arrival of tsunami, since it was confirmed that the water level of the spent fuel pool was full before the earthquake (around overflow level) and that the water temperature of the spent fuel pool was around 25℃, therefore it did not seem to be an obstacle for the immediate cooling of the fuel.

⑲ Shift Supervisor Task Handover Journal states that all alternative power sources were lost at 15:38.

⑳ After the loss of all alternative power sources, it is assumed that pumps of RHR of ECCS, and core spray pumps did not work due to the loss of power. The operation of the high pressure coolant system is stated above. (Annex-2)

㉑ Regarding a radiation monitoring for exhaust stack, the values recorded from scram of reactor to the end of recording are stable and nothing abnormal were seen. Gradual increase can be seen temporarily from approx. 5:00 on the next day. However, we consider this as a result of increase in radiation dose from other units in the site since the same trend can be seen at unit 5 and water level in the reactor of unit 5 was maintained at full at the same time. (Attachement-3-19)

※2

The time is based on the record from the alarm. In the operation related documents, the time is recorded as 15:06 (Time stated in 7 “Summary of operations”, report submitted on May 16,). As a result of the analysis and evaluation, the time RCIC started was determined as15:05.

Form-1
Fukushima Daiichi Nuclear Power Plant Unit 3 and 4

Shift Supervisor Task Handover Journal（1/3）

# Shift Supervisor Task Handover Journal

| |
|---|
| [confirmed by］ Chief engineer of reactors |
| |

| | | |
|---|---|---|
| March 11, 2011, Friday, 8:30, Shift 2, Group E | ［confirmed by］<br>Supervisor of next shift | ［made and approved by］<br>Shift supervisor |
| | | |

| | | | | |
|---|---|---|---|---|
| On duty<br>9（operator）<br>-（instructor）<br>1（trainee） | No. of organization | Off duty | [redacted] | Support duty |
| | 172 | Replacement | --- | none |

| | | | | |
|---|---|---|---|---|
| Unit 3 | Generator Output | 792MWe | Reactor Status | [✓ in operation]・start up・hot shutdown・cold shutdown・fuel exchange |
| Unit 4 | Generator Output | 0MWe | Reactor Status | in operation・start up・hot shutdown・cold shutdown・[✓ fuel exchange] |

Notes

Unit 3

1. Operation Status

(1) Reactor rated thermal output steady operation

(2) M. COND B/W 04:01-04:53

2. Compliance status of safety regulation

Not particular

3. Periodic test

None

4. Requested work, non compliance event

None

5. Status of waste treatment facility

None

Fukushima Daiichi Nuclear Power
Station Unit 3 Operation Log [1]

太枠は炉規則第7条／保安規定第120条対象記録

福島第一原子力発電所 3号機

# 運 転 日 誌 〔1〕

2011 年 3 月 11 日

要求記録確認表(引継ぎ後のプラント状態をチェックする)

| | | 炉水温度 | 燃料の状態 | プール・ゲートの状態 | 原子炉の加圧 | 記録項目確認 2直 | 1-1直 | 1-2直 | 2直 | 記録が必要な項目 |
|---|---|---|---|---|---|---|---|---|---|---|
| 定格熱出力一定運転中 | | → | → | → | → | ✓ | ✓ | | | 1,5,7,8,10 |
| 発電機並列中 | | → | → | → | → | ✓ | ✓ | | | 1,7,9,10,11,<br>12~25 |
| 原子炉の状態 | 運転 | → | → | → | → | ✓ | ✓ | | | 1,2,3,4,5,7,8,10,<br>12~19,21,22 |
| | 起動 | → | → | → | → | | | | | 1,2,3,4,5,7,8,10,<br>12~19,21,22 |
| | 高温停止 | → | → | → | → | | | ✓ | ✓ | 1,2,4,5,7,8,<br>10,12,22 |
| | 冷温停止 | 65℃以上 | → | → | 加圧なし | | | | | 1,2,4,7,10,<br>12,22 |
| | | | | | 加圧 | | | | | 1,2,6,7,10,<br>12,20,22 |
| | | 65℃未満 | → | → | 加圧なし | | | | | 1,2,6,7,10,<br>12,22 |
| | 燃料交換 | → | 1体以上炉心に装荷 | 閉鎖 | → | | | | | 1,2,6,7,10,<br>12,22 |
| | | | | 開放 | → | | | | | 1,2,6,7,10,12 |
| | | → | 全燃料取出中 | 閉鎖 | → | | | | | 1,2,7,10,22★ |
| | | | | 開放 | → | | | | | 1,2,7,10,12 |
| 格納容器閉鎖中 | | → | → | → | → | ✓ | ✓ | ✓ | ✓ | 1,2,3,4,7,8,10 |

## 記録確認項目

1 原子炉水導電率
2 サプレッションチェンバー水位
3 サプレッションチェンバー水温度
4 ドライウェル酸素濃度
5 原子炉熱出力(瞬時値、1時間平均値)
6 原子炉熱出力(SRNM、APRM)
7 補給水積算記録
8 格納容器内の原子炉冷却材漏えい率
9 発電機出力(積算)
10 変圧器等積算
11 タービン振動(最大値)
12 ●再循環ループ温度
13 ●給水温度
14 ●主蒸気温度
15 ●主蒸気流量
16 ●給水流量
17 ●給水圧力
18 ●主蒸気圧力
19 ●排ガス放射線モニタ指示
20 原子炉圧力容器壁温度
21 ●原子炉圧力
22 ●原子炉水位
23 ●格納容器圧力(真空度)
24 ●復水器真空度
25 ●高圧第1段圧力

★全燃料取出中でプールゲートが閉鎖されている場合においてRPVスタッドボルトの締付を行う場合はRPVスタッドボルト締付開始以降再循環ループ温度／原子炉冷却材温度変化率の記録を行う。

●の項目に記録要求がある場合でプロセス計算機打ち出しによる記録ができない場合は、現場を使用し記録を行う。

| 確 認 | | 承 認 | 内容確認 | 作 成 | プロセス計算機データ確認 |
|---|---|---|---|---|---|
| 原子炉主任技術者 | | 当直長 | 当直副長 | 当直員 | |
| | 2直 | [redacted] | [redacted] | [redacted] | [✓ 異常なし]<br>別紙有り |
| | 1-1直 | [redacted] | [redacted] | [redacted] | [✓ 異常なし]<br>別紙有り |
| | 1-2直 | [redacted] | [redacted] | [redacted] | 異常なし<br>[✓ 別紙有り] |
| | 2直 | | | | 異常なし<br>[✓ 別紙有り] |

| 保安規定 | 9,18,120 | 9,13,40,45 | 9,13,45 | 9,13,45 | 26 | | 9,26,27,120 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 記録すべき場合、頻度 | 毎日1回 | すべての期間 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | 定格熱出力一定運転時 | | 原子炉に1体以上燃料が装荷されている場合連続 | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | | 6 | | | | | | | |
| 項目 | (補2) 原子炉水電導度 | サプレッションチェンバー水位 | サプレッションチェンバー水温度 | ドライウェル酸素濃度 | 原子炉熱出力 瞬時値 | 1時間平均値 | 熱出力・炉心の中性子束密度 原子炉熱出力(補1) ( SRNM [✓ APRM] ) A | C | E | G | B | D | F | H |
| 時 | μS/cm | cm | ℃ | %O₂ | MWt | MWt | cps [✓ %] | | | | | | | |
| 刻 | 9-4 | 9-3 | 9-60 | 9-25 | 計算機 | | 9-6 | | | | | | | |
| 計器 | CRS-12-132 | LI-16-132 | TRS-16-180A/B | O₂RS-50-76 | 原子炉熱出力 | 原子炉平均熱出力 | NR-7-46A／46C／46B／46D | | | | | | | |
| PID | — | — | — | — | C192 | C210 | — | — | — | — | — | — | — | — |
| 1 | | | | | ✓ | ✓ | 101 | 101 | 101 | / | 101 | 101 | 101 | / |
| 2 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 3 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 4 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 5 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 6 | | ±0 | 21.5 | 2.50 | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 7 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 8 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 9 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 10 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 11 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 12 | 0.07 | ±0 | 21.5 | 2.50 | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 13 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 14 | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | / | ✓ | ✓ | ✓ | / |
| 15 | | | | | | | ※5 ~~70~~ | ※6 ~~70~~ | ※7 ~~60~~ | ※8 ~~65~~ | 100 | $5\times10^2$ | $3\times10^2$ | 100 ※11 |
| 16 | | | | | | | ※9 ~~60~~ | ※10 ~~65~~ | $1\times10^2$ | $2\times10^2$ | 50 | $2\times10^2$ | $2\times10^2$ | $1\times10^2$ |
| 17 | | | | | | | 100 | $3\times10^2$ | 100 | $2\times10^2$ | 60 | $2\times10^2$ | $1.5\times10^2$ | 100 |
| 18 | | ※1 +200 | ※2 — | ※3 — | | | 100 | $2\times10^2$ | 80 | $1.8\times10^2$ | 40 | $2\times10^2$ | $1.5\times10^2$ | 100 |
| 19 | | | | | | | 100 | $2\times10^2$ | 50 | $1.2\times10^2$ | 40 | $2\times10^2$ | $1.2\times10^2$ | 90 |
| 20 | | | | | | | 100 | $2\times10^2$ | 50 | 100 | 40 | $2\times10^2$ | $1.2\times10^2$ | 80 |
| 21 | | | | | | | 100 | $1.5\times10^2$ | 50 | 100 | 40 | $1.8\times10^2$ | $1.2\times10^2$ | 80 |
| 22 | | | | | | | 90 | $1.8\times10^2$ | 50 | 100 | 40 | $1.8\times10^2$ | $1.2\times10^2$ | 80 |
| 23 | | | | | | | 90 | $1.8\times10^2$ | 50 | 100 | 40 | $1.8\times10^2$ | $1.2\times10^2$ | 80 |
| 24 | ※4 — | ※1 +400 | ※2 — | ※3 — | | | | | | | | | | |

| 9,120 | 9,13,31 | | | | |
|---|---|---|---|---|---|
| 原子炉に使用している冷却材及び減速材の毎日の補給量 | | | | | |
| 毎日1回 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | | | |
| 7 | 8 | | | | |
| 補給水積算記録 | 格納容器内の原子炉冷却材漏えい率 | | | | |
| | 純水補給水量 FQ-79-360(ℓ) | D/W床ドレンサンプ流量 FQ-20-527(×0.1m³) | D/W機器ドレンサンプ流量 FQ-20-530(×0.1m³) | D/W冷却器ドレン量 FQ-76-221(ℓ) | |
| | 現場 | 9-19 | | | |
| 24 | | 019618 | 245272 | 133185 | D/W床ドレン m³/h |
| 0 | 175940930 | 019617 | 245219 | 133167 | 全漏洩量 m³/h |
| 差 | | 1 | 53 | 18 | |

| | 6.9kV母線 3SA₄ | 3SB₁ |
|---|---|---|
| | kWh×1,000 | kWh×1,000 |
| | メタクラ | |
| | 3SA-4 | 3SB-4 |
| 24 | | |
| 0 | 11 070.2 | 11 066.2 |
| 差 | | |

| | 主発電機 | 変圧器等積算 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 発電機出力 | 10 | | | | | | | |
| | 9 | 起動変圧器 | | | 所内変圧器 | | | 励磁電源変圧器 | 所内電力量合計 |
| | 読み | 3SA | 3SB | 小計 | A | B | 小計 | 電力量 | |
| | kWh×10,000 | kWh×1,000 | kWh×1,000 | MWh | kWh×1,000 | kWh×1,000 | MWh | kWh×100 | MWh |
| | 9-31 | メタクラ | | | メタクラ | | | 9-31 | |
| | WHT-43-107 | 3SA-1 | 3SB-1 | | 3A-1 | 3B-1B | | WHT-43-108 | |
| 24 | | | | | | | | 89 551.7 | |
| 0 | 83 251.44 | 68 331.9 | 48 312.0 | | 89 641.0 | 84 055.5 | | 89 384.5 | |
| 差 | | | | | | | | 167.2 | |

所内電力量算出
((3SA−1)+(3SB−1)+(3A−1)+(3B−1B))+(WHT-43-108 × 0.1)−((4A−3)+(4B−3)) = ______ MWh

4A-3電力量合計 ______ MWh　4B-3電力量合計 ______ MWh　所内電力量のうち 集中RW(3SB)使用分 ______ MWh

| 定格出力運転時 タービン振動記録(1日の最大値) | |
|---|---|
| 11 | |
| 9-75 | |
| M40-20-R2/R4/R5/R6/R7 | |
| 軸受 No. | 最大値×1/100mm p-p |
| | |

補足事項
補1 炉規則第7条、保安規定第120条記録は連続記録のチャートである。
補2 原子炉水電導度が記録できない場合は代替記録採取場所により記録する。詳細は運転日誌記載ガイドを確認すること。
補3 再循環ポンプ吸込温度(原子炉冷却材浄化系入口温度)の毎正時の温度と1時間前の温度を確認し、温度差が55℃/hを超えていないことを確認する。

注意事項(運転日誌共通)
1. 運転日誌別紙の項目に●が記載されているものは、BOP打出保守記録のため、再打出し記録を確認しデータに異常が無い事を確認し空欄とすること。
2. PTW以外で記録不可能な場合は「—」としその理由を余白に記載する。PTWの場合は「PTW」と記載する。
3. 記録不要な場合は当該欄の枠を「／」とする。(運転日誌別紙の●項目も同様)

記事
M/c 3SAはM/c 2SAより受電中
6:44～　水素注入量調整
25↘15　Nm³/h
14:47′ スクラム

※1 採取計器変更 LI-16-174 単位 mm
※2 計器電源喪失
※3 サンプリング系トリップ(電源喪失)
※4 サンプリング系(CUW系)トリップ(電源喪失)
※5 誤記訂正「3×10²」
※6 誤記訂正「7×10²」
※7 誤記訂正「2×10²」
※8 誤記訂正「4×10²」
※9 誤記訂正「2×10²」
※10 誤記訂正「3×10²」
※11 15:00以降 SRNMに切替

1F-3-5

2011年4月23日 05:09分
TEPCO配布-3.4号中操
No. 0098 P. 1/3

添付資料－３－２

Fukushima Daiichi Nuclear Power Station Unit 2 Status of emergency machines check sheet

# 福島第一原子力発電所　3 号 機　非常用機器状態確認チェックシート

2011 年 3 月 11 日

| | 承認<br>当直長 | 内容確認<br>当直副長 | 作成<br>当直員 |
|---|---|---|---|
| 1直 | | | |
| 2直 | [redacted] | [redacted] | [redacted] |

| 項 | 目 | 通常状態 | 2直 | 1直 |
|---|---|---|---|---|
| 自動逃し弁系 | AO−2 −71A | × | レ | |
| | −71B | × | レ | |
| | −71C | × | レ | |
| | −71E | × | レ | |
| | −71G | × | レ | |
| | −71H | × | レ | |
| 残留熱除去系〔A〕 | RHRポンプ A | SB | レ | |
| | RHRポンプ C | SB | レ | |
| | RHRSポンプ 'A | SB | レ | |
| | RHRSポンプ C | SB | レ | |
| | MO−10−15A | × | レ | |
| | −15C | × | レ | |
| | −65A | ○ | レ | |
| | −66A | ○ | レ | |
| | −12A | ○ | レ | |
| | −27A | ○ | レ | |
| | −25A | × | レ | |
| | −31A | × | レ | |
| | −26A | × | レ | |
| | −38A | × | レ | |
| | −39A | × | レ | |
| | −34A | × | レ | |
| | −13A | ○ | レ | |
| | −13C | ○ | レ | |
| | −89A | × | レ | |
| | −20 | ○ | レ | |
| | RHRポンプA潤滑油ポンプ | SB | レ | |
| | RHRポンプC潤滑油ポンプ | SB | レ | |
| | RHRポンプA. C非常用潤滑油ポンプ | SB | レ | |
| | RHRSポンプA. C潤滑油ポンプ$A_1$ | SB | レ | |
| | RHRSポンプA. C潤滑油ポンプ$A_2$ | SB | レ | |
| | RHRSポンプA. C潤滑油冷却ファン$A_1$ | SB | レ | |
| | RHRSポンプA. C潤滑油冷却ファン$A_2$ | SB | レ | |
| 炉心スプレイ系〔A〕 | ポンプ A | SB | レ | |
| | MO−14− 7A | ○ | レ | |
| | −11A | ○ | レ | |
| | −12A | × | レ | |
| | −26A | × | レ | |
| | − 5A | ○ | レ | |

| 項 | 目 | 通常状態 | 2直 | 1直 |
|---|---|---|---|---|
| 炉心スプレイ系〔A〕 | CSポンプA潤滑油ポンプ | SB | レ | |
| | CSポンプA非常用潤滑油ポンプ | SB | レ | |
| 高圧注水系 | MO−23−15 | ○ | レ | |
| | −16 | ○ | レ | |
| | −14 | × | レ | |
| | −17 | ○ | レ | |
| | −57 | × | レ | |
| | −58 | × | レ | |
| | −21 | × | レ | |
| | −20 | ○ | レ | |
| | −19 | × | レ | |
| | −24 | × | レ | |
| | −25 | × | レ | |
| | −144 | × | レ | |
| | タービン止め弁 | × | レ | |
| | タービン加減弁 | × | レ | |
| | 潤滑油ポンプ | SB | レ | |
| | 真空ポンプ | SB | レ | |
| | 復水ポンプ | SB | レ | |
| | 流量制御器 | AUTO | レ | |
| 残留熱除去系〔B〕 | RHRポンプ B | SB | レ | |
| | RHRポンプ D | SB | レ | |
| | RHRSポンプ B | SB | レ | |
| | RHRSポンプ D | SB | レ | |
| | MO−10−15B | × | レ | |
| | −15D | × | レ | |
| | −65B | ○ | レ | |
| | −66B | ○ | レ | |
| | −12B | ○ | レ | |
| | −27B | ○ | レ | |
| | −25B | × | レ | |
| | −31B | × | レ | |
| | −26B | × | レ | |
| | −38B | × | レ | |
| | −39B | × | レ | |
| | −34B | × | レ | |
| | −13B | ○ | レ | |
| | −13D | ○ | レ | |
| | −89B | × | レ | |

| 項 | 目 | 通常状態 | 2直 | 1直 | 記事 |
|---|---|---|---|---|---|
| 残留熱除去系〔B〕 | RHRポンプB潤滑油ポンプ | SB | レ | | |
| | RHRポンプD潤滑油ポンプ | SB | レ | | |
| | RHRポンプB. D非常用潤滑油ポンプ | SB | レ | | |
| | RHRSポンプB. D潤滑油ポンプ$B_1$ | SB | レ | | |
| | RHRSポンプB. D潤滑油ポンプ$B_2$ | SB | レ | | |
| | RHRSポンプB. D潤滑油冷却ファン$B_1$ | SB | レ | | |
| | RHRSポンプB. D潤滑油冷却ファン$B_2$ | SB | レ | | |
| 炉心スプレイ系〔B〕 | ポンプ B | SB | レ | | |
| | MO−14− 7B | ○ | レ | | |
| | −11B | ○ | レ | | |
| | −12B | × | レ | | |
| | −26B | × | レ | | |
| | − 5B | ○ | レ | | |
| | CSポンプB潤滑油ポンプ | SB | レ | | |
| | CSポンプB非常用潤滑油ポンプ | SB | レ | | |
| 隔離時冷却系 | MO−13− 15 | ○ | レ | | |
| | − 16 | ○ | レ | | |
| | −131 | × | レ | | |
| | − 18 | ○ | レ | | |
| | − 39 | × | レ | | |
| | − 41 | × | レ | | |
| | − 20 | ○ | レ | | |
| | − 21 | × | レ | | |
| | − 30 | × | レ | | |
| | − 27 | × | レ | | |
| | −132 | × | レ | | |
| | タービン止め弁 | ○ | レ | | |
| | タービン加減弁 | ○ | レ | | |
| | 復水ポンプ | SB | レ | | |
| | 真空ポンプ | SB | レ | | |
| | 流量制御器 | AUTO | レ | | |
| ディーゼル発電機３Ａ | ディーゼル発電機 | SB | レ | | |
| | 6.9kvしゃ断器3C3 | ○ | レ | | |
| ディーゼル発電機３Ｂ | ディーゼル発電機 | SB | レ | | |
| | 6.9kvしゃ断器3D3 | ○ | レ | | |

1．主要操作が終了し、引継ぎまでの間に状態を確認する。
　１直帯は１８時～引継ぎまで、２直帯は６時～引継ぎまで
2．通常状態と比較し異常なければ「レ」相違する場合は、次の記号で記載する。
3．記号　レ：異常なし　○：開　×：閉　W：作業中　RUN：運転中
　MAN：手動　P/L：引き保持

# 3号機　BOPログ

| 発電所コード | 号機コード | データ採取日 | データ採取時間 | 原子炉APRM平均(%) | 原子炉熱出力(MW) | 原子炉給水熱出力(MW) | 原子炉圧力(MPa) |
|---|---|---|---|---|---|---|---|
| 1F | 3 | 2011/03/11 | 01 | 100.78674 | 2376 | 2369.009 | 6.9302397 |
| 1F | 3 | 2011/03/11 | 02 | 100.83188 | 2377 | 2370.5005 | 6.9297628 |
| 1F | 3 | 2011/03/11 | 03 | 100.83517 | 2377 | 2370.2336 | 6.9309359 |
| 1F | 3 | 2011/03/11 | 04 | 100.83765 | 2376 | 2371.1733 | 6.930316 |
| 1F | 3 | 2011/03/11 | 05 | 100.758 | 2379 | 2370.1216 | 6.9305515 |
| 1F | 3 | 2011/03/11 | 06 | 100.83096 | 2377 | 2369.825 | 6.930707 |
| 1F | 3 | 2011/03/11 | 07 | 100.82327 | 2379 | 2372.373 | 6.9303083 |
| 1F | 3 | 2011/03/11 | 08 | 100.84515 | 2378 | 2371.353 | 6.9307003 |
| 1F | 3 | 2011/03/11 | 09 | 100.82776 | 2379 | 2371.6863 | 6.9304714 |
| 1F | 3 | 2011/03/11 | 10 | 100.79526 | 2379 | 2371.7354 | 6.9311762 |
| 1F | 3 | 2011/03/11 | 11 | 100.83609 | 2379 | 2371.6611 | 6.9313278 |
| 1F | 3 | 2011/03/11 | 12 | 100.82227 | 2379 | 2372.4543 | 6.9301624 |
| 1F | 3 | 2011/03/11 | 13 | 100.77017 | 2378 | 2372.144 | 6.932498 |
| 1F | 3 | 2011/03/11 | 14 | 100.82556 | 2379 | 2371.6863 | 6.9316416 |
| 1F | 3 | 2011/03/11 | 15 | 4.1637859 | 0 |  | 7.2241659 |
| 1F | 3 | 2011/03/11 | 16 | 4.9337463 | 0 |  | 7.3243408 |
| 1F | 3 | 2011/03/11 | 17 | 3.1179571 | 0 |  | 7.2587996 |
| 1F | 3 | 2011/03/11 | 18 | 1.2585564 | 0 |  | 7.2444296 |
| 1F | 3 | 2011/03/11 | 19 | 0 | 0 |  | 7.1974716 |
| 1F | 3 | 2011/03/11 | 20 |  |  |  |  |
| 1F | 3 | 2011/03/11 | 21 |  |  |  |  |
| 1F | 3 | 2011/03/11 | 22 |  |  |  |  |
| 1F | 3 | 2011/03/11 | 23 |  |  |  |  |
| 1F | 3 | 2011/03/11 | 24 |  |  |  |  |
|  |  |  |  | 99～101 | ≦ 2381 | ≦ 2381 | ≦ 7.03 |

**※ ３号機 第2４回定期検査総合性能検査記録より制限値（≦　）、過去データ（　～　）があるパラメータについて表記。**

※From "Integrated Performance Test Record of the 24th Periodic Inspection of Unit 3", parameters with that there exist limit values ( ≦ ), or past data ( ～ ) are referred here.

**プラント主要パラメータを打出したBOPタイパー　サンプル**

BOP (Balance of Plant) Typer (printed out main parameters of the plant) - sample

添付資料－３－４

Output Distribution Calculation　　　Fukushima Daiichi Nuclear Power Station Unit 3  25th Cycle

# 出力分布計算　No.14　福島第一原子力発電所 第３号機　第25サイクル　2011年 3月 11日 14時 0分

## プラントデータ／炉心主要データ

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 発電機出力 | 792.8 | MW | ( 101.13 %) | 原子炉圧力 | 7.033 | MPa | 固有値 | 1.00346 | |
| 原子炉熱出力 | 2378.1 | MW | ( 99.88 %) | 炉心平均圧力 | 7.128 | MPa | ゼノン反応度 | 0.02517 | Δk |
| 給水流量 | 4408.0 | t/h | ( 99.57 %) | 支持板差圧 | 0.1170 | MPa | 相対ゼノン濃度 | 0.96216 | |
| 炉心流量 | 31205.0 | t/h | ( 93.71 %) | 炉心圧損計算値 | 0.1530 | MPa | 相対ヨウ素濃度 | 0:99860 | |
| 炉心流量判定 | 1 | | | 原子炉水位 | 1160 | mm | 径方向分布指標 | 1.07461 | |
| ・ジェットポンプ | 31205.0 | t/h | ( 93.71 %) | 入口エンタルピ | 1211.57 | kJ/kg | 軸方向分布指標 | 0.59227 | |
| ・ヒートバランス法 | 30936.0 | t/h | ( 92.90 %) | 入口サブクーリング | 62.39 | kJ/kg | 収束計算指標 | 0.00006 | - |
| ・再循環流量法 | 32242.8 | t/h | ( 96.83 %) | 制御棒密度 | 6.42 | % | 収束計算回数 | 1 | |
| ・支持板差圧法 | 31247.8 | t/h | ( 93.84 %) | 最大出口クオリティ | 25.46 | % | 制御棒対称性 | １／８対称 | |
| 再循環ループ流量 | 14832.5 | t/h | ( 95.69 %) | 平均出口クオリティ | 16.80 | % | 炉心対称性 | 全炉心 | |
| 再循環ポンプ速度(A) | | | ( 88.53 %) | 平均ボイド率 | 44.13 | % | 炉心計算領域 | 全炉心 | |
| 再循環ポンプ速度(B) | | | ( 88.51 %) | 平均熱流束 | 45.34 | W/cm² | 計算モード | ＬＰＲＭ学習 | |
| 平均発電機出力 | 792.8 | MW | ( 101.12 %) | 平均出力密度 | 50.38 | kW/l | 運転流量曲線 | 104.65 | % |
| 平均原子炉熱出力 | 2378.8 | MW | ( 99.91 %) | ファイル名 | p1_20110311140000_lprm.wrap | | | | |

データ日時　2011年 03月 11日
14時　00分　No.14

### プロセスデータ注意項目

| | | |
|---|---|---|
| 制御棒データ代替位置 | | 0個 |
| LPRMデータ範囲外位置 | f | 0個 |
| LPRMデータ注意位置 | a | 0個 |
| BASE更新必要位置 | b | 0個 |
| データ範囲外センサー | | 0個 |

### 制御棒パターン

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | |
| 43 | | | 22 | | | | 14 | | | | 22 | | |
| 39 | | | | | | | | | | | | | |
| 35 | | | | | 12 | | | | 12 | | | | |
| 31 | | | | | | | | | | | | | |
| 27 | | | 14 | | | | 10 | | | | 14 | | |
| 23 | | | | | | | | | | | | | |
| 19 | | | | | 12 | | | | 12 | | | | |
| 15 | | | | | | | | | | | | | |
| 11 | | | 22 | | | | 14 | | | | 22 | | |
| 07 | | | | | | | | | | | | | |
| 03 | | | | | | | | | | | | | |
| | 02 | 06 | 10 | 14 | 18 | 22 | 26 | 30 | 34 | 38 | 42 | 46 | 50 |

## APRMデータ／円筒領域分布データ

| 位置 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| APRM読み (%) | 100.84 | 100.94 | 101.00 | 101.09 | 100.97 | 101.06 | | | |
| APRMゲイン較正係数 | 0.990 | 0.990 | 0.989 | 0.988 | 0.989 | 0.988 | | | |
| 円筒領域相対出力分布 | 0.862 | 1.204 | 1.238 | 1.132 | 1.146 | 1.044 | 0.701 | | |
| 円筒領域相対燃焼度分布 | 1.334 | 1.079 | 0.907 | 0.985 | 1.009 | 0.910 | 1.080 | | |

### 補正後LPRM読み(mu)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 45 | | | 24<br>40<br>43<br>48 | 31<br>46<br>60<br>80 | 32<br>41<br>53<br>62 | 28<br>43<br>56<br>80 | 18<br>29<br>23<br>20 |
| 37 | | 18<br>28<br>38<br>45 | 35<br>48<br>59<br>86 | 35<br>43<br>52<br>70 | 37<br>50<br>62<br>87 | 40<br>48<br>58<br>82 | 28<br>43<br>57<br>82 |
| 29 | | 25<br>37<br>50<br>66 | 37<br>47<br>58<br>76 | 38<br>50<br>62<br>85 | 40<br>47<br>59<br>80 | 37<br>51<br>63<br>87 | 34<br>41<br>53<br>68 |
| 21 | | 22<br>36<br>49<br>69 | 37<br>50<br>60<br>85 | 42<br>49<br>59<br>78 | 38<br>50<br>63<br>87 | 34<br>44<br>53<br>68 | 31<br>45<br>59<br>80 |
| 13 | | | 31<br>47<br>55<br>68 | 36<br>50<br>61<br>86 | 38<br>48<br>58<br>76 | 34<br>48<br>59<br>89 | 24<br>37<br>41<br>49 |
| 05 | D<br>C<br>B<br>A | | | 22<br>36<br>49<br>67 | 25<br>37<br>52<br>67 | 19<br>30<br>38<br>45 | |
| | | 04 | 12 | 20 | 28 | 36 | 44 |

## 燃料燃焼度データ

| データ項目 | (MWd/t) | (X-Y-Z) | バンドル名 |
|---|---|---|---|
| サイクル燃焼度 | 4244.9 | | |
| 炉心平均燃焼度 | 21812.0 | | |
| 最大バンドル燃焼度 | 42244 | 43-06 | F3AA030 |
| 最大ノード燃焼度 | 51094 | 43-06-11 | F3AA030 |

## 出力分布ピーキングデータ

| データ項目 | 係数 | (X-Y-Z) |
|---|---|---|
| 軸方向ピーキング | 1.454 | 05 |
| 径方向ピーキング | 1.369 | 39-36 |
| グロスピーキング | 2.216 | 39-36-04 |
| トータルピーキング | 2.615 | 39-36-04 |

## 熱的制限値データ(対称位置を除く上位5個)　熱的制限値データ(燃料分類)

| 限界出力比の番号 | 1 | 2 | 3 | 4 | 5 | STEP3A | MOX |
|---|---|---|---|---|---|---|---|
| 限界出力比制限比 | 0.882 | 0.879 | 0.876 | 0.871 | 0.867 | 0.882 | 0.738 |
| ・限界出力比 | 1.463 | 1.468 | 1.473 | 1.481 | 1.488 | 1.463 | 1.734 |
| ・径方向ピーキング | 1.361 | 1.369 | 1.364 | 1.333 | 1.339 | 1.361 | 1.201 |
| ・チャンネル流量配分 | 0.979 | 0.974 | 0.977 | 0.988 | 0.986 | 0.979 | 1.040 |
| ・R因子 | 1.025 | 1.021 | 1.021 | 1.030 | 1.026 | 1.025 | 0.998 |
| ・バンドル座標 (X-Y) | 19-24 | 39-36 | 17-14 | 25-22 | 23-20 | 19-24 | 17-22 |
| ・バンドル名 | F3AD108 | F3AE026 | F3AE024 | F3AD100 | F3AD104 | F3AD108 | UMF0004 |

| 線出力密度の番号 | 1 | 2 | 3 | 4 | 5 | STEP3A | MOX |
|---|---|---|---|---|---|---|---|
| 線出力密度制限比 | 0.927 | 0.910 | 0.903 | 0.896 | 0.880 | 0.903 | 0.927 |
| ・線出力密度 (kW/m) | 40.78 | 40.01 | 39.72 | 39.37 | 38.68 | 39.72 | 40.78 |
| ・トータルピーキング | 2.177 | 2.136 | 2.615 | 2.102 | 2.547 | 2.615 | 2.177 |
| ・径方向ピーキング | 1.201 | 1.193 | 1.369 | 1.193 | 1.364 | 1.369 | 1.201 |
| ・軸方向ピーキング | 1.469 | 1.466 | 1.618 | 1.420 | 1.575 | 1.618 | 1.469 |
| ・局所ピーキング | 1.234 | 1.221 | 1.180 | 1.241 | 1.185 | 1.180 | 1.234 |
| ・ノード座標 (X-Y-Z) | 17-22-04 | 37-34-04 | 39-36-04 | 21-18-04 | 17-14-04 | 39-36-04 | 17-22-04 |
| ・バンドル名 | UMF0004 | UMF0014 | F3AE026 | UMF0008 | F3AE024 | F3AE026 | UMF0004 |

## 炉心平均軸方向相対分布

| Z | 出力 | 燃焼度 | ボイド率 |
|---|---|---|---|
| 24 | 0.128 | 0.156 | 0.706 |
| 23 | 0.244 | 0.255 | 0.704 |
| 22 | 0.666 | 0.772 | 0.698 |
| 21 | 0.774 | 0.892 | 0.688 |
| 20 | 0.888 | 1.030 | 0.676 |
| 19 | 0.962 | 1.120 | 0.661 |
| 18 | 0.979 | 1.151 | 0.646 |
| 17 | 0.956 | 1.132 | 0.630 |
| 16 | 0.986 | 1.169 | 0.611 |
| 15 | 1.050 | 1.116 | 0.590 |
| 14 | 1.062 | 1.126 | 0.565 |
| 13 | 1.090 | 1.156 | 0.538 |
| 12 | 1.128 | 1.187 | 0.508 |
| 11 | 1.155 | 1.195 | 0.474 |
| 10 | 1.164 | 1.182 | 0.435 |
| 09 | 1.207 | 1.196 | 0.392 |
| 08 | 1.253 | 1.199 | 0.341 |
| 07 | 1.282 | 1.168 | 0.284 |
| 06 | 1.382 | 1.197 | 0.217 |
| 05 | 1.454 | 1.198 | 0.142 |
| 04 | 1.448 | 1.139 | 0.069 |
| 03 | 1.323 | 1.003 | 0.017 |
| 02 | 1.100 | 0.804 | 0.000 |
| 01 | 0.318 | 0.231 | 0.000 |

Attachment-3-5
NM-51-4 1F-F1-001　Manual of writing a Task Handover Journal
October 1, 2008 (11)

Form-1
Fukushima Daiichi Nuclear Power Plant Unit 3 and 4

Shift Supervisor Task Handover Journal（1/3）

# Shift Supervisor Task Handover Journal

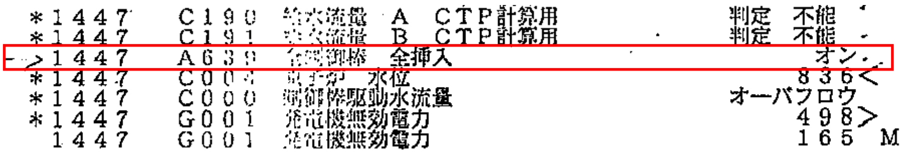
| | | |
|---|---|---|
| | | [confirmed by］ Chief engineer of reactors |
| | | |
| March 11, 2011, Friday, 21:00, Shift 1, Group A | ［confirmed by］<br>Supervisor of next shift | ［made and approved by］<br>Shift supervisor |
| | | |

| | | | | | |
|---|---|---|---|---|---|
| On duty<br>8（operator）<br>-　（instructor）<br>1　（trainee） | | No. of organization | Off duty | [redacted] | Support duty |
| | | 172 | Replacement | [redacted] | Refer to attachment |
| Unit 3 | Generator Output | 0MWe | Reactor Status | in operation・start up・[✓ hot shutdown]・cold shutdown・fuel exchange | |
| Unit 4 | Generator Output | 0MWe | Reactor Status | in operation・start up・hot shutdown・cold shutdown・[✓ fuel exchange] | |

| Notes | |
|---|---|
| Unit 3 | |
| 1. Operation Status | |
| (1) Reactor is shutdown | |
| (2) Alarm “SEISMIC TRIP” | 14:47 |
| (3) Reactor automatic scram | 14:47 |
| (4) Main turbine manual trip | 14:47 |
| (5) M Cond Vac break | 14:51-15:15 |
| (6) Reactor in subcriticality | 14:54 |
| (7) Reactor mode switch “operation” to “shutdown” | 15:08 |
| (8) Status of reactor “operation” to “hot shutdown” | 15:08 |
| (9) Loss of station power supply / report stipulated by articule 10 of the act on special measures concerning nuclear emergency preparedness (from Technical Support Center (TSC)) | 15:38/15:42 |
| (10) RCIC “start up” | 16:03 |
| (11) Report stipulated by article 15 of the act on special measures concerning nuclear emergency preparedness (from TSC) | 16:36 |
| | |
| 2. Compliance status of safety regulation | |
| abnormal, following articles are applicable | |
| (1) Article 17 (procedures at the time of earthquake and fire) | |
| (2) Article 76 (basic procedures at the occurrence of abnormal event) | |
| (3) Article 77 (procedures at the time of abnormal event) | |
| (4) Article 113 (notice) | |
| (5) Article 121 (report) | |

【Unit 3 Alarm Typer】

【３号機アラームタイパ】

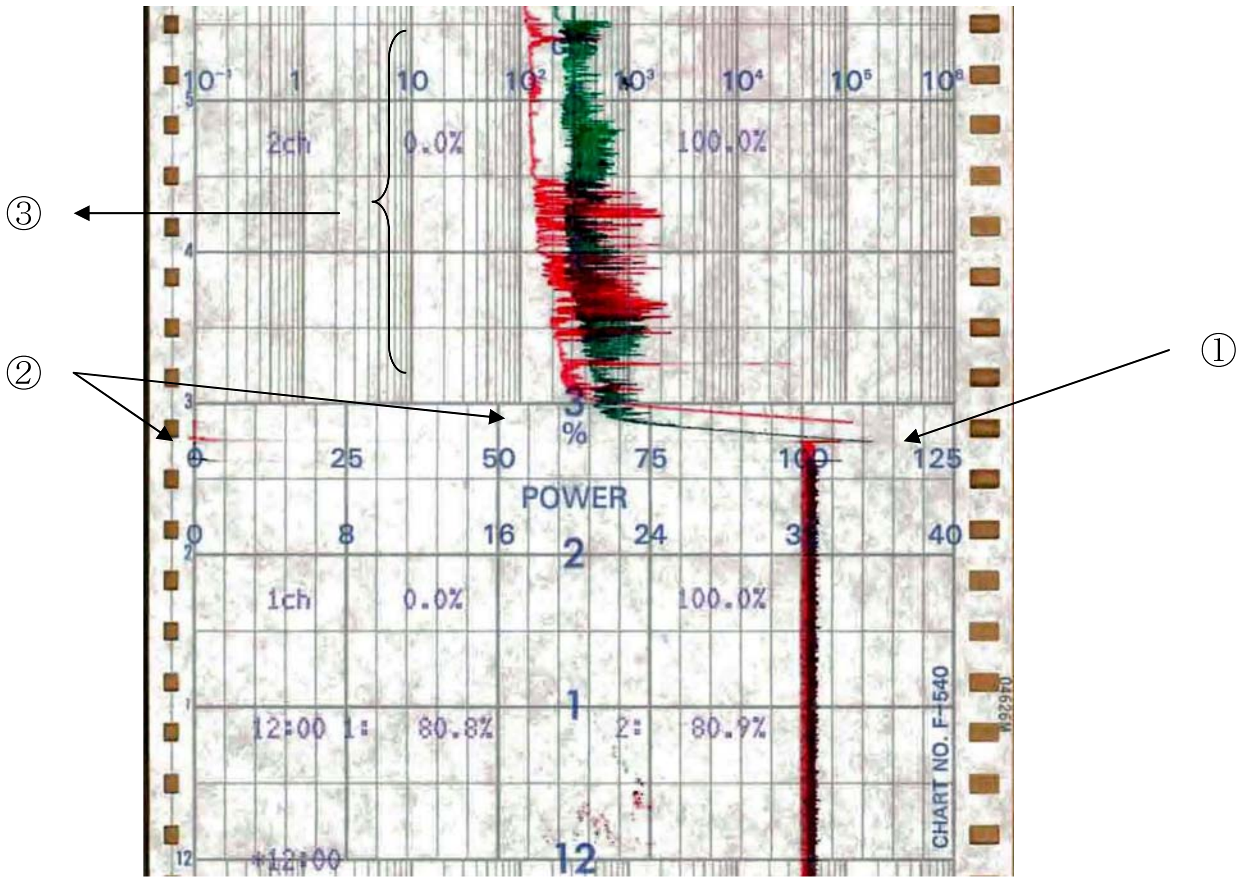


```
*1447   C190  給水流量  A  CTP計算用           判定 不能
*1447   C191  給水流量  B  CTP計算用           判定 不能
->1447  A639  全制御棒  全挿入                      オン
*1447   C004  原子炉  水位                          836<   1002  MM
*1447   C000  制御棒駆動水流量                 オーバフロウ
*1447   G001  発電機無効電力                        498>    390  MVAR
 1447   G001  発電機無効電力                        165  MVAR  正常  復帰
```

←Complete insertion of all control rods

← 全制御棒全挿入

## 【３号　ＳＲＮＭ、ＡＰＲＭ】



| NR-7-46A | | |
|---|---|---|
| No.1 | 🟥 | SRNM ch.A／APRM ch.A 出力レベル |
| No.2 | 🟩 | SRNM ch.C／APRM ch.C 出力レベル |

①　１４時４７分　地震によるスクラムとスクラムによる出力低下

②　平均出力領域モニタ（ＡＰＲＭ）としてのダウンスケールと起動領域モニタ（ＳＲＮＭ）への切替

③　ノイズによる指示の変動

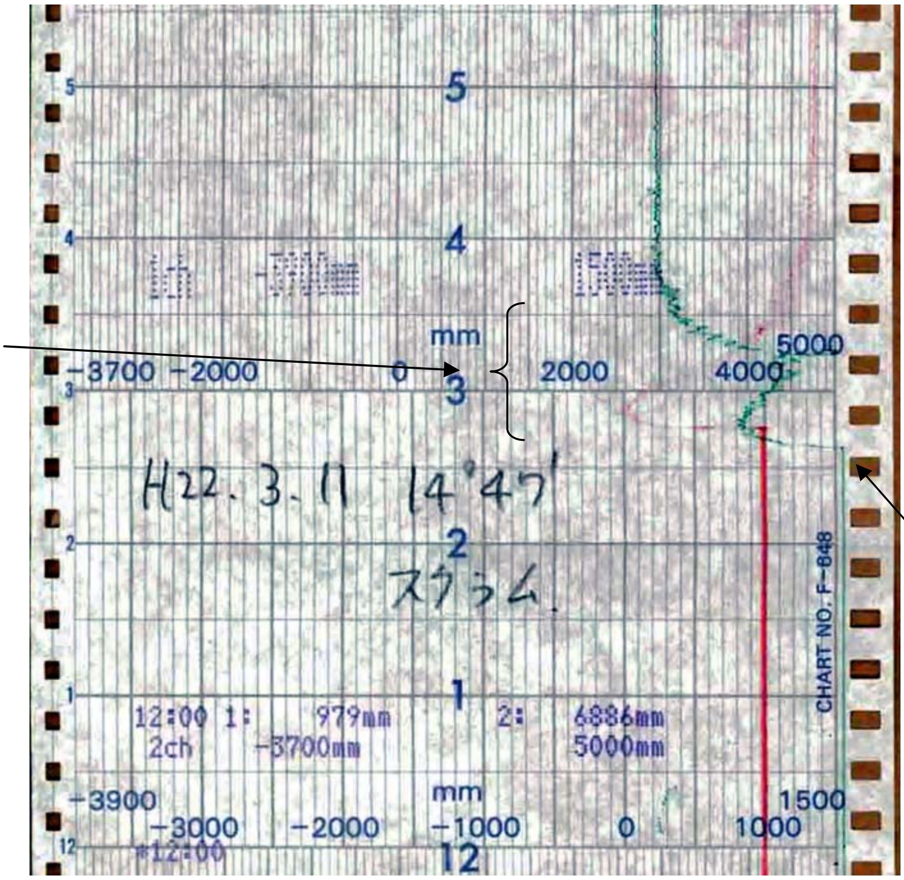
①14:47 Scram due to the earthquake and the output decrease due to the scram

②Below detectible level by Average Power Output Region Monitor (APRM), and switch to Startup Region Monitor (SRNM)

③ Fluctuation of indication due to noise

## 【Unit 3 Reactor water level (wide band range, fuel range)】

## 【３号　原子炉水位（広帯域、燃料域）】



②

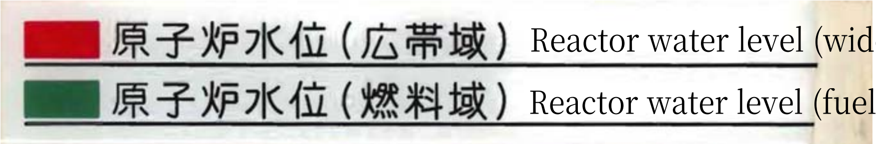
14:49

14:48

14:47　スクラム

L3で記録紙送り速度上昇

①



🟥 原子炉水位（広帯域） Reactor water level (wide band range)

🟩 原子炉水位（燃料域） Reactor water level (fuel range)

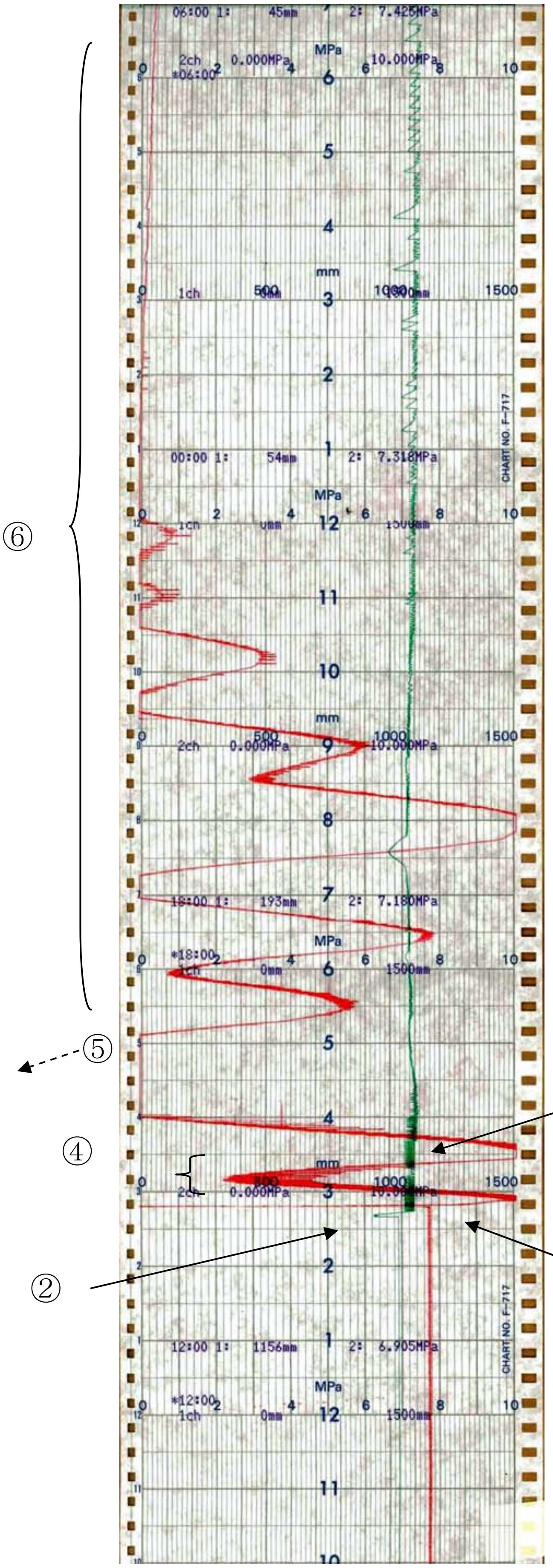
①　１４時４７分　地震によるスクラム

②　スクラムによる出力低下、タービン止め弁閉止、主蒸気隔離弁閉止等の外乱に伴う水位変動

①14:47 Scram due to the earthquake
② Water level fluctuation caused by output decrease due to the scram, Main Stop Valve closure, Main Steam Isolation Valve closure, etc

# 【Unit 3 Reactor water level, Reactor Pressure 1/3】

# 【３号原子炉水位、原子炉圧力（１／３）】



| | | |
|---|---|---|
| LR/PR-6-97 | | |
| No.1 | 🟥 | 原子炉水位 |
| No.2 | 🟩 | 原子炉圧力 |

①　１４時４７分　地震によるスクラム

②　出力低下による炉圧低下とそれに続く主蒸気隔離弁閉による炉圧増加

③　主蒸気逃し安全弁による炉圧制御

④　主蒸気逃し安全弁開閉、原子炉隔離時冷却系の起動・停止に伴う水位変動

　　１５時０５分　原子炉隔離時冷却系起動

　　１５時２５分　同系トリップ（水位高）

⑤　原子炉隔離時冷却系の起動に伴う水位変動

　　１６時０３分　原子炉隔離時冷却系起動

⑥　炉圧７ＭＰａ程度、炉水位は狭帯域（有効燃料頂部から約４ｍ上に設定された通常運転時に使用される水位計装域）レンジに維持され、安定的に推移

①14:47 Scram due to the earthquake

② Reactor pressure decrease due to output decrease and subsequent reactor pressure rise caused by Main Steam Isolation Valve closure

③ Reactor pressure control by Safety Relief Valve

④ Water level fluctuation caused by Safety Relief Valve open/close and Reactor Core Isolation Cooling System start/stop

　15:05 Reactor Core Isolation Cooling System start

　15:25 Reactor Core Isolation Cooling System trip (High water level)

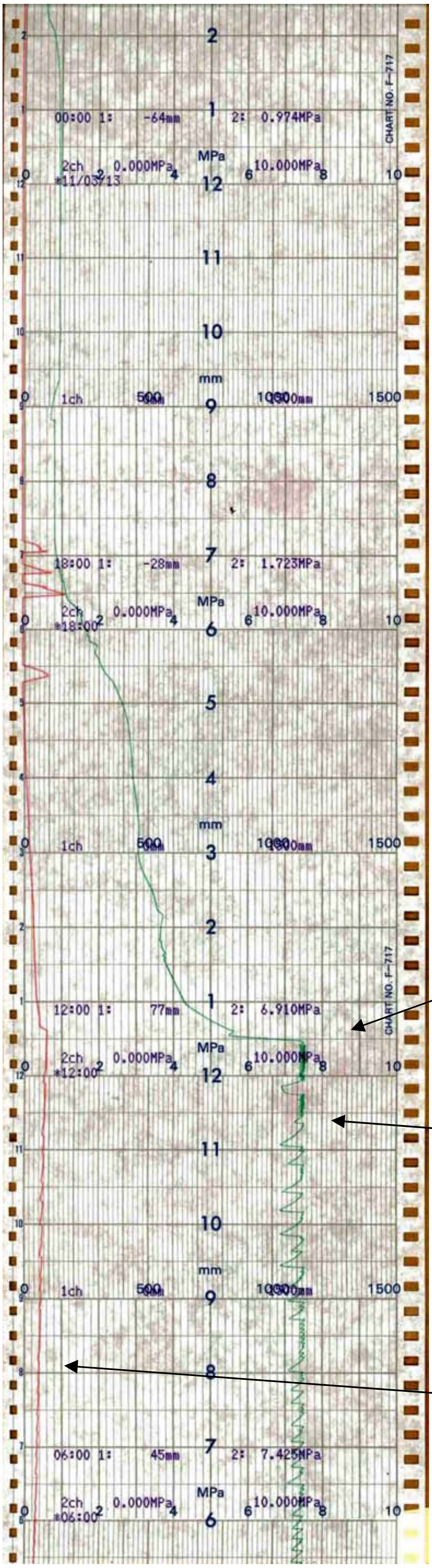
⑤ Water level fluctuation caused by Reactor Core Isolation Cooling System start

　16:03 Reactor Core Isolation Cooling System start

⑥ Reactor pressure is around 7MPa, water level was kept within the narrow band range (area of water level instrumentation device for normal operation located approx. 4 meters above from the top of active fuel) by water injection, and is maintained stably.

## 【Unit 3 Reactor water level, Reactor Pressure 2/3】

## 【３号原子炉水位、原子炉圧力（２／３）】



| LR/PR-6-97 | | |
|---|---|---|
| No.1 | 🟥 | 原子炉水位 |
| No.2 | 🟩 | 原子炉圧力 |

⑦　炉水位は狭帯域（有効燃料頂部から約４ｍ上に設定された通常運転時に使用される水位計装域）レンジに維持され、安定的に推移。

⑧　３月 12 日 11 時 30 分頃より、圧力制御の様相変化（11 時 30 分頃より小刻みな変動）
11 時 36 分　原子炉隔離時冷却系停止

⑨　３月 12 日 12 時頃より、６時間程度かけて炉圧の低下

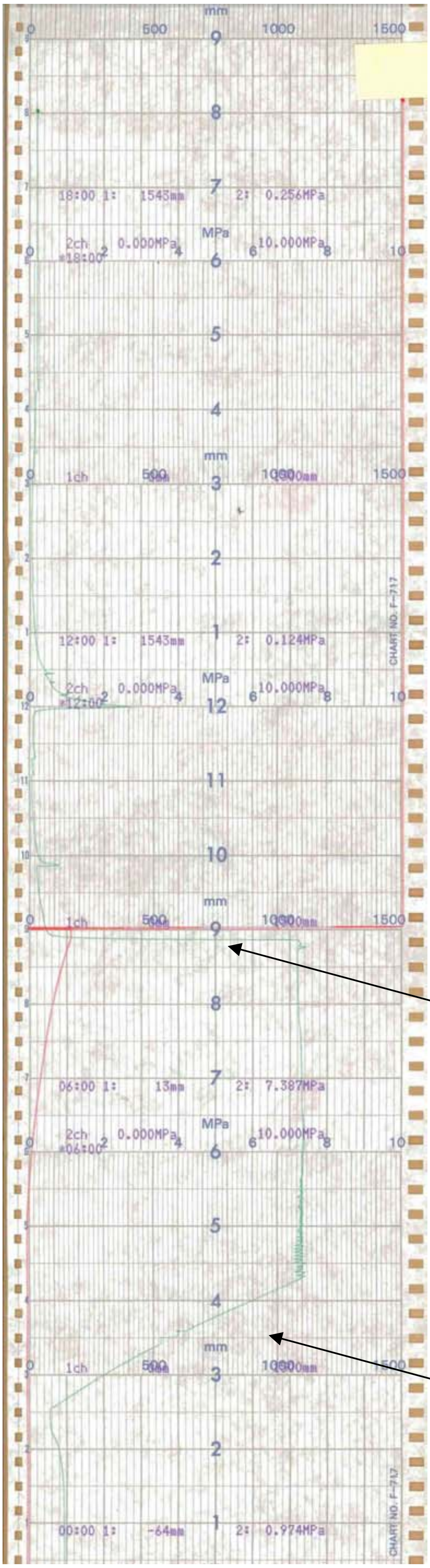
⑦ Water level was kept within the narrow band range (area of water level instrumentation device for normal operation located approx. 4 meters above from the top of active fuel) by water injection, and is maintained stably.

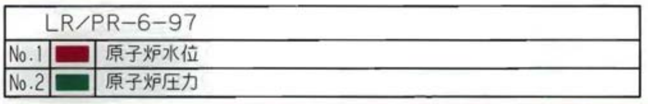
⑧ From around 11:30 on March 12, situation of pressure control changed (From around 11:30, small fluctuation started)
11:36 Reactor Core Isolation Cooling System stopped

⑨ From around 12:00 on March 12, reactor pressure decreased over around 6 hours.

## 【Unit 3 Reactor water level, Reactor Pressure 3/3】

## 【３号原子炉水位、原子炉圧力（３／３）】





| LR/PR-6-97 | | |
|---|---|---|
| No.1 | 🟥 | 原子炉水位 |
| No.2 | 🟩 | 原子炉圧力 |

⑩　3 月 13 日 2 時頃より炉圧上昇

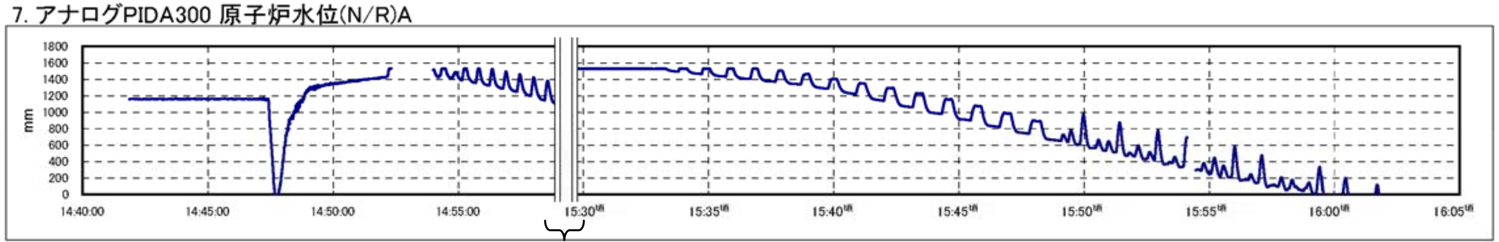
⑪　3 月 13 日 9 時頃より炉圧減圧

⑩ From around 2:00 on March 13, reactor pressure rise

⑪ From around 9:00 on March 13, reactor pressure decrease

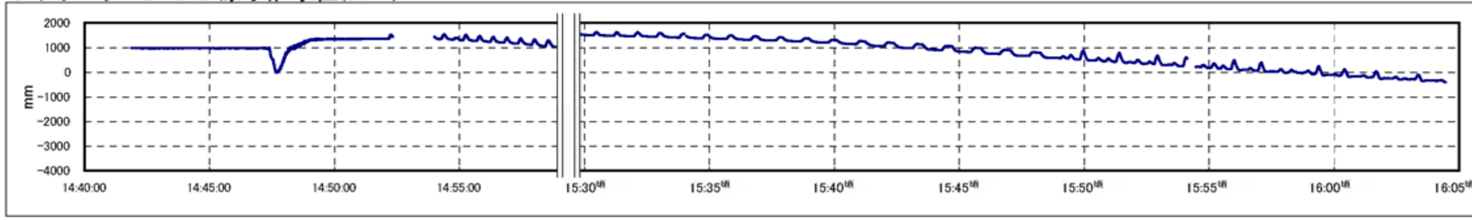
<table>
<tr><th>パラメータ</th><th>備　考</th></tr>
<tr><td>

7. アナログPIDA300 原子炉水位(N/R)A



約30分間の欠測と想定（以下同じ）

8. アナログPIDA303 原子炉水位(W/R)A



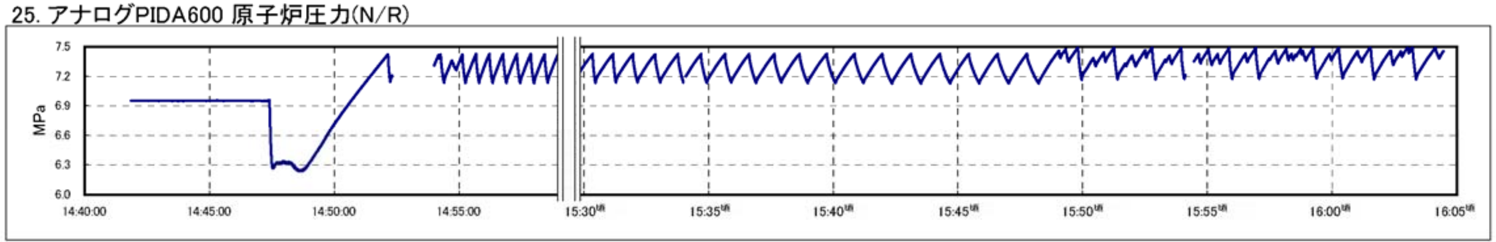
</td><td>

原子炉水位は、スクラム直後にボイド（気泡）のつぶれに伴い瞬時変動し、その後通常水位に復帰している。14時55分前あたりから、主蒸気逃し安全弁の開閉動作に伴い原子炉水位は周期的に変動している。また、水位は徐々に低下している。

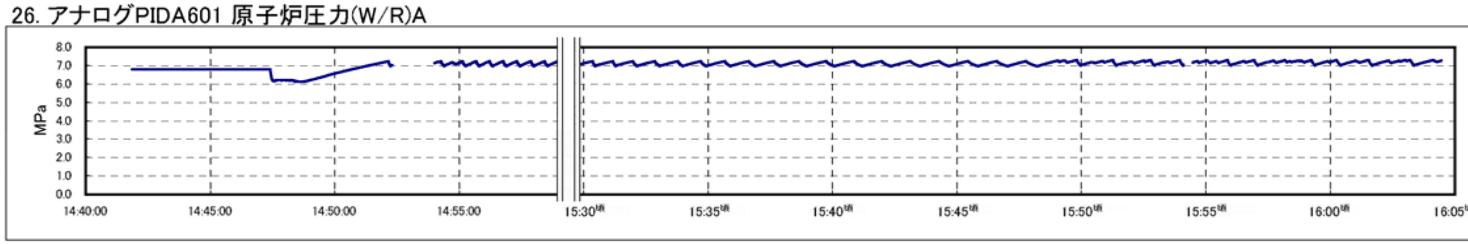
Water level in the reactor was changed immediately after the scram due to the crash of void and maintained within the normal level thereafter. Since around 14:55, water level in the reactor was fluctuated periodically due to the opening/closure of safety relief valves. Water level was decreased gradually.

</td></tr>
<tr><td>

25. アナログPIDA600 原子炉圧力(N/R)



26. アナログPIDA601 原子炉圧力(W/R)A

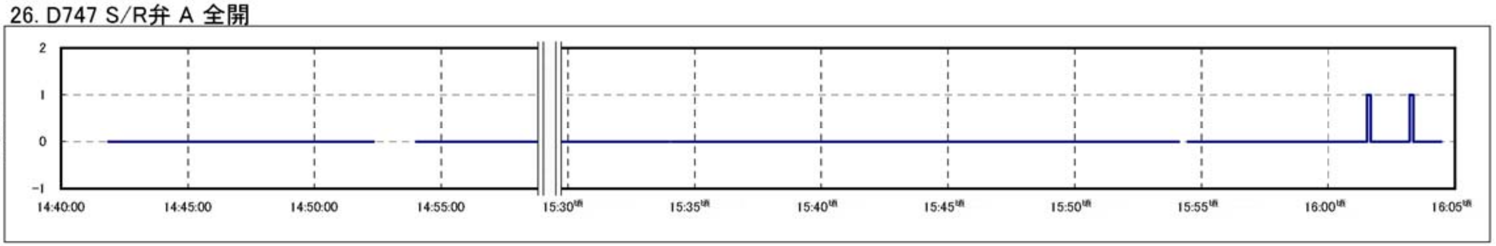
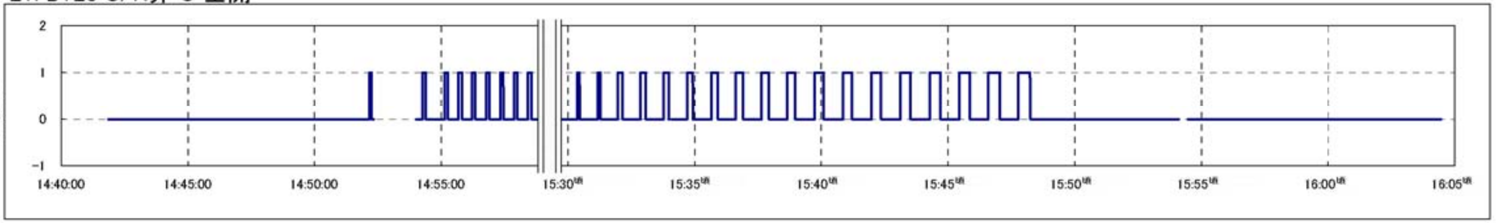
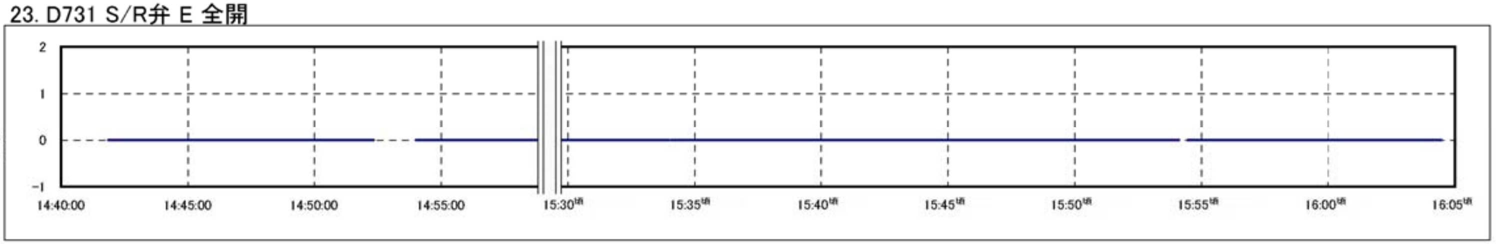
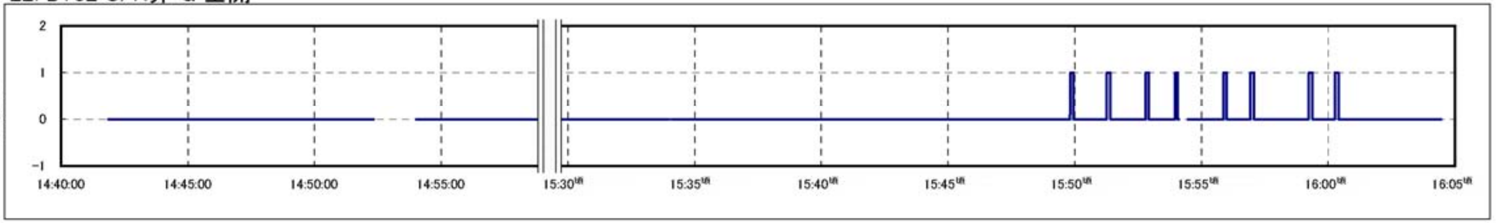


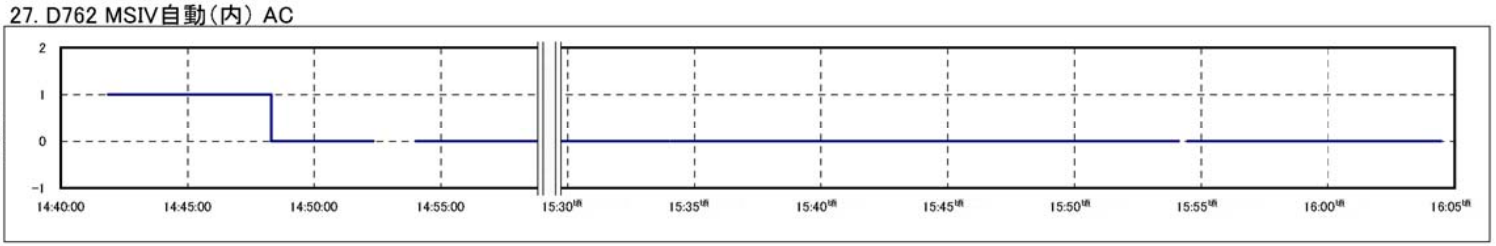
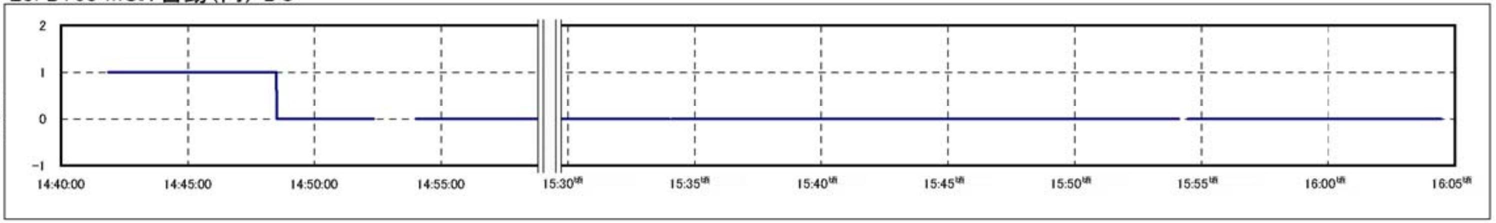
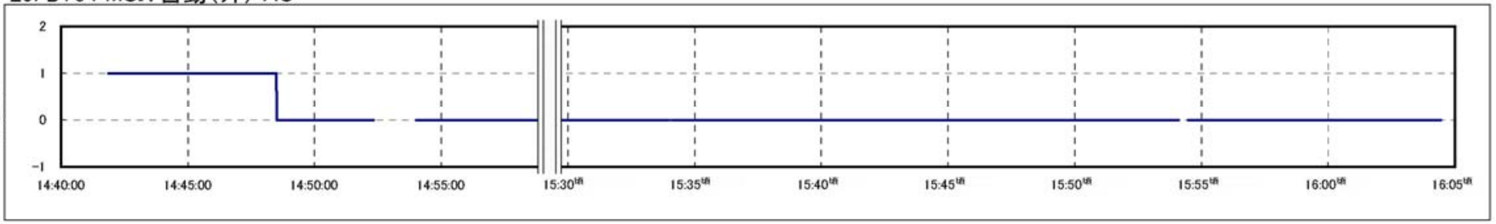
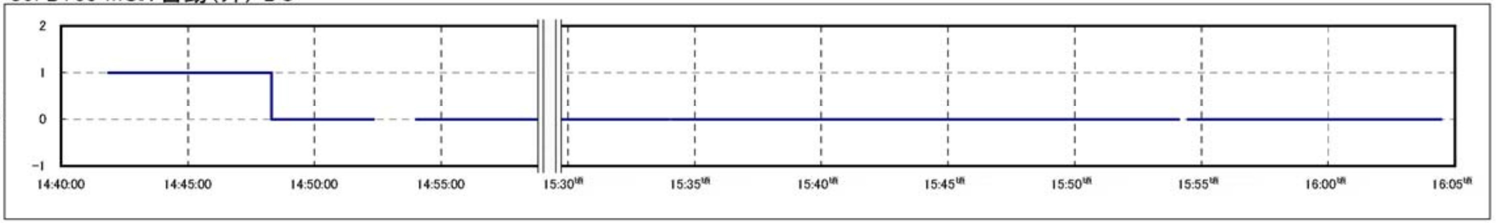
</td><td>

原子炉圧力は、スクラム直後に低下し、その後主蒸気隔離弁が閉鎖することで、崩壊熱により上昇するものの主蒸気逃し安全弁の開閉動作により周期的に変動している。

Pressure in the reactor was decreased immediately after the scram. It was later increased due to the decay heat after the closure of the main steam isolation valve, however, it was fluctuated periodically due to the operation of main steam safety relief valves.

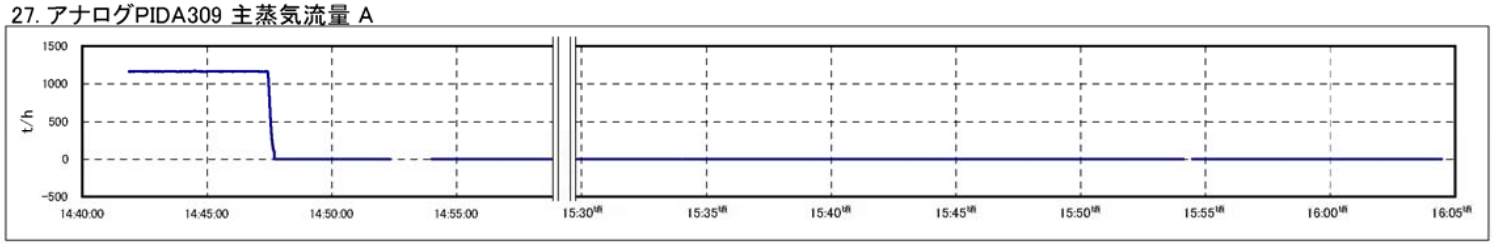
</td></tr>
</table>

| パラメータ | 備　考 |
|---|---|
| 26. D747 S/R弁 A 全開<br> <br>21. D728 S/R弁 C 全開<br> <br>23. D731 S/R弁 E 全開<br> <br>22. D732 S/R弁 G 全開<br> | 主蒸気逃し安全弁（SR弁）は、14時55分前あたりから周期的に作動している。<br>主蒸気逃し安全弁は、当初C弁が動作していたが、動作回数が多く作動圧力を喪失したためにG弁に切り替わり、同様にアキュムレータの作動圧力を喪失したG弁からA弁に切り替わっていたものと推定する。<br>Main steam safety relief valves (SRVs) were operated periodically since around 14:55. Regarding SRVs, it is estimated that initially the valve C was operated, however, later it was switched to valve G since it lost the working pressure due to frequent operations, and it was further switched to valve A since the accumulator of valve G lost its working pressure. |

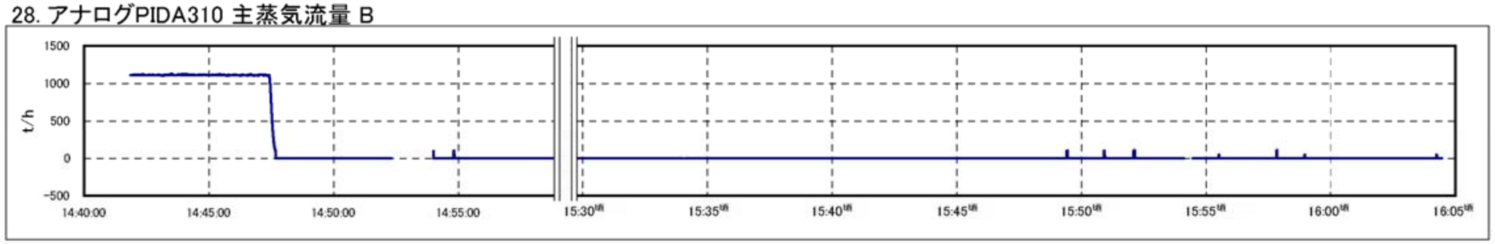
| パラメータ | 備　考 |
|---|---|
| 27. D762 MSIV自動（内） AC<br><br>28. D763 MSIV自動（内） DC<br><br>29. D764 MSIV自動（外） AC<br><br>30. D765 MSIV自動（外） DC<br> | 主蒸気隔離弁については、内側弁、外側弁の閉鎖信号が出ている。<br>Regarding main steam isolation valve, signals indicating the closure of inside and outside valves were transmitted. |

<table>
<tr><th>パラメータ</th><th>備　考</th></tr>
<tr><td>

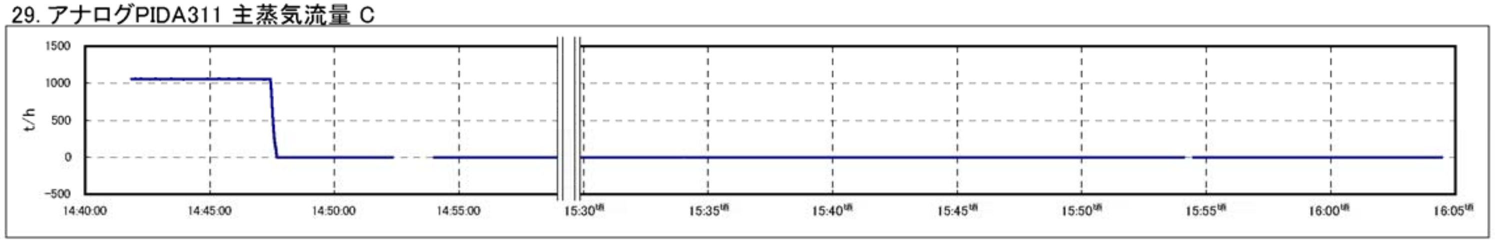
27. アナログPIDA309 主蒸気流量 A



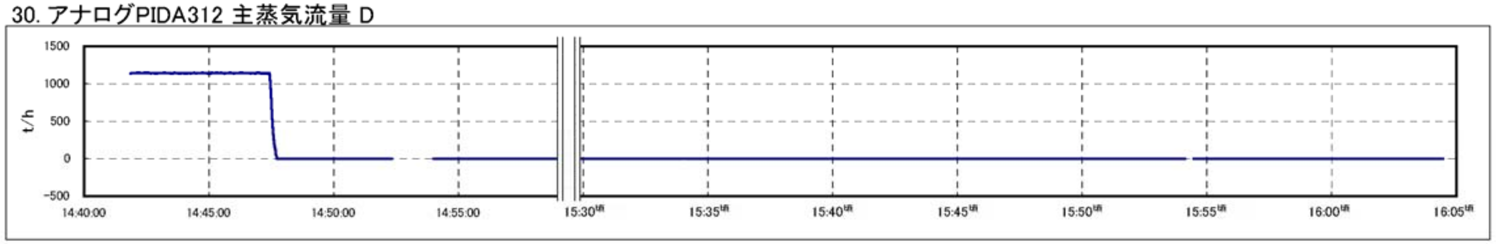
28. アナログPIDA310 主蒸気流量 B



29. アナログPIDA311 主蒸気流量 C



30. アナログPIDA312 主蒸気流量 D



</td><td>

主蒸気流量については、主蒸気隔離弁が閉鎖し、流量は0 （ゼロ）となっており、その過程で蒸気流量の増大等はなく、主蒸気の漏えいの兆候は認められない。

Regarding main steam flow rate, main steam isolation valve is closed thus the flow rate is zero (0). There was no increase of flow rate, and there is no evidence showing the leakage of the main steam.

</td></tr>
</table>

1F-3-20

## 【３号機　アラームタイパ】

```
 １５０４　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３１．５　ＤＥＧＣ　正常　復帰
 １５０４　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オフ
＊１５０４　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オン
 １５０４　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　　　２　Ａ　　　　正常　復帰
＊１５０４　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３２．３＞　３２．０　ＤＥＧＣ
 １５０４　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オフ
 １５０４　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オン
＊１５０４　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　－０＜　　　－０　Ａ
 １５０４　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オン
 １５０４　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オフ　正常　復帰
 １５０４　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　　　２　Ａ　　　　正常　復帰
 １５０４　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３２．０　ＤＥＧＣ　正常　復帰
 １５　０４　５６　０３０　Ｄ６２５　逃し安全弁　Ｃ　開　　　　　　　　　　　　　　　オン
＊１５０４　Ｃ００６　炉心圧力損失　　　　　　　　　　　　　下限　逸脱
＊１５０５　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　－０＜　　　－０　Ａ
 １５０５　Ｃ００６　炉心圧力損失　　　　　　　　　　　　　　　－１　ＫＰＡ　　正常　復帰
 １５　０５　０３　９１０　Ｄ６２５　逃し安全弁　Ｃ　開　　　　　　　　　　　　　　　オフ
 １５０５　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オフ
＊１５０５　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オン
 １５０５　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オフ
 １５０５　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オン
 １５０５　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オン
 １５０５　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オフ　正常　復帰
 １５０５　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オフ
＊１５０５　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オン
 １５０５　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オフ
 １５０５　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オン
 １５０５　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オン
 １５０５　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オフ　正常　復帰
 １５　０５　３０　４４０　Ｄ６２５　逃し安全弁　Ｃ　開　　　　　　　　　　　　　　　オン
＊１５０５　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３２．３＞　３２．０　ＤＥＧＣ
＊１５０５　Ｃ００６　炉心圧力損失　　　　　　　　　　　　　下限　逸脱
 １５０５　Ｃ００６　炉心圧力損失　　　　　　　　　　　　　　　－０　ＫＰＡ　　正常　復帰
 １５　０５　３８　２１０　Ｄ６２５　逃し安全弁　Ｃ　開　　　　　　　　　　　　　　　オフ
 １５０５　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３１．８　ＤＥＧＣ　正常　復帰
 １５　０５　３９　０２０　Ｄ６４５　ＲＣＩＣタービン　起動　RCIC turbine Start　　　オン
 １５０５　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　　　２　Ａ　　　　正常　復帰
＊１５０５　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３２．２＞　３２．０　ＤＥＧＣ
 １５０５　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オフ
＊１５０５　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オン
＊１５０５　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　－０＜　　　－０　Ａ
 １５０５　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３２．０　ＤＥＧＣ　正常　復帰
 １５０５　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オフ
 １５０５　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オン
 １５０５　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オン
 １５０５　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オフ　正常　復帰
＊１５０５　Ｂ２４５　ＲＣＩＣ　系統　流量　　　　　　　　　　　下限　逸脱
＊１５０６　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３２．３＞　３２．０　ＤＥＧＣ
 １５０６　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オフ
＊１５０６　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オン
 １５０６　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オフ
 １５０６　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オン
 １５０６　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オン
 １５０６　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オフ　正常　復帰
 １５　０６　０６　７７０　Ｄ６２５　逃し安全弁　Ｃ　開　　　　　　　　　　　　　　　オン
 １５０６　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　　　２　Ａ　　　　正常　復帰
＊１５０６　Ｇ００５　発電機　界磁電流　　　　　　　　　　　　　－０＜　　　－０　Ａ
 １５　０６　１４　４１０　Ｄ６２５　逃し安全弁　Ｃ　開　　　　　　　　　　　　　　　オフ
＊１５０６　Ｔ００６　タービングランドシール蒸気圧力　　　０．０１１＜　０．０１１　ＭＰＡ
 １５０６　Ｂ６１３　ＲＣＩＣ　注入弁　　開　　　　　　　　　　　　オン
 １５０６　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オフ
＊１５０６　Ａ５１５　ＲＷＭ　制御棒　阻止　警報　　　　　　　　　　オン
 １５０６　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オフ
 １５０６　Ｂ２２０　Ｓ／Ｃ　水温　１系（３１°付近）　　　　　３１．９　ＤＥＧＣ　正常　復帰
 １５０６　Ａ５４７　ＲＷＭ　制御棒　引抜許可　エコー　　　　　　　オン
 １５０６　Ａ５４８　ＲＷＭ　制御棒　挿入許可　エコー　　　　　　　オン
```

添付資料－３－１４

【3号機　アラームタイパ】

```
  時      分       秒     ミリ秒    PID           ポイント名                                状  態
 1525     A547   RWM  制御棒  引抜許可  エコー              オフ
 15   25    01     000     D648＊  RCICタービン  起動 RCIC turbine Start          オフ
 15   25    02     880     D585    原子炉水位高  トリップ Reactor water level highトリップ
 1525     A547   RWM  制御棒  引抜許可  エコー              オン
 1525     A548   RWM  制御棒  挿入許可  エコー              オン
 1525     A515   RWM  制御棒  阻止  警報                    オフ  正常  復帰
 1525     A548   RWM  制御棒  挿入許可  エコー              オフ
＊1525     A615   RWM  制御棒  阻止  警報                    オン
 1525     A547   RWM  制御棒  引抜許可  エコー              オフ
 1525     A547   RWM  制御棒  引抜許可  エコー              オン
 1525     A548   RWM  制御棒  挿入許可  エコー              オン
 1525     A615   RWM  制御棒  阻止  警報                    オフ  正常  復帰
 1525     B613   RCIC  注入弁    開                         オフ
終了
```

# Operator Task Handover Journal - Appendix

Friday, March 11, 2011

1/

| Operation ・ Time of Event | Contents |
|---|---|
| | |
| **14:47** | **Earthquake Occurred Unit 3 Acceleration Horizontal: 507.0gal Up and Down: 231gal (equivalent to Seismic intensity lower 6)** |
| **14:47** | **RxScrum *Successful** |
| **14:47** | **Main Turbine "Manual Trip" O - 3 "Automatically Open" LS - 3 "Manually Open"** |
| | *Internal Switching Failed (Cause Unknown) |
| | *D/G3A, D/G3B Start Successful |
| | Feed Water Dead Stop, SW Dead Stop |
| | |
| **14:51 / 15:15** | **Main Condenser Vacuum Break** |
| | |
| **14:54** | **Subcritical Confirmed** |
| | |
| **15:56** | **L- 8** |
| | |
| 15:02 | SW Pump B "Start" |
| | |
| 15:02 | S/P Water Temperature 32°C |
| | |
| 15:06 / 15:25 | RCIC Quick Start/ L-8 Trip |
| | |
| 15:08 | Reactor Mode SW "Stop" |
| | |
| 15:15 | P/C3SA Power Received (Power Received from P/C3D) |
| | |
| 15:24 / 15:25 | RPS M-G(A) "Start"/"Power Receive" |
| 15:28 / 15:29 | RPS M-G(A) "Start"/"Power Receive" |
| | |
| 15:26 | STr3A 3 Points at the Bottom Confirmed *Leakage point Not Detected |
| | |
| 15:31 | T/B Sump "P/L" |
| 15:33 | R/B Sump "P/L" |
| | |
| 15:33 | ANN "Leakage at Condenser Area" ANN Occurred *Damage by Tsunami |
| | |
| 15:36 | SW Pump B "Trip" |
| | |
| | |
| | |

Friday, March 11, 2011

| | | Contents |
|---|---|---|
| Operation · Time of Event | | |
| | **15:38** | **SBO** |
| | **15:42** | **Report under Article 10 (from Technical Support Center)** |
| | | |
| | 16:03 | RCIC"Start"   R*Water Level: -500mm   S/C Level: 150mm (Rise due to mini-flow valve open) |
| | | RCIC mini-flow valve "Close" |
| | 16:13 | HPCI, RCIC Water Source Switching Prevention Lift |
| | 16:16 | RCIC Injection Start   RxWater Level: -900mm |
| | | |
| | 16:04 | Ceiling Crane   3 staff rescued (5F No lights) |
| | | |
| | 16:12 | PNL9-3 ANN"D/W Pressure High" |
| | | |
| | 16:24 | Main Turbine EOP"Stop"   (Except ESOP) |
| | | |
| | **16:36** | **Report under Article 15 (from Emergency Measures Office)** |
| | | |
| | 16:45 | Stack 3cps   RxWater Level: -450mm   Reactor Pressure: 7.3MPa   RCIC: 19L/s |
| | 16:55 | R*Water Level: -150mm   Reactor Pressure: 7.25MPa |
| | | |
| | 17:06 | Generator   Disaster Prevention Equipment Start |
| | | |
| | 17:12 | Process Computer Monitor Power "Off" |
| | | |
| | 17:13 | D/W Pressure 130kPaabs   S/C Level: 200cm |
| | | |
| | 17:41 | Earthquake Occurred |
| | | |
| | 17:48 | ESOP "Stop" |
| | | |
| | 17:30 | Process Computer Room Emergency Lights "Off" (Removed the fluorescent lights) |
| | 18:45 | Main Control - Fuel Change TEL⑧, Jack ⑦ "Off" |
| | 19:08-19:11 | Process Computer Power "Off" |
| | 19:16 | Power "Off" |
| | 20:30 | 2nd Main Control EHC, T/D Panel Power "Off" |
| | 21:11 | CRD Panel 9-27, 28 Power "Off" |
| | 21:27 | Main Control Temporary lighting equipment, Main Control DC Lights "Off" |
| | | |
| | 23:07-23:20 | Vital Power Supply "Off" (Cable Volt Room) |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## Saturday, March 12, 2011

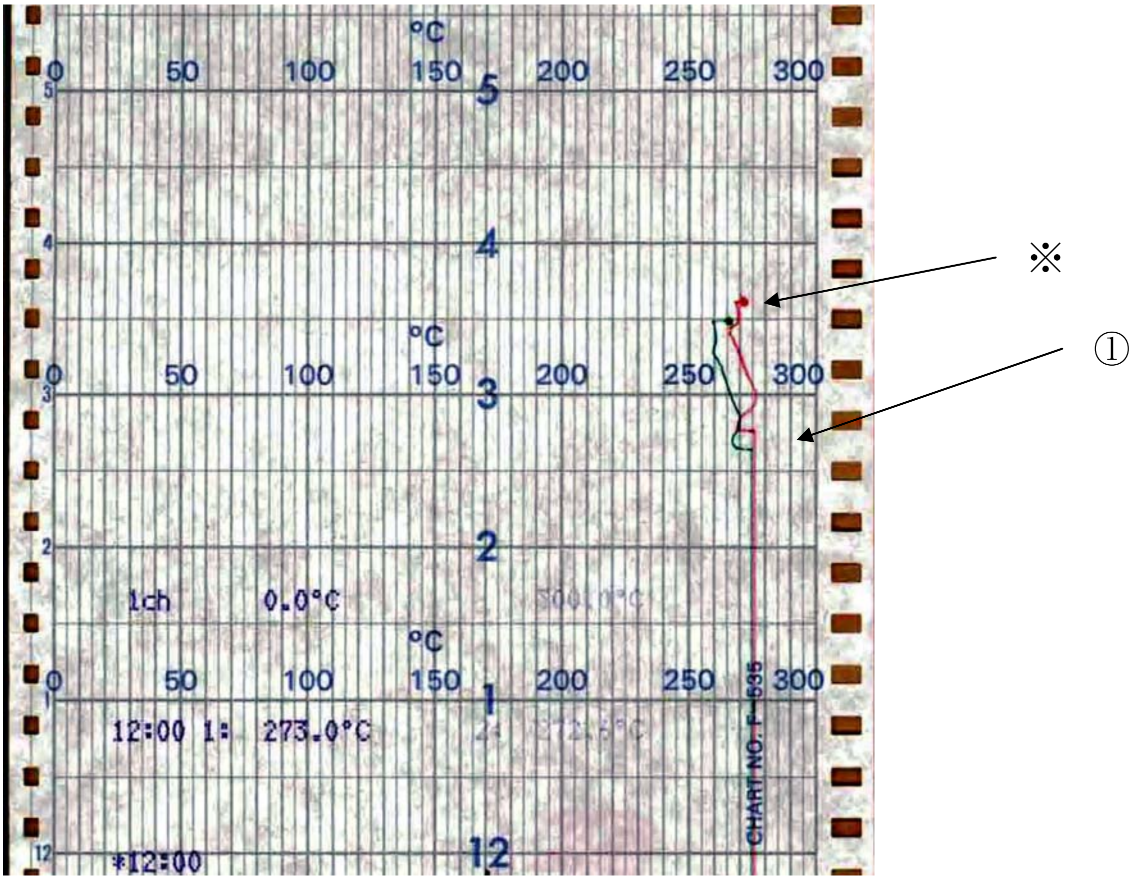
| | | Contents |
|---|---|---|
| Operation ・ Time of Event | 2:32 | Main Control Room Clock Power "Stop" |
| | 2:45 | Main Control Room Power Supply for Communication "Off] |
| | 3:27 | D/D FP Pump "Activation Confirmation" (Activation Failed Cause Unknown) |
| | 4:03 | HPCI Test Valve MO-23-21 "Open "Prevention Lift |
| | 8:11 | AM Facility MO-111 "Fully Open" |
| | 8:52 | NSS Side ANN Pilot Lump "All Out" |
| | 9:27 | Stack Monitor D.S Confirmation No Power Supply |
| | 10:18 | CST Supply LCV Bypass Valve "Open" |
| | 10:18 | Unit 1 D/W Ventilation |
| | 11:13 | RCIC MO-18, 19, 41 NFB "OFF" |
| | 11:13 | D/D FP Pump "Manual start at Site"(Confirmed) / "Stop"(Automatic start after Being Stopped at Main Control Room) |
| | 11:36 | D/D FP Pump "Emergency Stop" (Activated for Confirmation, but Did not stop. Stopped by Emergency Stop PB) |
| | 11:36 | RCIC Trip　　Reactor Water Level: +200mm (W) |
| | 12:06 | D/D FP Pump "Manually Activated" |
| | 12:35 | Reactor Water Level L-2　　Reactor Water Level: -1220mm (W) |
| | | HPCI Automatically Activated |
| | 12:40 | FP No.2-3 Tie Valve (301, 22) "Close" (AM Panel Flow Rate Hunching Observed) |
| | 12:55 | RCIC Vac Pump Trip (Cooling Water Valve MO-23-132 Close) |
| | 14:00 | D/D FP Pump Fuel Supply (Reception Valve Open, Supply only for the line) 172 ↑ 195L Suction Pressure: 0.02MPa |
| | | D/D FP Pump Suction Pressure: 0.02MPa Discharge Pressure: 0.35MPa |
| | 16:35 | Water Level Rise Operation　+400mm (W)　Reactor Pressure: 2.86MPa |
| | 17:35-17:50 | No.2 Light-Oil Tank　D/D FP Pump Transfer Line Up (Integrator, Pump Bypass) |
| | 20:00 | D/D FP Pump　Fuel Tank 130L |

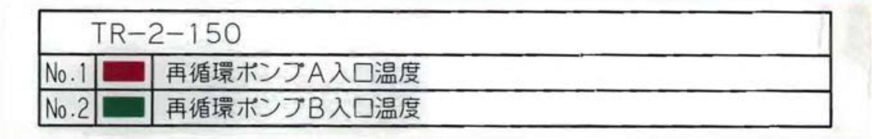
Saturday, March 12, 2011-

| Operation ・ Time of Event | | Contents |
|---|---|---|
| | | |
| | 20:27 | AM Panel D/W Pressure, S/C Pressure, S/C Water Level Indicator No Power Supply |
| | | |
| | 20:36 | Reactor Water Level Indicator No Power Supply Final Data Wide Range A System: 1350mm, Fuel Range A System: +400mm |
| | | |
| | 20:57 | Water Supply Control Equipment A Power "Off" |
| | | PLR Control Equipment A Power "Off" |
| | | ECCS Recorder Power "Off" |
| | | |
| | 21:30 | Site PI Instruction: D/W Pressure 170 kPa |
| | | |
| | | |
| | 3/13 | |
| | 1:45 | D/D FP Pump Light Oil Supply 70 ↑ 110L Suction Pressure: 0MPa Discharge Pressure: 0.42MPa |
| | | |
| | 2:42 | HPC Stop Reactor Pressure: 0.58MPa |
| | | |
| | 2:45 | SRV Not Opened Reactor Pressure: 0.8MPa |
| | 2:55 | SRV Not Opened Reactor Pressure: 1.3MPa |
| | | |
| | 3:05 | D/D FP Pump Injection into Reactor MO-10-27B 15% Open Probable Flowing Sound at 7% |
| | | Suction Pressure: 0 ↑ 0.14MPa Discharge: 0.4 ↑ 0.61MPa |
| | | |
| | 3:35 | HPCI FIC Pilot Lump Off |
| | 3:37 | RCIC Vac Pump Not Activated |
| | 3:39 | HPCI AOP Stop |
| | | |
| | 3:51 | Rx Water Level Indicator (W) Indicator Power ON -3600mm |
| | | Rx Water Level Indicator (Fuel Range) Indicator ON -1600mm Reactor Pressure: 5MPa Possibility of TAF |
| | 4:04 | Rx Water Level Indicator (Fuel Range) -1600mm Reactor Pressure: 5.6MPa |
| | | |
| | 4:06 | HPCI Condenser Pump Power OFF |
| | | |
| | 4:52 | D/W Ventilation Valve AO-205 Temporary Outlet ON Valve: Fully Open Cylinder Pressure: 0 |
| | | |
| | 5:08 | S/C Spray Start MO-10-25B Close |
| | | |
| | 5:08 | RCIC Manual start/Stop Valve Close RCIC Stop Valve Did Not Move |
| | | |
| | **5:10** | **Water Supply All Lost, article 15, Act on Special Measures Concerning Nuclear Emergency Preparedness** |
| | | |
| | 5:16 | DTr Pump Megohmmeter Finished No Water Attached Usability Confirmed |
| | | |
| | | |
| | | |
| | | |

## 【Unit 3 PLR pump inlet temperature】

## 【３号　ＰＬＲポンプ入口温度】





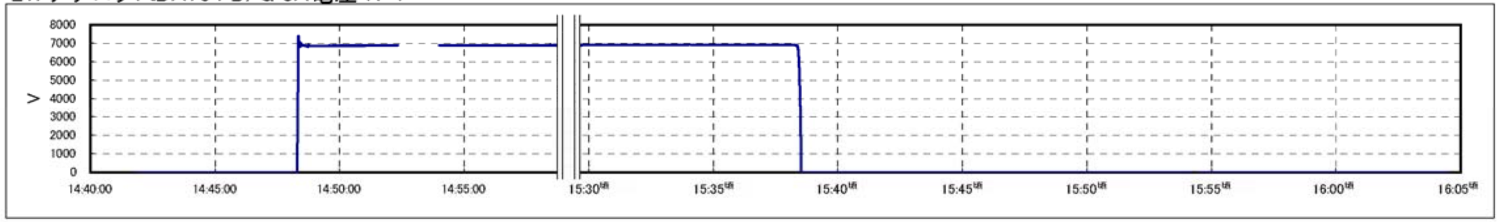
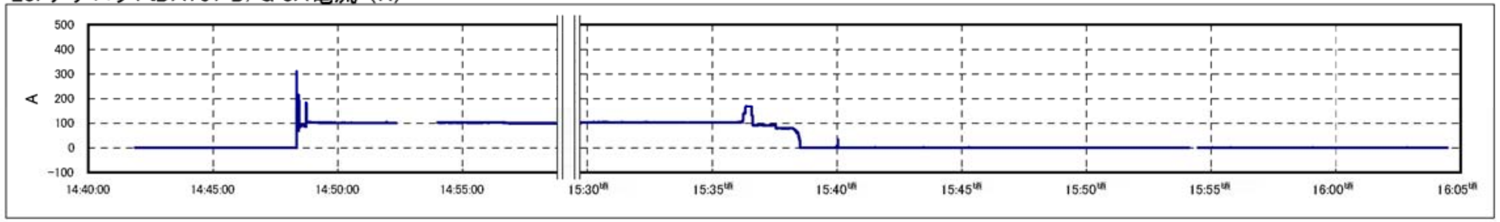
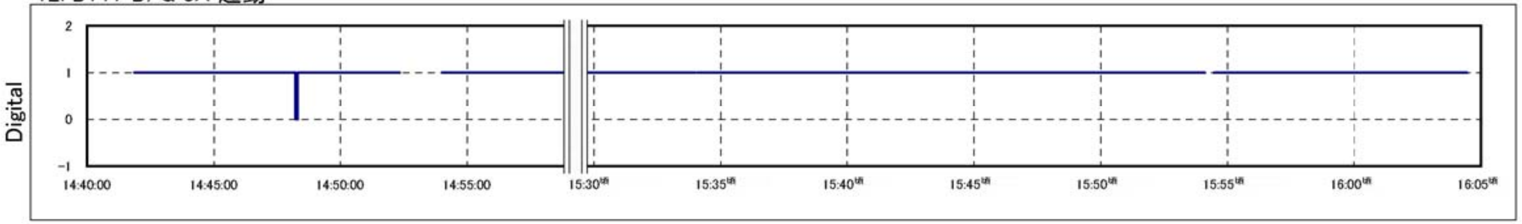
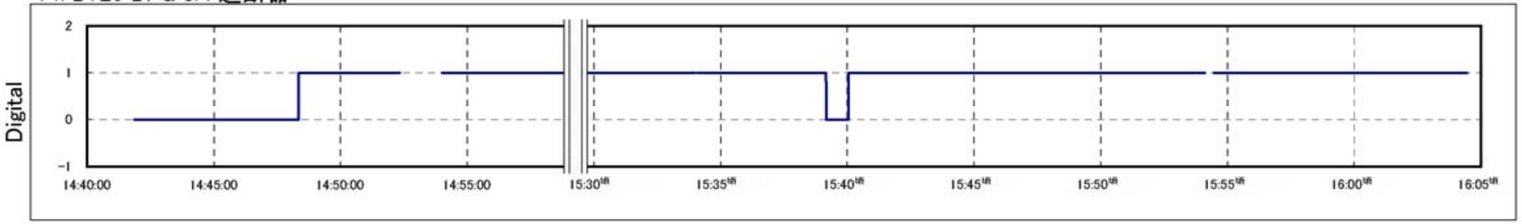
| TR-2-150 | | |
|---|---|---|
| No.1 | 🟥 | 再循環ポンプA入口温度 |
| No.2 | 🟩 | 再循環ポンプB入口温度 |

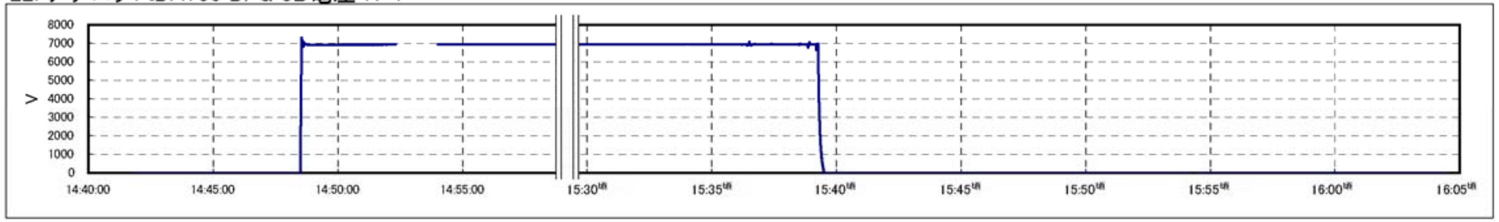
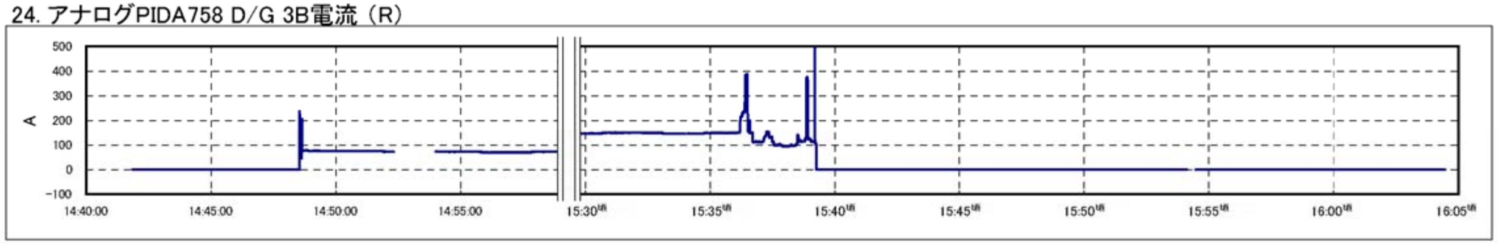
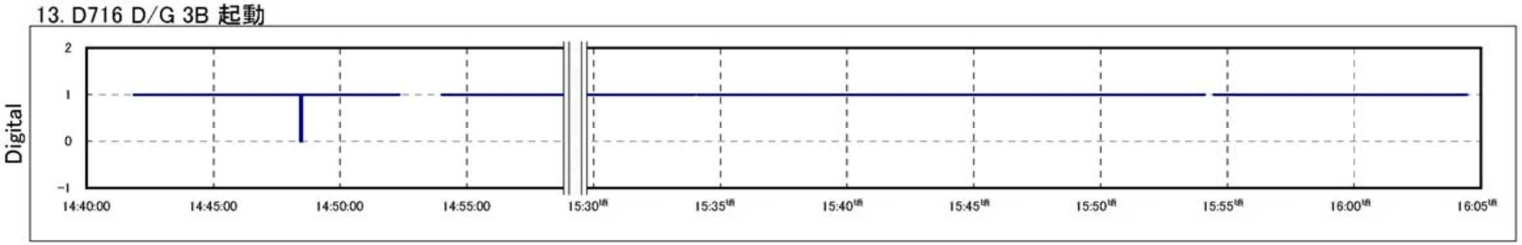
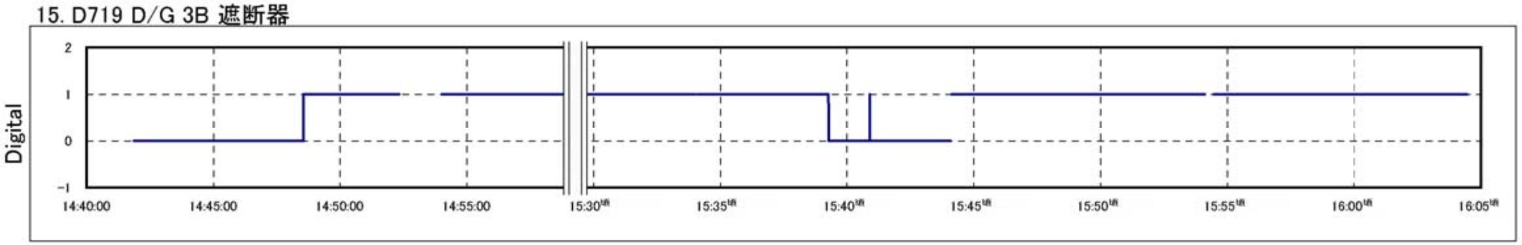
①　１４時４７分　地震によるスクラム

※　１５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

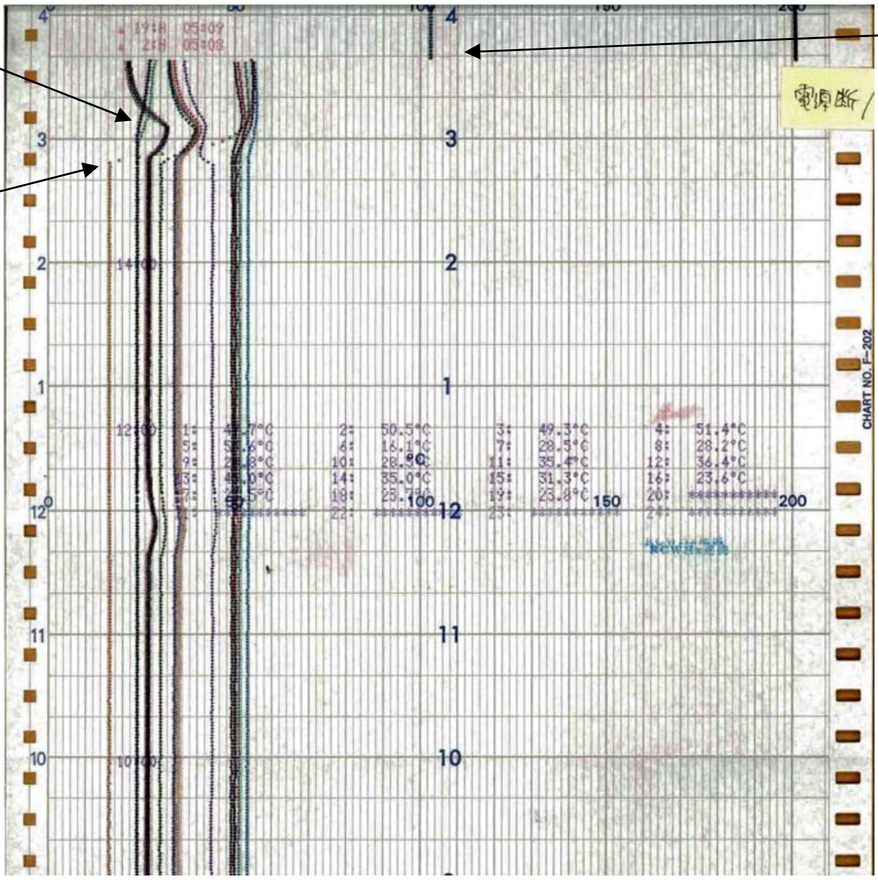
①14:47 Scram due to the earthquake

※It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

| パラメータ | 備　考 |
|---|---|
| 21. アナログPIDA754 D/G 3A電圧 R-T<br><br>23. アナログPIDA757 D/G 3A電流（R）<br><br>12. D717 D/G 3A 起動<br><br>14. D720 D/G 3A 遮断器<br> | ディーゼル発電機（3A）については、15時35分～40分の間において、津波による影響と思われるが停止したものと推定される。<br>It is estimated that the diesel generator (3A) was stopped at between 15:35 and 15:40 presumably due to tsunami. |

| パラメータ | 備　考 |
|---|---|
| 22. アナログPIDA755 D/G 3B電圧 R-T<br><br> <br>24. アナログPIDA758 D/G 3B電流（R）<br><br> <br>13. D716 D/G 3B 起動<br><br> <br>15. D719 D/G 3B 遮断器<br><br> | ディーゼル発電機（3B）については、15時35分～40分の間において、津波による影響と思われるが停止したものと推定される。<br>It is estimated that the diesel generator (3A) was stopped at between 15:35 and 15:40 presumably due to tsunami. |

## 【Unit 3 Temperature of various parts in Primary Containment Vessel】
## 【３号　原子炉格納容器内各部温度】



TRS-16-115

ストアNo.　３号機－19

| 入力番号 | 色 | 打点 | 入力計器番号 | 入力計器測定点 | スイッチ設定値 |
|---|---|---|---|---|---|
| 1 | 🟪 | ● | TE-16-114A | 格納容器空調機戻り空気温度 | 65.6℃ |
| 2 | 🟥 | ● | TE-16-114B | 格納容器空調機戻り空気温度 | 65.6℃ |
| 3 | ⬛ | ● | TE-16-114C | 格納容器空調機戻り空気温度 | 65.6℃ |
| 4 | 🟩 | ● | TE-16-114D | 格納容器空調機戻り空気温度 | 65.6℃ |
| 5 | 🟦 | ● | TE-16-114E | 格納容器空調機戻り空気温度 | 65.6℃ |
| 6 | 🟫 | ● | TE-16-114F | 格納容器空調機供給空気温度 | 65.6℃ |
| 7 | 🟪 | ○ | TE-16-114G | 格納容器空調機供給空気温度 | 65.6℃ |
| 8 | 🟥 | ○ | TE-16-114H | 格納容器空調機供給空気温度 | 65.6℃ |
| 9 | ⬛ | ○ | TE-16-114J | 格納容器空調機供給空気温度 | 65.6℃ |
| 10 | 🟩 | ○ | TE-16-114K | 格納容器空調機供給空気温度 | 65.6℃ |
| 11 | 🟦 | ○ | TE-16-114L | 原子炉ベロー・シール部温度 | 65.6℃ |
| 12 | 🟫 | ○ | TE-16-114M | 原子炉ベロー・シール部温度 | 65.6℃ |
| 13 | 🟪 | + | TE-16-114N | 原子炉ベロー・シール部温度 | 65.6℃ |
| 14 | 🟥 | + | TE-16-114P | 原子炉ベロー・シール部温度 | 65.6℃ |
| 15 | ⬛ | + | TE-16-114R | 原子炉ベロー・シール部温度 | 65.6℃ |
| 16 | 🟩 | + | TE-16-114T | 圧力抑制室　ガス温度 | 65.6℃ |
| 17 | 🟦 | + | TE-16-114U | 圧力抑制室　ガス温度 | 65.6℃ |
| 18 | 🟫 | + | TE-16-114V | 圧力抑制室　ガス温度 | 65.6℃ |
| 19 | 🟪 | Y | TE-16-114W | 圧力抑制室　ガス温度 | 65.6℃ |
| 20 | 🟥 | Y | | | |
| 21 | ⬛ | Y | | | |
| 22 | 🟩 | Y | | | |
| 23 | 🟦 | Y | | | |
| 24 | 🟫 | Y | | | |

①　１４時４７分　地震によるスクラム

②　電源喪失による格納容器空調停止、スクラムによる出力低下等に伴う格納容器内温度変化（配管破断等に起因する極端な温度上昇は認められず）

※　１５時３０分過ぎに津波の到来により記録計電源が喪失し、記録計が一旦停止したものと考えられる。

①14:47 Scram due to the earthquake

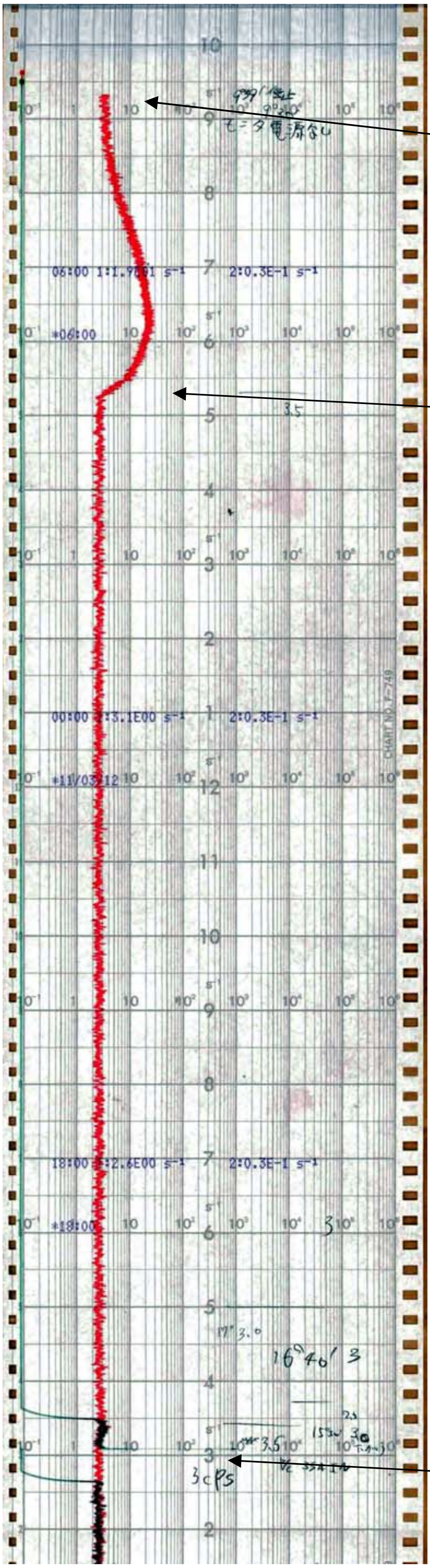
② PCV temperature change caused by shutdown of PCV air conditioner due to power outage, output decrease due to scram, and so on (Rapid temperature rise caused by such as pipe rupture was not shown.)

※ Just after 15:30, it is considered that recorder suspended due to recorder's power source loss by tsunami

添付資料－３－１９

## 【Unit 3 Main Exhaust Stack radiation monitor】

## 【３号　主排気筒放射線モニタ】



① 構内線量上昇の影響を受けたと考えられる指示値上昇

② 電源喪失に伴うダウンスケール

※ 電源喪失よると思われる記録終了

① Rise of indication considered to be caused by increase of radiation dose in the site

② Measurement failure due to power source loss

※Recording was finished presumably due to power outage.

## 3. Overview of Data Analysis of Unit 4

### (1) Plant Data

Plant behavior represented by data collected from Unit 4 is shown as follows.

The chart of Unit 4 recorded data when the earthquake and tsunami attacked. However, due to the loss of power sources and signals by the effects of inundation by tsunami, the chart stopped after a certain period of time. The data of annunciator, was unavailable as the process computer of was being replaced on the regular inspection. Regarding the operation log which is the record by the operators on duty the records before the earthquake are kept, however, the records after the occurrence of the earthquake are not complete with some parts missing due to the blackout and working environment in such severe conditions. Data of transient phenomena of Unit 4were unavailable either since the recorder was also being replaced.

### (2) Plant Behavior

① When the earthquake occurred, Unit 4 had been shut down under the regular inspection since November 30, 2010. And all fuels were removed from the reactor to the spent fuel pool, as replacement of shroud and other works were planned. (Attachment-4-1～6)

② According to shift supervisor task handover journal, it was confirmed that the water level of spent fuel pool was full (near overflow line) and the temperature of the pool was 27℃, which was considered to be normal condition.

③ In addition, according to operator task handover journal, when the earthquake occurred, on the reactor (well) side, the work to cut off the shroud was being conducted. The pool gate was closed and the water level was full. After the earthquake, water level of the reactor (well) side did not fluctuate significantly.

④ As offsite power was lost by the earthquake, one of the emergency diesel generators which had been stand-by started (the other generator was stopped under regular inspection). As Unit 4 was under regular inspection, and process computer the transient phenomenon recorder were being replaced, no records regarding seizing signals and build-up of electric pressure were available. As fuel level of fuel oil tank (fuel day tank) was confirmed to be decreased (as of May 21, 2011, oil level was decreased by 11mm from the last regular test), etc., it is estimated that emergency diesel generator started and successfully built-up its voltage and the necessary power was ensured.

⑤ According to the shift supervisor task handover journal and flow volume chart, pumps of RHR (D) were operated for cooling of the spent fuel pool, and they stopped due to the loss of offsite power, and the emergency diesel generator started. Regarding the restart of the pumps of RHR, the condition was not considered to affect cooling fuels immediately with the water level of spent fuel pool was full (near overflow line) and the temperature of the pool was 27℃ before the earthquake, the restart was not conducted before the tsunami reached. Pumps of RHR (A, C) were under regular inspection.

(Attachment-4-1, 4, 6, Annex-2)

⑥ Unit 3 and Unit 4 use an exhaust stack in common, and as explained in the data analysis of Unit 3, regarding a radiation monitoring for exhaust stack, the values recorded from scram of reactor to the end of recording were stable and nothing abnormal were seen, while some noises were measured on the monitor from scram of reactor.

⑦ According to the shift supervisor task handover journal, it was written that all alternative power sources were lost at 15:38, and pumps of RHR did not work due to the loss of power. (Attachment-4-7)

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 3 and 4

March 11, 2011, Friday, Shift 2, Shift Supervisor Task Handover Journal（2/3）

| |
|---|
| Unit 4 |
| 1. Operation Status |
| (1)　Plant shutdown due to regular inspection, RHR (B) line emergency thermal load mode operation |
| |
| |
| |
| |
| |
| |
| 2. Compliance status of safety regulation |
| Not particular |
| |
| |
| |
| |
| |
| |
| |
| 3. Periodic test |
| None |
| |
| |
| |
| 4. Requested work, non compliance event |
| None |
| |
| |
| |
| 5. Status of waste treatment facility |
| None |
| |
| |
| |
| 6. Others (Common) |
| None |
| |
| |
| |
| |
| |
| |
| |

太枠は炉規則第7条／保安規定第120条対象記録

福島第一原子力発電所 4号機

# 運 転 日 誌 〔1〕

2011年 3月 11日

| | | ※基本記録確認項目（引継ぎ後のプラント状態をチェックする） | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 炉水温度 | 燃料の状態 | プールゲートの状態 | 原子炉の加圧 | 引継項目内容 2直 | 1-1直 | 1-2直 | 3直 | 記録が必要な項目 |
| 定格熱出力一定運転中 | | → | → | → | → | | | | | 1.5.7.9.10 |
| 発電機並列中 | | → | → | → | → | | | | | 1.7.9.10.11.23.24.25 |
| 原子炉の状態 | 運転 | → | → | → | → | | | | | 1.2.3.4.6.7.8.10.12～19.21.27 |
| | 起動 | → | → | → | → | | | | | 1.2.3.4.7.8.10.12～19.21.22 |
| | 高温停止 | → | → | → | → | | | | | 1.2.3.6.7.8.10.12.22 |
| | 冷温停止 | 65℃以上 | → | → | 加圧なし | | | | | 1.2.4.7.10.12.22 |
| | | | | | 加圧 | | | | | 1.2.6.7.10.12.20.22 |
| | | 65℃未満 | → | → | 加圧なし | | | | | 1.2.6.7.10.12.22 |
| | 燃料交換 | → | 1体以上炉心に装荷 | 閉鎖 | → | | | | | 1.2.6.7.10.12.22 |
| | | | | 開放 | → | | | | | 1.2.4.7.10.12 |
| | | → | 全燃料取出中 | 閉鎖 | → | ✓ | ✓ | ✓ | | 1.2.7.10.22.★ |
| | | | | 開放 | → | | | | | 1.2.7.10.12 |
| 格納容器閉鎖中 | | → | → | → | → | | | | | 1.2.3.4.5.6.10 |

## 記録確認項目

| | |
|---|---|
| 1 | 原子炉水電導度 |
| 2 | サプレッションチェンバー水位 |
| 3 | サプレッションチェンバー水温度 |
| 4 | ドライウェル酸素濃度 |
| 5 | 原子炉熱出力（瞬時値、1時間平均値） |
| 6 | 原子炉熱出力（SRNM、APRM） |
| 7 | 補給水積算記録 |
| 8 | 格納容器内の原子炉冷却材漏えい率 |
| 9 | 発電機出力（読み） |
| 10 | 受電電力量 |
| 11 | タービン軸振動（軸受等） |
| 12 | ●再循環ループ温度 |
| 13 | ●原子炉入口給水平均温度 |
| 14 | ●主蒸気温度 |
| 15 | ●主蒸気流量 |
| 16 | ●給水流量 |
| 17 | ●給水圧力 |
| 18 | ●主蒸気圧力 |
| 19 | ●原子炉格納容器温度 |
| 20 | 原子炉圧力容器温度 |
| 21 | ●原子炉圧力 |
| 22 | ●原子炉水位 |
| 23 | ●発電機出力（電力量） |
| 24 | ●復水器真空 |
| 25 | ●高圧第1段圧力 |

★全燃料取出中でプールゲートが閉鎖されている場合にRPVスタッドボルトの締付を行う場合はRPVスタッドボルト締付終了後再循環ループ系統／原子炉冷却材が低温度化率の記録を行う。

●の項目に記録要求がある場合でプロセス計算機打ち出しによる確認ができない場合は、現場を確認し記録を行う。

| 確 認 | | 承 認 | 内容確認 | 作 成 | プロセス計算機データ添付 |
|---|---|---|---|---|---|
| 原子炉主任技術者 | | 当直長 | 当直副長 | 当直員 | |
| | 2直 | [redacted] | [redacted] | [redacted] | 異常なし<br>[✓ 添付有り] |
| | 1-1直 | | | [redacted] | 異常なし<br>[✓ 添付有り] |
| | 1-2直 | | | | 異常なし<br>[✓ 添付有り] |
| | 2直 | | | | 異常なし<br>添付有り |

| 保安規定 | 9,16,120 | 9,13,40,46 | 9,13,45 | 9,13,48 | 28 | | 9,28,27,120 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 炉規則第7条 保安規定第120条 記録No.3 | 原子炉に使用している冷却材の放射性物質に関する記録 | | | | | | 熱出力・炉心の中性子束密度 | | | | | | | |
| 記録すべき場合、時期 | 毎日1回 | すべての期間 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | 定格熱出力一定運転時 | | 原子炉に1体以上燃料が装荷されている場合適用 | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | | 6 | | | | | | | |
| 項目 | （補2）原子炉水電導度 | サプレッションチェンバー水位 | サプレッションチェンバー水温度 | ドライウェル酸素濃度 | 原子炉熱出力 瞬時値 | 1時間平均値 | 原子炉熱出力（補1）（SRNM APRM） | | | | | | | |
| | | | | | | | A | C | E | G | B | D | F | H |
| 時 | μS/cm | cm | ℃ | %O₂ | MW | MW | cps | | | | % | | | |
| 刻 | 9-4 | 9-3 | 9-58 | 9-25 | 計算機 | | 9-5 | | | | | | | |
| 計器 | ORS-59-101/102 | LI-16-132 | TRS-16-359A/B | O₂RS-51-110A | 原子炉熱出力 | 原子炉平均熱出力 | NR-7-1A／B／C／D | | | | | | | |
| PID | — | — | — | — | C525 | C527 | — | — | — | — | — | — | — | — |
| 1 | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | |
| 6 | | — | ／ | ／ | | | | | | | 全燃料取出中 | | | |
| 7 | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | |
| 12 | — | — | ／ | ／ | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | |
| 18 | | — | ／ | ／ | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | |
| 24 | — | — | ／ | ／ | | | | | | | | | | |

| | 9,120 | 9,13,31 | | | | |
|---|---|---|---|---|---|---|
| | 原子炉に使用している冷却材及び減速材の毎日の補給量 | | | | | |
| | 毎日1回 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | | | |
| | 7 | 8 | | | | |
| | 補給水積算記録 | 格納容器内の原子炉冷却材漏えい率 | | | | |
| | 純水補給水量 FQ-57-1(2) | D/W床ドレンサンプ流量 FQ-20-527(×0.01m³) | D/W機器ドレンサンプ流量 FQ-20-530(×0.01m³) | D/W冷却器ドレン量 FQ-20-2533(×0.1ℓ) | | |
| | 現 場 | 9-19 | | 9-4 | | |
| 24 | | | | | D/W床ドレン | m³/h |
| 0 | 512349920 | 58274 | 639337 | 901329 | 全漏洩量 | m³/h |
| 差 | | | | | | |

| | 主発電機 | 他Gr使用情報 10 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 発電機出力 9 | 起動用開閉母線 | | | 所内変圧器 | | | 出退所用変圧器 | 所内電力量合計 |
| | 読み | 4A | 4B | 小計 | 4A | 4B | 小計 | 電力量 | |
| | kWh×10,000 | kWh×1,000 | kWh×1,000 | MWh | kWh×1,000 | kWh×1,000 | MWh | kWh×100 | MWh |
| | 9-31 | メタクラ | | | メタクラ | | | 9-31 | |
| | WHM | 4A-3 | 4B-3 | | 4A-1 | 4B-1 | | WHI-43-2 | |
| 24 | | | | | | | | | |
| 0 | | 71 922.4 | 15 686.0 | | 29 597.4 | 39 027.6 | | 05 635.5 | |
| 差 | | | | | | | | | |

所内電力量算出
(4A-3)+(4B-3)+(4A-1)+(4B-1)+(WHI-43-2×0.1)+(共用所内ボイラー変圧器(4号負荷分)) = ______ MWh

所内電力量のうち共用所内ボイラー(4号負荷分)使用分 ______ MWh

記事
・CUW停止中
・プロコレ停止中

| 定期自主検査運転時 タービン軸受振動値(1日の最大値) | |
|---|---|
| 11 | |
| 9-57 | |
| VBR-30-1/2/3/4/5 | |
| 軸受 No. | 最大値 1/100mm |
| — | — |

補足事項
補1 炉規則第7条、保安規定第120条記録は連続記録のチャートである。
補2 原子炉水電導度が記録できない場合は代替記録採取場所により記録する。詳細は運転日誌記載ガイドを確認すること。
補3 再循環ポンプの追従性（原子炉冷却材浄化系入口温度）の確定時の温度と1時間前の温度を確認し、温度差が55℃/hを超えていないことを確認する。

注意事項（運転日誌共通）
1. 運転日誌別紙の項目に●が記載されているものは、BOP打出し参照記録のため、毎時打出し記録を確認しデータに異常が無い事を確認し空欄とすること。
2. PTW以外で記録不可能な場合は「—」としその理由を余白に記載する。PTWの場合は「PTW」と記載する。
3. 記録不要な場合は当該欄を「／」とする。（運転日誌別紙の●項目も同様）

太枠は炉規則第7条／保安規定第120条対象記録

## 福島第一原子力発電所 4号機

# 運転日誌 別紙

Operation log - Appendix

2011年 3月 11日

|  | 確認<br>原子炉主任技術者 | 承認<br>当直長 | 内容確認<br>当直副長 | 作成<br>当直員 |
|---|---|---|---|---|
| 2直 |  | [redacted] | [redacted] | [redacted] |
| 1-1直 |  |  |  | [redacted] |
| 1-2直 |  |  |  |  |
| 2直 |  |  |  |  |

| 保安規定 | 9,35,36,37,120 |  | 9,120 |  |  |  |  |  |  |  |  |  | 9,37 | 38 | 56 | 他Gr使用データ |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 炉規則第7条<br>保安規定<br>第120条<br>記録項目 | 炉心の温度 |  | 冷却材入口温度 | 冷却材出口温度 | 冷却材流量 |  | 冷却材圧力 |  | 再結合装置内の温度 |  |  |  |  |  |  | 発電機出力 |  |  |  |
| 記録すべき場合、頻度 | 全燃料取り出し中で且つプールゲート閉の場合以外連続 |  | 原子炉の状態が運転及び起動において1時間ごと |  |  |  |  |  |  |  |  |  | 原子炉を昇圧する場合（補1） | [illegible] | [illegible] | 発電機出力運転中 |  |  |  |
| [illegible] | 12 |  | 13 | 14 | 15 | 16 | 17 | 18 | 19 |  |  |  | 20 | 21 | 22 | 23 |  | 24 | 25 |
| 項目 | ●再循環系ループ温度（補2） |  | ●平均温度 原子炉入口給水 | ●主蒸気温度 | ●主蒸気流量 | ●給水流量 | ●給水圧力 | ●主蒸気圧力 | ●排ガス再結合器温度 |  |  |  | 最低温度 原子炉圧力容器 | ●原子炉圧力 | ●原子炉水位 | 読み | ●電力量 | ●復水器真空 | ●高圧第1段圧力 |
|  | A | B |  |  |  |  |  |  | A |  | B |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | 入口 | 出口 | 入口 | 出口 |  |  |  |  |  |  |  |
| 時刻 | ℃ |  | ℃ | ℃ | T/H | T/H | MPa | MPa | ℃ |  |  |  | ℃ | MPa | ※~~mm~~ cm | kWh×10,000 | MWh | kPa(abs) | MPa |
|  | 9-4 |  | 9-6 |  | 9-5 |  | 9-6 | 9-7 | 9-34 |  |  |  | 9-21 | ※~~9-5~~ 9-4 |  | 9-31 |  | 9-7 |  |
| 計器 | TR-2-150 |  | TRS-51-1 No.13 | TRS-51-1 No.1 | FR-6-98 |  | PI-52-31 | PI-30-20-MSPS | TRS-24-426<br>① | ② | ③ | ④ | TRS-2-3-89 | ※~~LR/PR-6-97~~ LR-2-3-103 |  | WHM |  | PI-51-8B | PI-51-5 |
| PID | C300 | C310 | D230 | C311 | D200 | D201 | C046 | B012 | S031 | S030 | S033 | S032 | － | C003 | C004 |  | － | T001 | T004 |
| 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  | 停 |  |  |
| 7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  | 止 |  |  |
| 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 14 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 1220 |  |  |  |  |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 中 |  |  |
| 16 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 21 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

補足事項

補1　原子炉圧力容器漏えい（水圧）検査等で原子炉を加圧する場合に採取する。

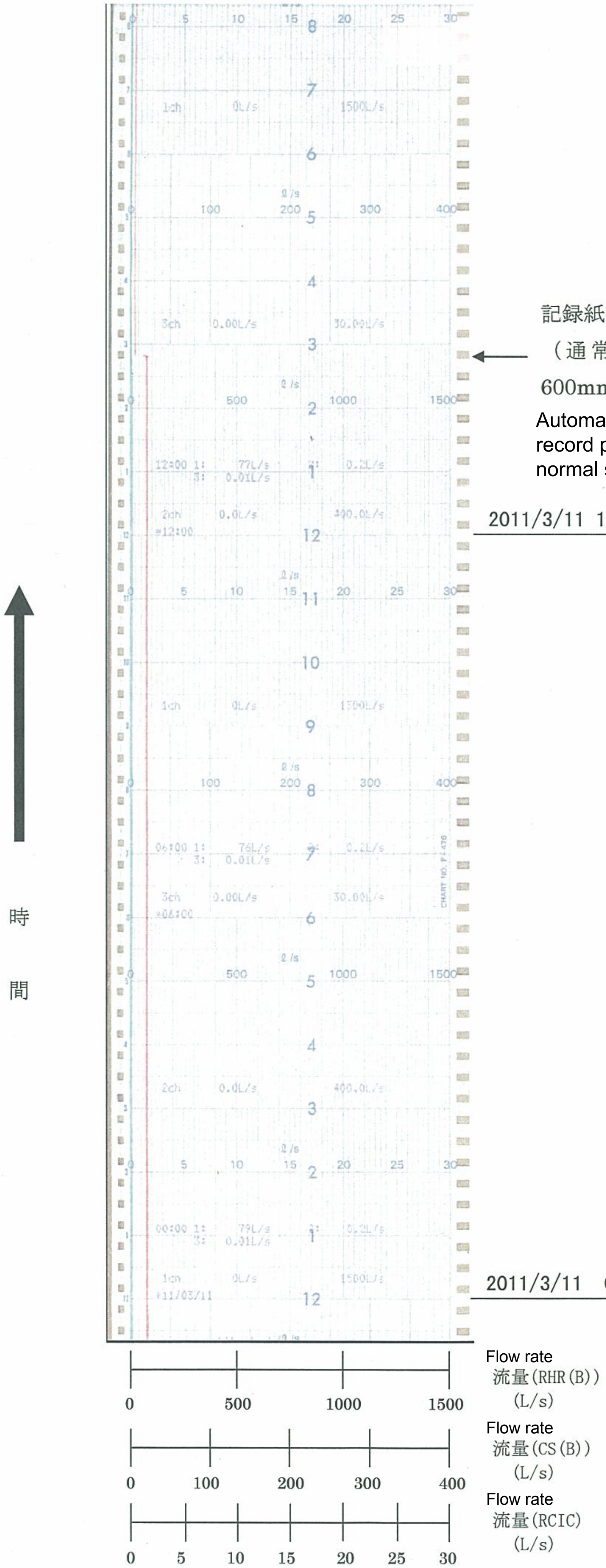
補2　再循環系ループ温度が記録できない場合は、代替記録採取場所により記録する。詳細は運転日誌記載ガイドを確認すること。

記事

※採取計器変更

1F-4-5

添付資料－４－４



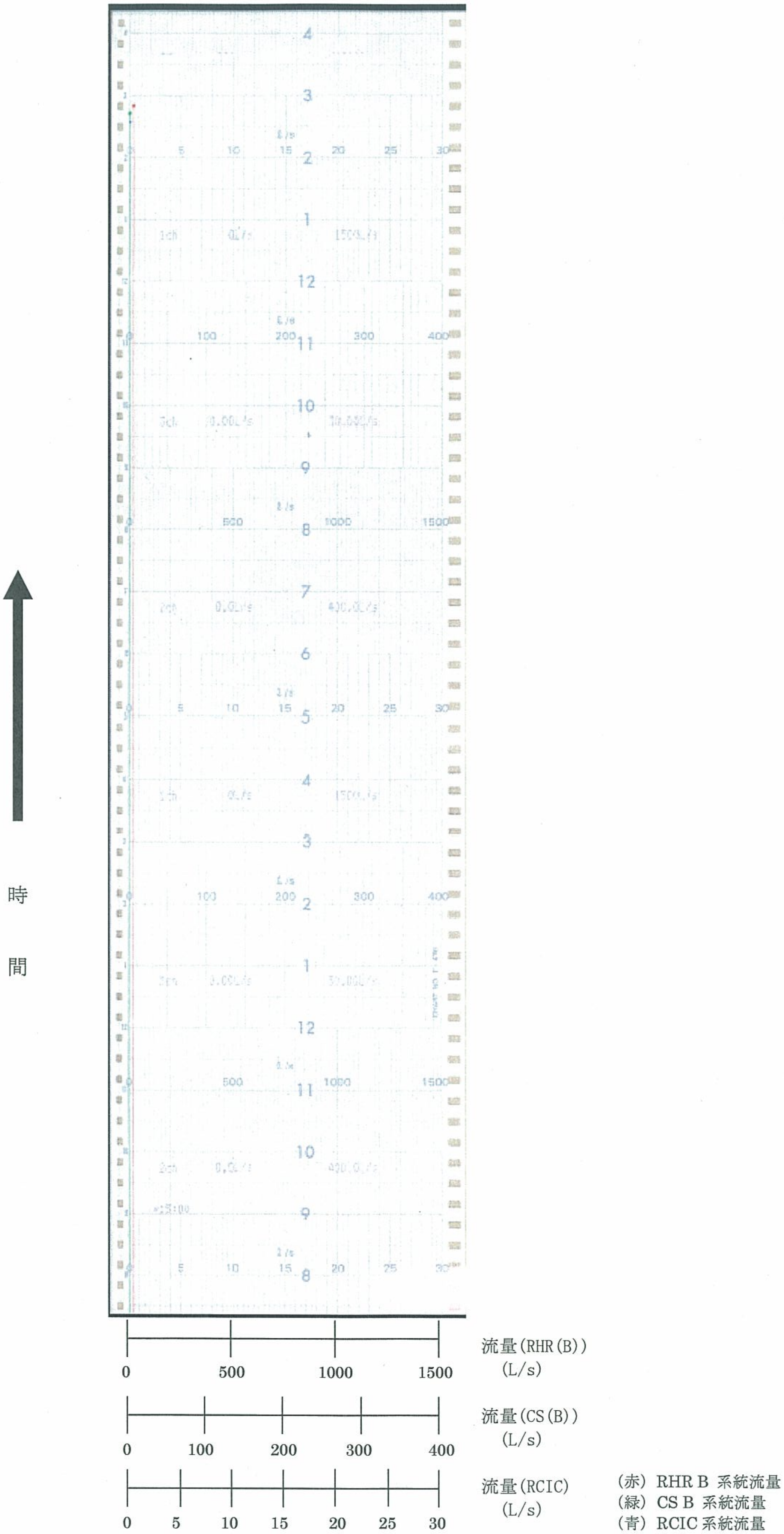
記録紙早送りに自動切替
（通常時　10mm/h　から
600mm/h）
Automatic switch to fast feed of record paper (from 10 mm/h at normal situation to 600 mm/h)

2011/3/11 12:00

2011/3/11 0:00

（赤）RHR B 系統流量
（緑）CS B 系統流量
（青）RCIC 系統流量

Unit 4 RHR B/CS B/RCIC systems flow rate
４号機　RHR B/CS B/RCIC 系統流量（１／２）

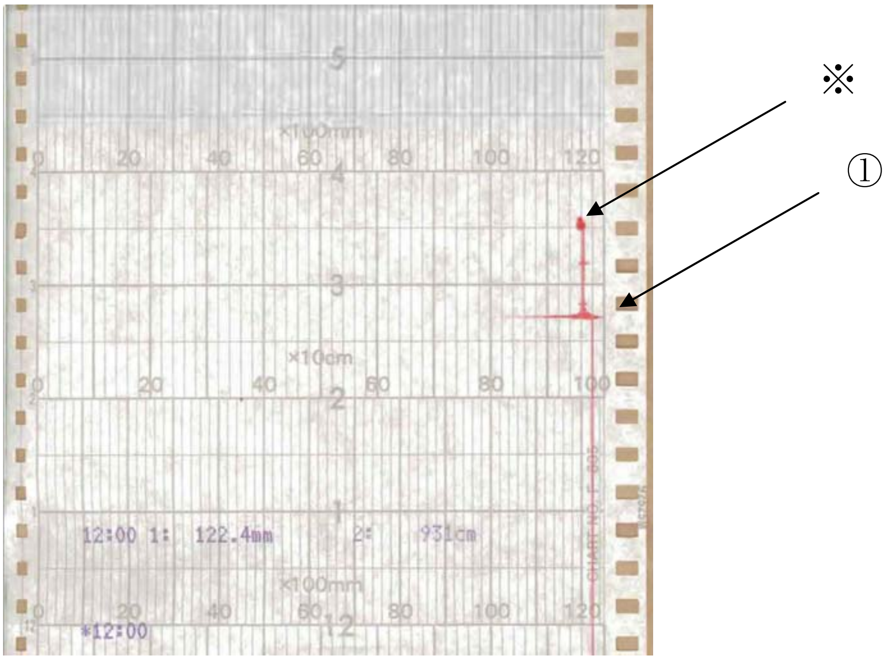


4号機　RHR B/CS B/RCIC 系統流量（２／２）

添付資料－４－５

## 【Unit 4 Reactor Water Level (For water filling, Wide range)】

## 【４号　原子炉水位（水張り用、ワイドレンジ】



LR-2-3-103

赤　原子炉水位（水張り用）　Red: Reactor Water Level (For water filling)

緑　原子炉水位（ワイドレンジ）Green: Reactor Water Level (Wide range)

①　１４時４６分　地震発生
（地震後も十分な水位が維持されている）

※　１５時３０分過ぎに津波が到来したと想定される。津波の影響によると思われる記録終了。

①14:46 Occurrence of the earthquake
(Sufficient water level is maintained after the earthquake)

※It is estimated that the tsunami arrived past 15:30. Recording was finished presumably due to the tsunami.

様式－２

| 福島第一原子力発電所　　４号機 |
|---|

# Operator Task Handover Journal

# 当直員引継日誌

当直員引継日誌（　1/3　）

| | | |
|---|---|---|
| 平成23年3月11日　　金曜日 | １直　　Ａ班 | ［承認］<br>当直長 |
| 引継者（作成者）名 | [redacted] | （Ａ班） |
| 引受者名 | [redacted] | （Ｅ班） |

運転状況

| 原子炉の状態 | 運　転　・　起　動　・　高温停止　・　冷温停止　・[✓ 燃料交換] |
|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RHR「非常時熱負荷モード」 | 燃料プールゲート（開 [✓ 閉]） | | | | LR-2-3-103（水張り用） | 1220 | cm |
| RHRポンプ（A B C [✓ D]） | RHRSポンプ（A [✓ B] C [✓ D]） | | | | 炉水温度 | － | ℃ |
| FPCポンプ（~~A B~~） | ※全停 Hx（~~A B~~） | | | | プール水温度 | 26.9 | ℃ |
| RCWポンプ（A [✓ B] C） | Hx（A B [✓ C]） | RCW圧力 | | MPa | RCW温度 | | ℃ |
| TCWポンプ（A [✓ B] C） | Hx（A [✓ B] C） | TCW圧力 | 0.68 | MPa | TCW温度 | 8.4 | ℃ |
| SWポンプ（A [✓ B] C） | | SW圧力 | 0.49 | MPa | SW温度 | 7.2（3u） | ℃ |
| 循環水ポンプ（~~A B C~~） | | CSTレベル | 77.2 | % | トーラスレベル | D・S | cm |

（採取時刻：20時00分）

| ＬＣＯに係わるインターロック除外の有無 | ・SRNM中性子束高インターロック除外中<br>・燃料取替機インターロック除外中　・APRM高インターロック除外中 |
|---|---|

定例試験・定例切替の実施状況

| 実施時間 | 内　容 | 結　果 | 状　況 |
|---|---|---|---|
| | ＜定例試験＞ | | |
| | なし | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | ＜定例切替＞ | | |
| 10:55～11:06 | R/B,T/B,R/W各建屋サンプポンプ切替（B→A） | 合格・不合格 | [✓ 良好]・要注意・継続中・中止 |
| ― | 励磁機室空調機切替　※1 | 合格・不合格 | 良好・要注意・継続中・[✓ 中止] |
| | TCW熱交切替（B）→（C）　※2 | 合格・不合格 | [✓ 良好]・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | 合格・不合格 | 良好・要注意・継続中・中止 |
| | | | |

備考

※1　PTW中につき中止

※2　３／１２予定分実施

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 3 and 4

March 11, 2011, Friday, Shift 1, Shift Supervisor Task Handover Journal（2/3）

Unit 4

1. Operation Status

(1) Plant shutdown for regular inspection

(2) Loss of station power supply / report stipulated by article the act on special measures concerning nuclear emergency preparedness (from Technical Support Center (TSC)) 15:38/15:42

2. Compliance status of safety regulation

abnormal, following articles are applicable

(1) Article 17 (procedures at the time of earthquake and fire)

(2) Article 113 (notice)

(3) Article 121 (report)

3. Periodic test

None

4. Requested work, non compliance event

None

5. Status of waste treatment facility

None

Red colored is tentative data.
Report writing has not been
completed due to blackout.

6. Others (Common)

None

## 3. Overview of Data Analysis of Unit 5

### (1) Plant Data

Plant behavior represented by data collected from Unit 5 is shown as follows.

The chart of Unit 5 recorded data when the earthquake and tsunami attacked. However, due to the loss of power sources and signals by the effects of inundation by tsunami, the chart stopped after a certain period of time. The annunciator output recorded for 2 minutes after the occurrence of the quake. However, it stopped printing by some reasons. Regarding the operation log which is the record by the operators on duty the records before the earthquake are kept, however, the records after the occurrence of the earthquake are not perfect due to the blackout and working environment in such severe conditions. Transient phenomenon recorder was replaced during this regular inspection. Recording at the hour has been set to the system as the operation test of the equipment itself (data collection from 5 minutes prior to each hour and to 30 minutes after the hour). The recording at the hour was conducted before and after the quake (2:00 pm, 3:00 pm, and 4:00 pm).

### (2) Plant Behavior

① Unit 5 had been shut down for under inspection since January 3, 2011. The plant was under the pressure/ leakage test of RPV when the quake occurred. (Attachment-5-1～5)

② The fuel was loaded to the reactor, and all the control rods were inserted. According to shift supervisor task handover journal, the supervisor confirmed that the water level of common pool was full (near overflow line) and the temperature of the pool was 24℃ before the earthquake occurred. That was a normal condition.

③ When the earthquake occurred, the pressure of the reactor had risen to 7.2 MPa and remained the level because of the pressure/ leakage test.

④ After the quake, because the facilities which added pressure to the reactor for the pressure/ leakage test stopped the operation due to the loss of power supply, the pressure inside the reactor temporarily decreased. Later, the pressure gradually rose because of decay heat and then the pressure inside the reactor maintained at the level of approximately 8 MPa (assumed maximum pressure: 8.27MPa, designed pressure: 8.62MPa). At 6:06 am on March 12, 2011, which is the next day after the day of the quake, the pressure inside the reactor pressure vessel was decreased by opening the valve on the top of the RPV. (Attachment-5-5,6)

⑤ Two emergency diesel generators automatically started because the external power supply was lost due to the earthquake. Because the external power supply was lost, Fuel Pool Cooling and Filtering(Clean up) System also stopped its operation, though the emergency diesel generator started. Regarding the pool cooling using RHR pump whose power was supplied from the emergency diesel generator, it was confirmed that the water level of the spent fuel pool was full (around the level of overflow) before the earthquake, and that the water temperature of the pool was 24℃ before the earthquake. It was not the case that the fuel cooling would face any problem in an early stage. Therefore, we did not conduct the cooling using RHR pump before the tsunami arrived. All external AC power supply was lost at 3:40 pm due to the tsunami. Because of this, RHR pumps and Core Spray pumps turned to be inoperative. One diesel generator kept working at Unit 6. (Annex-2)

⑥ On March 13, 2011, temporary cables were laid from low-voltage distribution switchboard of Unit 6, and the condensate pumps to transfer the water of Unit 5 were started receiving power from the emergency diesel generator of Unit 6. After the depressurization, the pressure inside the reactor gradually rose affected by decay heat. Since 5:00 am on March 14, 2011, we have implemented depressurization using main steam safety relief Valve in an appropriate manner (once the pressure rises to approximately 2MPa). In parallel, we repeatedly injected the water to the reactor from condensate storage tank using condensate water transferring pump, controlling the pressure and the water level inside the reactor.

⑦ Later, the temporary pump using seawater was started to cool RHR on March 19, 2011. Switching the system of RHR enabled cooling the spent fuel pools and the reactors by turns, achieving the cooling both of the spent fuel pool and the reactor. The reactor reached to the cold shutdown at 2:30 pm on March 20, 2011.

⑧ Radiation monitoring at the exhaust stack indicated stable values until the end of its recording after the scram. Abnormal situation was not recognized. Although there was gradual fluctuation from approximately 5:00 am on the following day, the rise was considered to be affected by the rise of radiation level in the premise caused by other units seeing that such a trend was also confirmed in Unit 3 and that the water level of the Unit 5's reactor was kept in the level to cover the fuels at the same time. (Attachment-5-7)

Form-1
Fukushima Daiichi Nuclear Power Plant Unit 5 and 6

Shift Supervisor Task Handover Journal（1/3）

# Shift Supervisor Task Handover Journal

| | | |
|---|---|---|
| | | [confirmed by］ Chief engineer of reactors |
| | | |
| March 11, 2011, Friday, 8:40, Shift 2, Group E | ［confirmed by］<br>Supervisor of next shift | ［made and approved by］<br>Shift supervisor |
| | | |

| | | | | |
|---|---|---|---|---|
| On duty<br>6（operator）<br>-（instructor）<br>1（trainee） | No. of organization | Off duty | None | Support duty |
| | 110 | Replacement | None | None |

| | | | | |
|---|---|---|---|---|
| Unit 5 | Generator Output | 0MWe | Reactor Status | in operation・start up・hot shutdown・[✓ cold shutdown]・fuel exchange |
| Unit 6 | Generator Output | 0MWe | Reactor Status | in operation・start up・hot shutdown・[✓ cold shutdown]・fuel exchange |

Notes

Unit 5

1. Operation Status

| | | |
|---|---|---|
| (1) Reactor is shutdown for periodical inspection | | |
| (2) Water level lowering operation in Reactor Pressure Vessel (RPV) finished | ↓ - 710cm | 21:24 |
| (3) Residual Heat Removal (RHR) Pump (B) system, SHC mode stopped | | 7:44 |
| (4) Water level elevating operation in RPV was started | + 715cm ↑ | 7:58 |
| (5) Pressure rising in RPV was started | + 0Mpa ↑ | 8:31 |

2. Compliance status of safety regulation

Not particular

3. Periodic test

None

4. Requested work, non compliance event

(1) Subject of Blow valve (V-37-22D-B1, 21A-B2)clogging at TCW Hx (B) sea water side

5. Status of waste treatment facility

None

Fukushima Daiichi Nuclear Power
Station Unit 5 Operation log [1]

1F-5-4

**太枠は炉規則第7条／保安規定第120条対象記録**

# 福島第一原子力発電所 5号機
# 運 転 日 誌 〔1〕

2011 年 3 月 11 日

| 要求記録確認表(引継ぎ後のプラント状態をチェックする) | | 炉水温度 | 燃料の状態 | プールゲートの状態 | 原子炉の加圧 | 記録項目確認 2直 | 1-1直 | 1-2直 | 2直 | 記録が必要な項目 |
|---|---|---|---|---|---|---|---|---|---|---|
| 定格熱出力一定運転中 | | → | → | → | → | | | | | 1.5.7.9.10 |
| 発電機並列中 | | → | → | → | → | | | | | 1.7.9.10.11.23.24.25 |
| 原子炉の状態 | 運転 | → | → | → | → | | | | | 1.2.3.4.5.7.8.10.12~19.21.22 |
| | 起動 | → | → | → | → | | | | | 1.2.3.6.7.8.10.12~19.21.22 |
| | 高温停止 | → | → | → | → | | | | | 1.2.3.6.7.8.10.12.22 |
| | 冷温停止 | 65℃以上 | → | → | 加圧なし | ✓ | | | | 1.2.6.7.10.12.22 |
| | | | | | 加圧 | | ✓ | ✓ | ✓ | 1.2.6.7.10.12.20.21 |
| | | 65℃未満 | → | → | 加圧なし | | | | | 1.2.6.7.10.12.22 |
| | 燃料交換 | → | 1体以上炉心に装荷 | 閉鎖 | → | | | | | 1.2.6.7.10.12.22 |
| | | | | 開放 | → | | | | | 1.2.6.7.10.12 |
| | | → | 全燃料取出中 | 閉鎖 | → | | | | | 1.2.7.10.22.★ |
| | | | | 開放 | → | | | | | 1.2.7.10.12 |
| 格納容器閉鎖中 | | → | → | → | → | | | | | 1.2.3.4.7.8.10 |

## 記録確認項目

| | |
|---|---|
| 1 | 原子炉水導電率 |
| 2 | サプレッションチェンバー水位 |
| 3 | サプレッションチェンバー水温度 |
| 4 | ドライウェル酸素濃度 |
| 5 | 原子炉熱出力(瞬時値、1時間平均値) |
| 6 | 原子炉熱出力(SRNM、APRM) |
| 7 | 補給水積算記録 |
| 8 | 格納容器内の原子炉冷却材漏えい率 |
| 9 | 発電機出力(読み) |
| 10 | 変圧器等積算 |
| 11 | タービン軸振動(軸番号) |
| 12 | ●再循環系ループ温度 |
| 13 | ●主蒸気流量 |
| 14 | ●給水流量 |
| 15 | ●給水圧力 |
| 16 | ●主蒸気圧力 |
| 17 | ●給水温度 |
| 18 | ●主蒸気温度 |
| 19 | ●排ガス再結合器温度 |
| 20 | 原子炉圧力容器表面温度 |
| 21 | ●原子炉圧力 |
| 22 | ●原子炉水位 |
| 23 | ●復水器真空 |
| 24 | ●高圧第1段圧力 |
| 25 | ●発電機出力(電力量) |

★全燃料取出中でプールゲートが閉鎖されている場合にRPVスタッドボルトの締付を行う場合はRPVスタッドボルト締付開始以降再循環系ループ温度／原子炉冷却材温度変化率の記録を行う。

●の項目に記録要求がある場合でプロセス計算機打ち出しによる確認ができない場合は、現場を使用し記録を行う。

| 確 認<br>原子炉主任技術者 | | 承 認<br>当直長 | 内容確認<br>当直副長 | 作 成<br>当直員 | プロセス計算機データ確認 |
|---|---|---|---|---|---|
| | 2直 | [redacted] | | | 異常なし<br>別紙有り |
| | 1-1直 | | | | 異常なし<br>別紙有り |
| | 1-2直 | | | | 異常なし<br>別紙有り |
| | 2直 | | | | 異常なし<br>別紙有り |

| 保安規定 | 9,18,120 | 9,13,40,46 | 9,13,45 | 9,13,48 | 26 | | 9,26,27,120 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 炉規則第7条保安規定第120条記録事項 | 原子炉に使用している冷却材及び減速材の純度 | | | | | | 熱出力・炉心の中性子束密度 | | | | | | | |
| 記録すべき場合、頻度 | 毎日1回 | すべての期間 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで<br>[illegible] | | 定格熱出力一定運転時 | | 原子炉に1体以上燃料が装荷されている場合運転 | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | | 6 | | | | | | | |
| 項目 | (補2) 原子炉水電導度 | サプレッションチェンバー水位 | サプレッションチェンバー水温度 | ドライウェル酸素濃度 | 原子炉熱出力 瞬時値 | 1時間平均値 | 原子炉熱出力(補1)<br>([✓ SRNM] APRM) | | | | | | | |
| | | | | | | | Ⓐ | Ⓒ | Ⓔ | Ⓖ | Ⓑ | Ⓓ | Ⓕ | Ⓗ |
| 時 | μS/cm | cm | ℃ | %O₂ | MW | MW | ※ — %-1 % | | | | | | | |
| 刻 | 9-4 | 9-3 | | 9-25 | 計算機 | | 9-5 | | | | | | | |
| 計器 | CRS-70-011/012 | LI-16-132 | TRS-16-706A/B | O₂RS-70-071 | 原子炉熱出力 | 原子炉平均熱出力 | NR-7-46A/B/C/D | | | | | | | |
| PID | — | — | — | — | C192 | C126 | — | — | — | — | — | — | — | — |
| 1 | ▨ | ▨ | ▨ | ▨ | | | ※1 ~~160~~ | 75 | 50 | 55 | 70 | 120 | 55 | 150 |
| 2 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 55 | 70 | 120 | 55 | 150 |
| 3 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 55 | 150 |
| 4 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 55 | 150 |
| 5 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 55 | 150 |
| 6 | ▨ | -3.5 | ／ | ／ | | | 150 | 75 | 50 | 60 | 70 | 120 | 55 | 150 |
| 7 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 55 | 150 |
| 8 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 55 | 150 |
| 9 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 55 | 150 |
| 10 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 11 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 12 | 1.30 | -3.5 | ／ | ／ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 13 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 14 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 15 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 16 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 17 | ▨ | ▨ | ▨ | ▨ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 18 | ▨ | ※2— | ／ | ／ | | | 150 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 19 | ▨ | ▨ | ▨ | ▨ | | | 140 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 20 | ▨ | ▨ | ▨ | ▨ | | | 140 | 75 | 50 | 60 | 70 | 120 | 60 | 150 |
| 21 | ▨ | ▨ | ▨ | ▨ | | | 140 | 75 | 50 | 60 | 70 | 120 | 60 | 140 |
| 22 | ▨ | ▨ | ▨ | ▨ | | | 140 | 75 | 50 | 60 | 70 | 120 | 60 | 140 |
| 23 | ▨ | ▨ | ▨ | ▨ | | | 140 | 75 | 50 | 60 | 70 | 120 | 60 | 140 |
| 24 | — | ※2— | ／ | ／ | | | 140 | 75 | 50 | 60 | 70 | 120 | 60 | 140 |

| | 9,120 | 9,13,31 | | | | |
|---|---|---|---|---|---|---|
| | 原子炉に使用している冷却材及び減速材の毎日の補給量 | | | | | |
| | 毎日1回 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | | | |
| | 7 | 8 | | | | |
| | 補給水積算記録 | 格納容器内の原子炉冷却材漏えい率 | | | | |
| | 純水補給水量<br>FQ-79-300(2) | D/W冷却器ドレン量<br>FQ-76-222-2(2) | D/W床ドレンサンプ流量<br>FQ-20-527(×0.01t) | D/W機器ドレンサンプ流量<br>FQ-20-530(×0.01t) | | |
| | 現 場 | 9-4 | | | | |
| 24 | ※3 — | 36853 | 39871 | 575614 | D/W床ドレン | m³/h |
| 0 | 128635350 | 36853 | 39865 | 575217 | 全漏洩量 | m³/h |
| 差 | — | 0 | 6 | 397 | | |

| | 主発電機 | 変圧器等積算 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | | | | | | | | | |
| | 発電機出力 | 起動変圧器 | | | | | 所内変圧器 | | | 励磁電源変圧器 | 所内電力量合計 |
| | 9 | | | | | | | | | | |
| | 読み | 5SA-1 | 5SA-2 | 5SB-1 | 5SB-2 | 小計 | 5A | 5B | 小計 | 電力量 | |
| | ×10000 kWh | ×1000 kWh | ×1000 kWh | ×1000 kWh | ×1000 kWh | MWh | ×1000 kWh | ×1000 kWh | MWh | ×100kWh | MWh |
| | 9-31 | 9-31 | | | | ▨ | 9-31 | | ▨ | 9-31 | ▨ |
| | WH-43-107 | WH-42-104A | WH-42-104B | WH-42-104C | WH-42-104D | ▨ | WH-42-103A | WH-42-103B | ▨ | WHT-43-108 | ▨ |
| 24 | ▨ | ※2 — | ※2 — | ※2 — | ※2 — | ▨ | ※2 — | ※2 — | ▨ | ※2 — | ▨ |
| 0 | ／ | 42100.5 | 61643.5 | 58983.0 | 61508.0 | ▨ | 68850.4 | 61400.1 | ▨ | 39898 | ▨ |
| 差 | ▨ | ※2 — | ※2 — | ※2 — | ※2 — | ※2 — | ※2 — | ※2 — | ※2 — | ※2 — | ※2 — |

所内電力量算出(計器番号WH-42-およびWHT-43-を省略)
(104A+104B+104C+104D)+(103A+103B)+(108×0.1)－(104A1+104A2+104B1+104B2)

6号起動変圧器使用量 104A1電力量合計 53 MWh 104B1電力量合計 56 MWh
104A2電力量合計 78 MWh 104B2電力量合計 111 MWh

| 定格回転速度運転時<br>タービン軸受振動値(1日の最大値) | |
|---|---|
| 11 | |
| 9-75 | |
| S/VBR-30-20-3/4/5/6/7 | |
| 軸受 No. | 最大値 1/100mm |
| — | — |

補足事項
- 補1 炉規則第7条、保安規定第120条記録は連続記録のチャートである。
- 補2 原子炉水電導度が記録できない場合は代替記録採取場所により記録する。詳細は運転日誌記載ガイドを確認すること。
- 補3 再循環ポンプ吸込温度(原子炉冷却材浄化系入口温度)の毎正時の温度と1時間前の温度を確認し、温度差が55℃/hを超えていないことを確認する。

注意事項(運転日誌共通)
1. 運転日誌別紙の項目に●が記載されているものは、BOP打出値参照記録のため、毎時打出し記録を確認し、データに異常が無い事を確認し空欄とすること。
2. PTW以外で記録不可能な場合は「－」としその理由を余白に記載する。PTWの場合は「PTW」と記載する。
3. 記録不要な場合は当該値の欄を「／」とする。(運転日誌別紙の●項目も同様)

記事
※ SI単位化に伴う単位変更
※1 誤記訂正「150」
H23.3.11 [illegible]
7h44' RHRポンプ(B)停止
8h31'～9h19' RPV昇圧
14h46' 原子炉スクラム
15h40' 全交流電源喪失
※2 電源喪失により確認不可
※3 現場のため確認不可

添付資料－5－2

**太枠は炉規則第7条／保安規定第120条対象記録**

一発－360 運転日誌記載ガイド
2011年3月10日(00)

| 確　認 | | 承　認 | 内容確認 | 作　成 |
|---|---|---|---|---|
| 原子炉主任技術者 | | 当直長 | 当直副長 | 当直員 |
| | 2直 | [redacted] | | |
| | 1-1直 | | | |
| | 1-2直 | | | |
| | 2直 | | | |

## 福島第一原子力発電所　5号機

# 運　転　日　誌　別紙

## Fukushima Daiichi Nuclear Power Station Unit 5 Operation log - Appendix

2011 年 3 月 11 日

| 保安規定 | 9,35,36,37,120 | | 9,120 | | | | | | | | | | 9,37 | 38 | 56 | 他Gr使用データ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 炉規則第7条 保安規定 第120条 記録項目 | 炉心の温度 | | 冷却材流量 | | 冷却材圧力 | | 冷却材入口温度 | 冷却材出口温度 | 再結合装置内の温度 | | | | | | | | | 発電機出力 | |
| 記録すべき場合、頻度 | 全燃料取り出し中で且つプールゲート閉の場合以外連続 | | 原子炉の状態が運転及び起動において1時間ごと | | | | | | | | | | 原子炉を昇圧する場合(補1) | 原子炉の状態が運転、起動の場合 | 原子炉に1体以上燃料が装荷されている場合で、プールゲートが閉の場合 | | | 発電機出力運転中 | |
| 運転日誌別紙 [illegible] | 12 | | 13 | 14 | 15 | 16 | 17 | 18 | 19 | | | | 20 | 21 | 22 | 23 | 24 | 25 | |
| 項目 | ●再循環系ループ温度(補2) | | ●主蒸気流量 | ●給水流量 | ●給水圧力 | ●主蒸気圧力 | ●給水温度 | ●主蒸気温度 | ●排ガス再結合器温度 | | | | 原子炉圧力容器最低温度 | ●原子炉圧力 | ●原子炉水位 | ●復水器真空 | ●高圧第1段圧力 | 読み | ●電力量 |
| | A | B | | | | | | | A | | B | | | | | | | | |
| | | | | | | | | | 上部 | 下部 | 上部 | 下部 | | | | | | | |
| 時刻 | ℃ | | t/h | t/h | MPa | MPa | ℃ | ℃ | ℃ | | | | ℃ | MPa | ※ cm ~~mm~~ | kPa(abs) | MPa | ×10000 kWh | MWh |
| | 9-4 | | 9-5 | | 9-6 | 9-7 | 9-20 | | 9-34-1 | | | | 9-21 | ※ ~~9-6~~ 9-4 | | 9-7 | | 9-31 | |
| 計器 | TR-2-150 | | FR-6-96 | | PI-52-31 | PI-EHC-001 | TRS-51-1 No.7 | TRS-51-1 No.8～11 | TRS-24-713A | | TRS-24-713B | | TR-2-3-89 | ※ ~~LR/PR-2-97~~ LR-2-3-126 | | PI-51-8B | PI-51-5 | WH-43-107 | |
| PID | C101 | C102 | D200 | D201 | C046 | B012 | D230 | C100 | L000 | L002 | L001 | L003 | - | C003 | C004 | T001 | T004 | | — |
| 0 | | | | | | | | | | | | | | | | | | | |
| 1 | 85 | 85 | | | | | | | | | | | | | 715 | | | | |
| 2 | 86 | 86 | | | | | | | | | | | | | 715 | | | | |
| 3 | 86 | 86 | | | | | | | | | | | | | 715 | | | | |
| 4 | 87 | 87 | | | | | | | | | | | | | 715 | | | | |
| 5 | 88 | 88 | | | | | | | | | | | | | 715 | | | | |
| 6 | 88 | 88 | | | | | | | | | | | | | 715 | | | | 停 |
| 7 | 89 | 89 | | | | | | | | | | | | | 715 | | | | |
| 8 | 89 | 89 | | | | | | | | | | | 70 | | 720 | | | | |
| 9 | 90 | 90 | | | | | | | | | | | 70 | | 870 | | | | |
| 10 | 91 | 91 | | | | | | | | | | | 71 | | 870 | | | | |
| 11 | 92 | 92 | | | | | | | | | | | 72 | | 870 | | | | 止 |
| 12 | 93 | 93 | | | | | | | | | | | 73 | | 870 | | | | |
| 13 | 94 | 94 | | | | | | | | | | | 73 | | 870 | | | | |
| 14 | 94 | 94 | | | | | | | | | | | 74 | | 870 | | | | |
| 15 | 9C | 9C | | | | | | | | | | | 73 | | 860 | | | | |
| 16 | — | — | | | | | | | | | | | — | | ※2OS | | | | 中 |
| 17 | — | — | | | | | | | | | | | — | 5.5 | ※2OS | | | | |
| 18 | — | — | | | | | | | | | | | — | 5.74 | ※2OS | | | | |
| 19 | — | — | | | | | | | | | | | — | 5.95 | ※2OS | | | | |
| 20 | — | — | | | | | | | | | | | — | 6.21 | ※2 OS | | | | |
| 21 | — | — | | | | | | | | | | | — | 6.53 | ※2OS | | | | |
| 22 | — | — | | | | | | | | | | | — | 6.80 | ※2OS | | | | |
| 23 | — | — | | | | | | | | | | | — | 7.10 | ※2OS | | | | |
| 24 | — | — | | | | | | | | | | | — | 7.40 | ※2 OS | | | | |

※1 記載削除 H23.3.11 作業管理G [redacted]

補足事項
補1 原子炉圧力容器漏えい(水圧)検査等で原子炉を加圧する場合に採取する。
補2 再循環系ループ温度が記録できない場合は、代替記録採取場所により記録する。
詳細は運転日誌記載ガイドを確認すること。

記事
※ 監視計器変更
H23.3.11 F班 前原
7°49' RHRポンプ(B)停止
7°58' 原子炉水位上昇操作
※2 監視計器変更 LR-2-3-91A
H23.3.11 作業管理G [redacted]
8°31'～9°19' RPV昇圧
14°46' 原子炉スクラム
15°40' 全交流電源喪失

様式２

# Fukushima Daiichi Nuclear Power Station Unit 5 Daily Inspection Sheet (for "Cold Shutdown" and "Fuel Exchange") 1/2

# 福島第一原子力発電所　5号機　日常点検表（「冷温停止」・「燃料交換」用；）1／2

一発－３５６　日常点検表運用ガイド
２０１１年３月１日（00）

記録採取：（2直①　5時～6時）・（1－1直　12時～13時）・（1－2直　19時～20時）・（2直②　24時）

2011 年 3 月 11 日

| | 承認 | 作成 | |
|---|---|---|---|
| | 当直長 | 当直副長 | 主任・副主任・主機 |
| 2直① | [redacted] | [redacted] | [redacted] |
| 1-1直 | [redacted] | [redacted] | [redacted] |
| 1-2直 | [redacted] | [redacted] | [redacted] |
| 2直② | [redacted] | [redacted] | [redacted] |

| 動作不能の確認項目 |
|---|
| ①当該チャンネルが設定値に達している場合，当該チャンネルがトリップしていること（誤不動作していないこと） |
| ②当該チャンネルの指示値に異常な変動がないこと |
| ③他のチャンネルと比較して有意な差異がないこと |

承認時確認事項
- 全ての枚数が揃っていること。
- 全ての枚数が片面印刷であること。
- ホチキス等で離散防止が図られていること。

## 1．計測及び制御設備

### (1) 核計装の確認

a. 起動領域モニタの確認　関連規定 保安規定第27条

- 計数率の指示が３S$^{-1}$以上であることを確認する。（起動領域モニタ周りの燃料が４体未満を除く）
- 動作不能でないことを「動作不能の確認項目」①～③により確認する。

[除外条件]
- 全燃料が取り出されている場合は記入不要一括斜線とする。

| PNL | 機器名称 | 設定値 | 2直① | 1-1直 | 1-2直 | 記入例 |
|---|---|---|---|---|---|---|
| 9－12 | SRNM A | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | 異常なし「レ」<br>異　常「×」<br>SRNM検出器廻りに燃料が無い場合「－」印を記入する |
| | SRNM B | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | |
| | SRNM C | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | |
| | SRNM D | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | |
| | SRNM E | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | |
| | SRNM F | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | |
| | SRNM G | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | |
| | SRNM H | 高トリップ 120%以上/下限3S$^{-1}$以下<br>ペリオド短短10秒以下 | ✓ | ✓ | ✓ | |

### (2) 原子炉建屋換気系放射線モニタの確認　関連規定 保安規定第27条

- 動作不能でないことを「動作不能の確認項目」①～③により確認する。

（炉心変更時〈停止余裕確認後の制御棒１本の挿入，引き抜きを除く〉又は原子炉建屋内で照射された燃料に係る作業時において動作不能でないこと）

| PNL | 機器名称 | 機器番号 | 設定値 | 1－2直 | 記入例 |
|---|---|---|---|---|---|
| 9－10 | 原子炉建屋換気系放射線モニタA | RIS-17-450A | 0.013mSv/h以上 | × | 異常なし「レ」<br>異　常「×」 |
| | 原子炉建屋換気系放射線モニタB | RIS-17-450B | 0.013mSv/h以上 | × | |

## 2．外部電源　関連規定 保安規定第59条

- 外部電源１系列が動作可能であることを外部電源の電圧が確立していることで確認する。

| 確認項目 | 2直① | 記入例 |
|---|---|---|
| 夜の森線１号 | ✓ | 異常なし「レ」<br>異常「×」<br>停止中の場合は「－」 |
| 夜の森線２号 | ✓ | |
| ６号機　主発電機 | － | |

## 3．所内電源系統母線受電状態確認　関連規定 保安規定第66条

### （１）原子炉保護系母線

- 原子炉保護系母線が受電されていることを母線受電状態表示白ランプ点灯により確認する。

| PNL | 確認項目 | 2直② | 記入例 |
|---|---|---|---|
| 9－15 | RPS A系母線受電　白ランプ点灯 | × | 異常なし「レ」，異常「×」，停止中の場合は「－」 |
| 9－17 | RPS B系母線受電　白ランプ点灯 | × | |

### （２）非常用交流高圧電源母線

- 非常用交流高圧電源母線が受電されていることを電圧指示計にて確認する。

| PNL | 機器番号 | 確認項目 | 2直② | 記入例 |
|---|---|---|---|---|
| 9-8 | EI-30 | 非常用交流高圧電源母線５C電圧正常 | × | 異常なし「レ」，異常「×」，停止中の場合は「－」 |
| | EI-76 | 非常用交流高圧電源母線５D電圧正常 | × | |

### （３）直流電源母線

- 直流電源母線が受電されていることを電圧指示計にて確認する。

| PNL | 機器番号 | 確認項目 | 2直② | 記入例 |
|---|---|---|---|---|
| 9-8 | EI-27 | DC125V母線A電圧正常 | × | 異常なし「レ」，異常「×」，停止中の場合は「－」 |
| | EI-78 | DC125V母線B電圧正常 | × | |

### （４）設備維持に対する機能満足の確認

| 確認項目 | 2直② | 記入例 |
|---|---|---|
| 設備維持に対する機能満足 | × | 要求機能を満足する「レ」<br>要求機能を満足しない「×」 |

- 設備維持に対する機能満足の確認とは、保安規定第27条、第35条、第36条、第40条で要求される設備の維持に必要な原子炉保護系母線，非常用交流高圧電源母線，直流電源母線が受電されていること。
- 原子炉保護系母線，非常用交流高圧電源母線，直流電源母線が停止中の場合において設備維持に対する機能満足を判断した場合は，その理由を備考欄に記載する。（例．M／C５C停止中　A系角落とし中につき設備維持に対する機能満足）

## 4．使用済燃料プールの水温　関連規定 保安規定第65条

- 使用済燃料プールの水温が６５℃以下であることを確認する。

| PNL | 確認項目 | 機器番号 | 制限値 | 2直② | | 記入例 |
|---|---|---|---|---|---|---|
| | | | | 記録欄［℃］ | 確認欄 | |
| 9-20 | 使用済燃料プールの水温（１日の最大値） | TRS-52-1<br>打点19 | 65℃以下<br>※ | ※1 — | × | 記録欄：最大値を記入する。<br>確認欄：異常なし「レ」，異常「×」 |

※管理目標値５２℃以下

## 5．使用済燃料プールの水位　関連規定 保安規定第55条

| 確認項目 | 2直② | 記入例 |
|---|---|---|
| 使用済燃料プールの水位がオーバーフロー水位付近にあること | ※2 ~~—~~ × ※1 | 異常なし「レ」，異常「×」 |

※2 誤記訂正 H23.3.12 B班 [redacted]

備考

・14°46′ 原子炉スクラム

・15°40′ D/G 5A，5B トリップ，全交流電源喪失

※1 電源喪失により確認，測定不可

一般　取扱注意　社内関係者限り　　福島第一原子力発電所 第一運転管理部発電(3・4号)G

－ 様式 2－5－1 －

1F-5-6

添付資料－５－４

様式２

# Fukushima Daiichi Nuclear Power Station Unit 5 Daily Inspection Sheet (for "Cold Shutdown" and "Fuel Exchange") 2/2

# 福島第一原子力発電所　５号機　日常点検表（「冷温停止」・「燃料交換」用）２／２

記録採取：（２直①　５時～６時）・（１－１直　１２時～１３時）・（１－２直　１９時～２０時）・（２直②　２４時）

2011 年 3 月 11 日

## ６．原子炉停止時冷却系の確認

### (1)原子炉の状態確認　　（該当項目を ⬭ で囲む）

| 確　認　項　目 | 2直① | 1－1直 | 1－2直 | 備　　考 |
|---|---|---|---|---|
| 原子炉の状態 | [✓ 冷温停止] | [✓ 冷温停止] | [✓ 冷温停止] | → (2)-1をチェック |
| | 燃料交換 | 燃料交換 | 燃料交換 | → (2)-2をチェック |

### (2)-1原子炉停止時冷却系の状態確認（原子炉の状態が"冷温停止"の場合）

関連規定 保安規定第35条

［除外条件］（以下の３つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉の状態が"燃料交換"の場合
- 原子炉停止時冷却系起動準備時（停止時冷却系起動前に実施する配管洗浄及びウォーミング）
- 原子炉の昇温を伴う検査時（原子炉冷却材の昇温開始から降温開始までの期間）

| 確　認　項　目 | 2直① | 1－1直 | 1－2直 | 記入例 |
|---|---|---|---|---|
| RHR　A系ポンプA　SHC運転中 | — | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　A系ポンプA　SHC運転可能 | ✓ | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| RHR　A系ポンプC　SHC運転中 | — | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　A系ポンプC　SHC運転可能 | ✓ | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| RHR　B系ポンプB　SHC運転中 | — | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　B系ポンプB　SHC運転可能 | ✓ | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| RHR　B系ポンプD　SHC運転中 | ✓ | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　B系ポンプD　SHC運転可能 | — | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| 原子炉冷却材温度（℃）（１００℃未満確認） | 88 | | | （備考）原子炉冷却材温度<br>(1)原子炉冷却材再循環ポンプ入口温度<br>(2)停止時冷却熱交換器入口温度 |
| 原子炉冷却材温度採取場所（備考を参照し番号を記入） | (1) | | | (3)ＦＰＣポンプ入口温度<br>(4)給水ノズル温度 |
| 原子炉状態に対する要求機能満足 | ✓ | | | 要求機能を満足する「レ」，要求機能を満足しない「×」 |

原子炉状態に対する要求機能満足（ＯＲ条件）
- １系列が運転中であること及び原子炉で発生する崩壊熱が原子炉停止時冷却系以外の手段で除去出来ると判断するまでさらに１系列の原子炉停止時冷却系が動作可能であること。
- 原子炉停止時冷却系が停止した場合においても、原子炉冷却材温度を１００℃未満に保つことができること。

### (2)-2原子炉停止時冷却系の状態確認（原子炉の状態が"燃料交換"の場合）

関連規定 保安規定第36条

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉の状態が"冷温停止"の場合
- 原子炉内から全燃料が取り出された場合

| 確　認　項　目 | 2直① | 1－1直 | 1－2直 | 備　　考 |
|---|---|---|---|---|
| 原　子　炉　水　位 | ＯＦ水位 | ＯＦ水位 | ＯＦ水位 | 該当項目を ⬭ で囲む |
| | 上記以外 | 上記以外 | 上記以外 | |

ＯＦ：オーバーフロー

| 確　認　項　目 | 2直① | 1－1直 | 1－2直 | 記入例 |
|---|---|---|---|---|
| RHR　A系ポンプA　SHC運転中 | | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　A系ポンプA　SHC運転可能 | | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| RHR　A系ポンプC　SHC運転中 | | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　A系ポンプC　SHC運転可能 | | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| RHR　B系ポンプB　SHC運転中 | | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　B系ポンプB　SHC運転可能 | | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| RHR　B系ポンプD　SHC運転中 | | | | 運転中「レ」，停止中（待機中）「—」，作業中「×」 |
| RHR　B系ポンプD　SHC運転可能 | | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「—」 |
| 原子炉冷却材温度（℃）（６５℃以下確認） | | | | （備考）原子炉冷却材温度<br>(1)原子炉冷却材再循環ポンプ入口温度<br>(2)停止時冷却熱交換器入口温度 |
| 原子炉冷却材温度採取場所（備考を参照し番号を記入） | | | | (3)ＦＰＣポンプ入口温度<br>(4)給水ノズル温度 |
| 原子炉状態に対する要求機能満足 | | | | 要求機能を満足する「レ」，要求機能を満足しない「×」 |

原子炉状態に対する要求機能満足（ＯＲ条件）
- １系列が運転中であること及び原子炉水位がオーバーフロー水位となるまでの期間は、さらに１系列の原子炉停止時冷却系が動作可能であること。
- 原子炉停止時冷却系が停止した場合においても、原子炉冷却材温度を６５℃以下に保つことができること。

## ７．非常用炉心冷却系の確認

関連規定 保安規定　第40条

### (1)原子炉の状態確認

| 確　認　項　目 | 2直① | 1－1直 | 1－2直 | 記入例 |
|---|---|---|---|---|
| 原子炉の状態 | [✓ 冷温停止]<br>燃料交換 | [✓ 冷温停止]<br>燃料交換 | [✓ 冷温停止]<br>燃料交換 | 該当項目を ⬭ で囲む<br>ＯＦ：オーバーフロー |
| プールゲート | 開 [✓ 閉] | 開 [✓ 閉] | 開 [✓ 閉] | |
| 燃料の状態 | [✓ 装荷]<br>全取出 | [✓ 装荷]<br>全取出 | [✓ 装荷]<br>全取出 | |
| 原　子　炉　水　位 | ＯＦ水位付近<br>[✓ 上記以外] | ＯＦ水位付近<br>[✓ 上記以外] | ＯＦ水位付近<br>[✓ 上記以外] | |

### (2)-1非常用炉心冷却系統の水源の確認

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバーフロー付近で，かつプールゲートが開の場合

| 確　認　項　目 | 2直① | 1－1直 | 1－2直 | 記入例 |
|---|---|---|---|---|
| ＥＣＣＳ系水源 | [✓ S/C]・CST | [✓ S/C]・CST | [✓ S/C]・CST | 該当項目を ⬭ で囲む |

### (2)-2非常用炉心冷却系統の水源の確認（ＣＳＴが水源の場合）

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバーフロー付近で，かつプールゲートが開の場合

| 確　認　項　目 | | 2直① | 1－1直 | 1－2直 | 記入例 |
|---|---|---|---|---|---|
| ＣＳＴレベル | ＣＳ系ポンプ水源の場合２２％以上 | — | — | — | 異常なし「レ」，異常「×」<br>ＣＳ系ポンプ水源がＳ／Ｃの場合または復水移送ポンプを注水系統として確保しない場合「—」 |
| | 復水移送ポンプを注水系統として確保する場合３７％以上 | ✓ | ✓ | × | |

### (2)-3非常用炉心冷却系統の水源の確認（Ｓ／Ｃが水源の場合）

［除外条件］（以下の３つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- ＥＣＣＳ系水源がCSTの場合
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバーフロー付近で，かつプールゲートが開の場合

| 確　認　項　目 | | 2直① | 1－1直 | 1－2直 | 記　入　例 |
|---|---|---|---|---|---|
| Ｓ／Ｃレベル | ＥＣＣＳ系ポンプ水源の場合－１５６cm以上 | ✓ | ✓ | × | 前記項目を満足する場合「レ」，満足しない場合「×」 |

### (2)-4非常用炉心冷却系統の状態確認

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバー水位付近で，かつプールゲートが"開"の場合

| 確　認　項　目 | 2直① | 1－1直 | 1－2直 | 記入例 |
|---|---|---|---|---|
| 炉心スプレイＡ系注入可能 | ✓ | ✓ | × | 注入可能「レ」，注入不可能「×」 |
| 炉心スプレイＢ系注入可能 | ✓ | ✓ | × | 注入可能「レ」，注入不可能「×」 |
| RHR　A系ポンプA　低圧注水系　注入可能※ | ✓ | ✓ | × | 注入可能「レ」，注入不可能「×」 |
| RHR　A系ポンプC　低圧注水系　注入可能※ | ✓ | ✓ | × | 注入可能「レ」，注入不可能「×」 |
| RHR　B系ポンプB　低圧注水系　注入可能※ | ✓ | ✓ | × | 注入可能「レ」，注入不可能「×」 |
| RHR　B系ポンプD　低圧注水系　注入可能※ | ✓ | ✓ | × | 注入可能「レ」，注入不可能「×」 |
| 復水移送ポンプ１台以上運転中 | ✓ | ✓ | × | 満足する場合「レ」，満足しない場合「×」 |
| 原子炉状態に対する要求機能満足 | ✓ | ✓ | × | 要求機能を満足する「レ」，要求機能を満足しない「×」 |

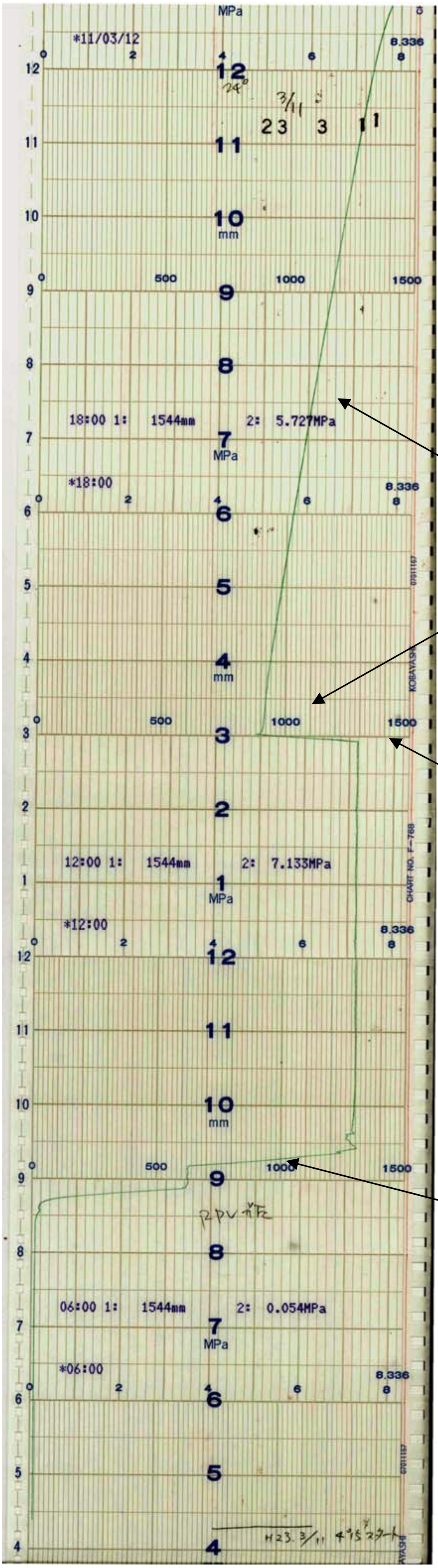
※原子炉停止時冷却系起動準備及び原子炉停止時冷却系の運転中は、低圧注水系の動作不能とはみなさない。

原子炉状態に対する要求機能満足（ＯＲ条件）
- 動作可能であるべき非常用炉心冷却系、系統数２系列（自動減圧系及び高圧注水系を除く）
- 動作可能であるべき非常用炉心冷却系、系統数１系列（自動減圧系及び高圧注水系を除く）及び復水補給水１系列

備考
- 7°44′ SHC（RHRポンプ（D））停止
- 8°31′～9°19′ RPV ᴸ/ᴛ 昇圧

## 【Unit 3 Reactor water level, Reactor Pressure】
## 【５号　原子炉水位、原子炉圧力】

| LR/PR-6-97 | |
|---|---|
| No. 1 🟥 | 原子炉水位 |
| No. 2 ⬛ | 原子炉圧力 |



① 原子炉圧力容器の耐圧漏えい試験のための昇圧

② １４時４６分　地震発生

③ 地震後の電源喪失で加圧源としていた機器が停止し圧力が降下

④ 崩壊熱による緩やかな圧力上昇

① pressure rising for pressure leak test of reactor pressure vessel

②14:46 Occurrence of the earthquake

③ Pressure drop caused by stop of machines as pressure supply due to power outage after earthquake

④ Gradual pressure rising due to decay heat

## 【Unit 3 Reactor water level, Reactor Pressure】

## 【５号　原子炉水位、原子炉圧力】

| LR/PR-6-97 | | |
|---|---|---|
| No. 1 | 🟥 | 原子炉水位 |
| No. 2 | ⬛ | 原子炉圧力 |

⑤　主蒸気逃し安全弁による炉圧制御

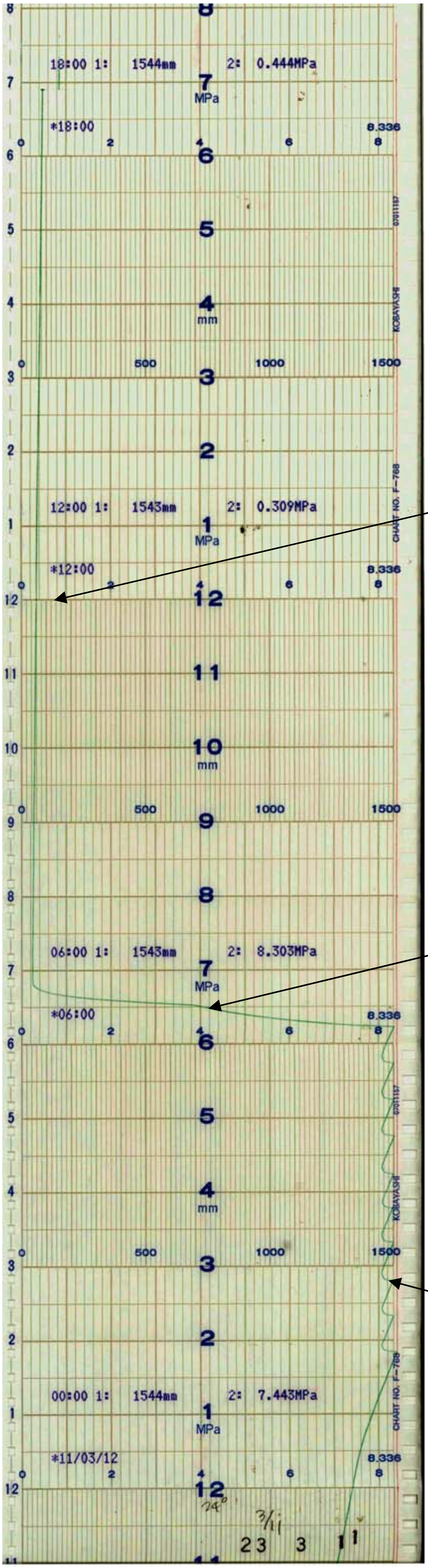
⑥　原子炉圧力容器頂部の弁の開操作による原子炉減圧

⑦　崩壊熱による緩やかな圧力上昇

⑤ Reactor pressure control by main steam safety relief valve

⑥ Reactor pressure reduction by opening the valveat the top of reactor pressure vessel

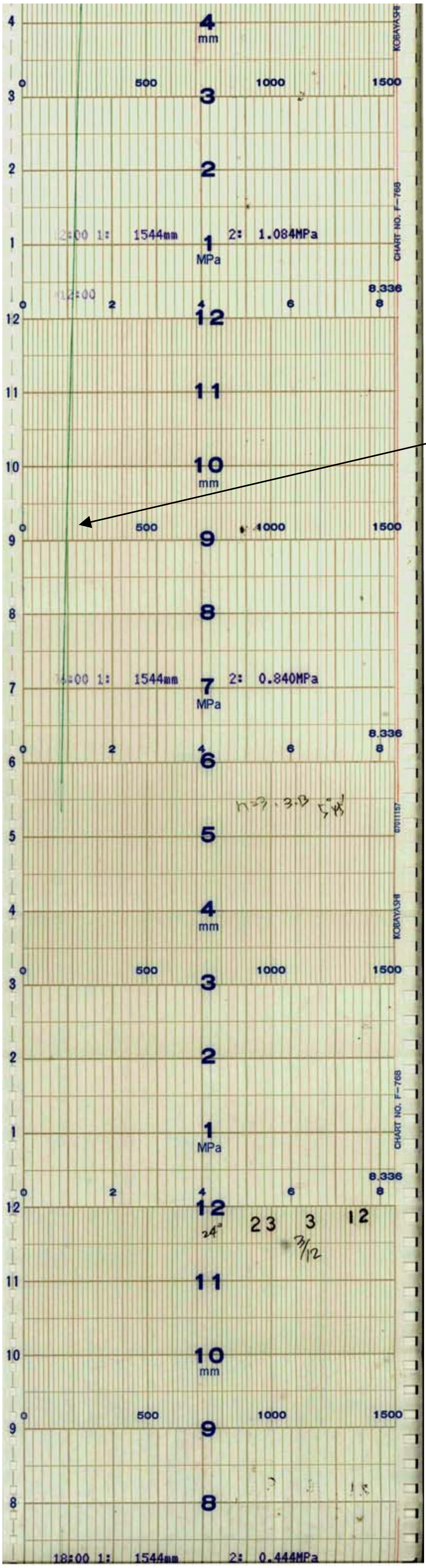
⑦ Gradual pressure rising due to decay heat



1F-5-9

## 【Unit 3 Reactor water level, Reactor Pressure】

## 【５号　原子炉水位、原子炉圧力】



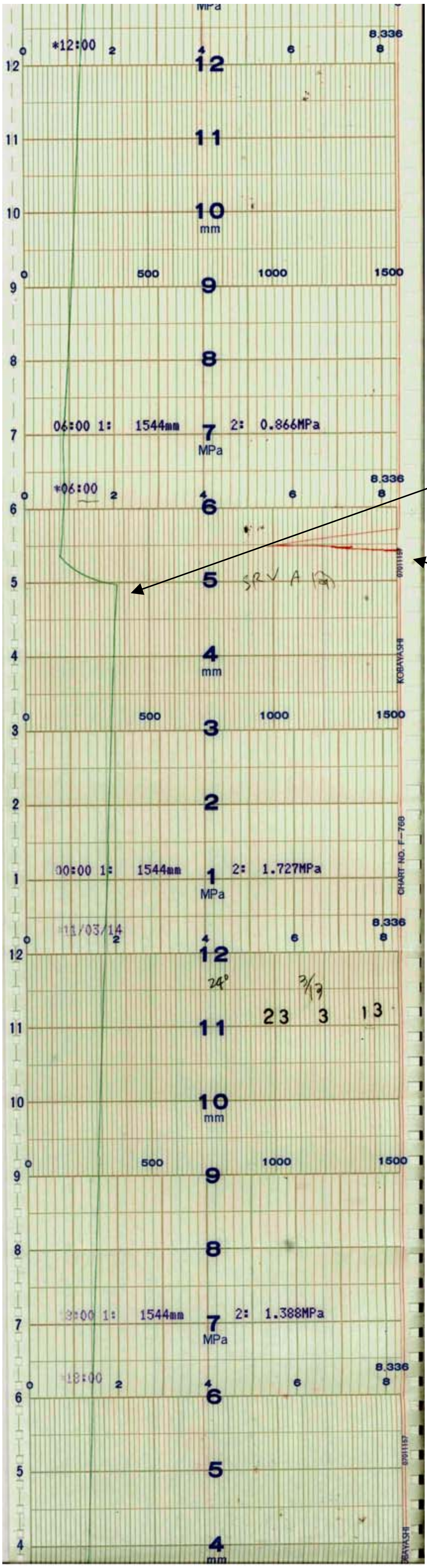
| LR/PR-6-97 | | |
|---|---|---|
| No. 1 | 🟥 | 原子炉水位 |
| No. 2 | ⬛ | 原子炉圧力 |

⑧　崩壊熱による緩やかな圧力上昇

⑧ Gradual pressure rising due to decay heat

⑧

## 【Unit 3 Reactor water level, Reactor Pressure】
## 【５号　原子炉水位、原子炉圧力】



⑨

⑩

| LR/PR-6-97 | | |
|---|---|---|
| No. 1 | 🟥 | 原子炉水位 |
| No. 2 | ⬛ | 原子炉圧力 |

⑨　主蒸気逃し安全弁による減圧、以降この操作を繰り返す

⑩　圧力変動による水位の変動

⑨ Pressure reduction by main steam safety relief valve, after that repeat this action

⑩ Water level fluctuation due to pressure fluctuation

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 5 and 6

# Shift Supervisor Task Handover Journal

| [confirmed by] Chief engineer of reactors |
|---|
| |

| March 11, 2011, Friday, 21:00, Shift 1, Group A | [confirmed by]<br>Supervisor of next shift | [made and approved by]<br>Shift supervisor |
|---|---|---|
| | | |

| | | | | |
|---|---|---|---|---|
| On duty<br>6 (operator)<br>- (instructor)<br>1 (trainee) | No. of organization | Off duty | None | Support duty |
| | 110 | Replacement | None | Refer to attachment |

| | | | | |
|---|---|---|---|---|
| Unit 5 | Generator Output | 0MWe | Reactor Status | in operation・start up・hot shutdown・[✓ cold shutdown]・fuel exchange |
| Unit 6 | Generator Output | 0MWe | Reactor Status | in operation・start up・hot shutdown・[✓ cold shutdown]・fuel exchange |

## Notes

Unit 5

1. Operation Status

(1) Reactor is shutdown for a periodical inspection

(2) Completion of RPV pressure boost ↑7.15MPa - 9:19

(3) One CR withdrawal interlock test Passed 10:07-10:13

(4) Control Rod Drive Hydraulic System function test (Scram test) 〒/abort 10:45/14:46

(5) Alarm “Huge Seismic Acceleration Scram” activated 14:47

(6) Reactor automatic scram 14:47

(7) 5A, 5B D/G 1A/1B automatic start up/ synchronized 14:47

(8) 5A, 5B D/G trip → Loss of All A/C power 15:36

2. Compliance status of safety regulation

(1) Safety regulation, article 17 (procedures at the time of earthquake and fire)

- report to O&M general manager at the occurrence of earthquake with an intensity of more than lower 5 14:50

(2) Safety regulation, article 76 (basic procedures at the occurrence of abnormal event)

- report to O&M general manager at the occurrence of reactor automatic scram 14:50

(3) Safety regulation, article 113 (report)

- report to O&M general manager at the occurrence of specific event (loss of all A/C power ) stipulated by clause 1, article 10 of the act on special measures concerning nuclear emergency preparedness 15:41

3. Periodic test

None

4. Requested work, non compliance event

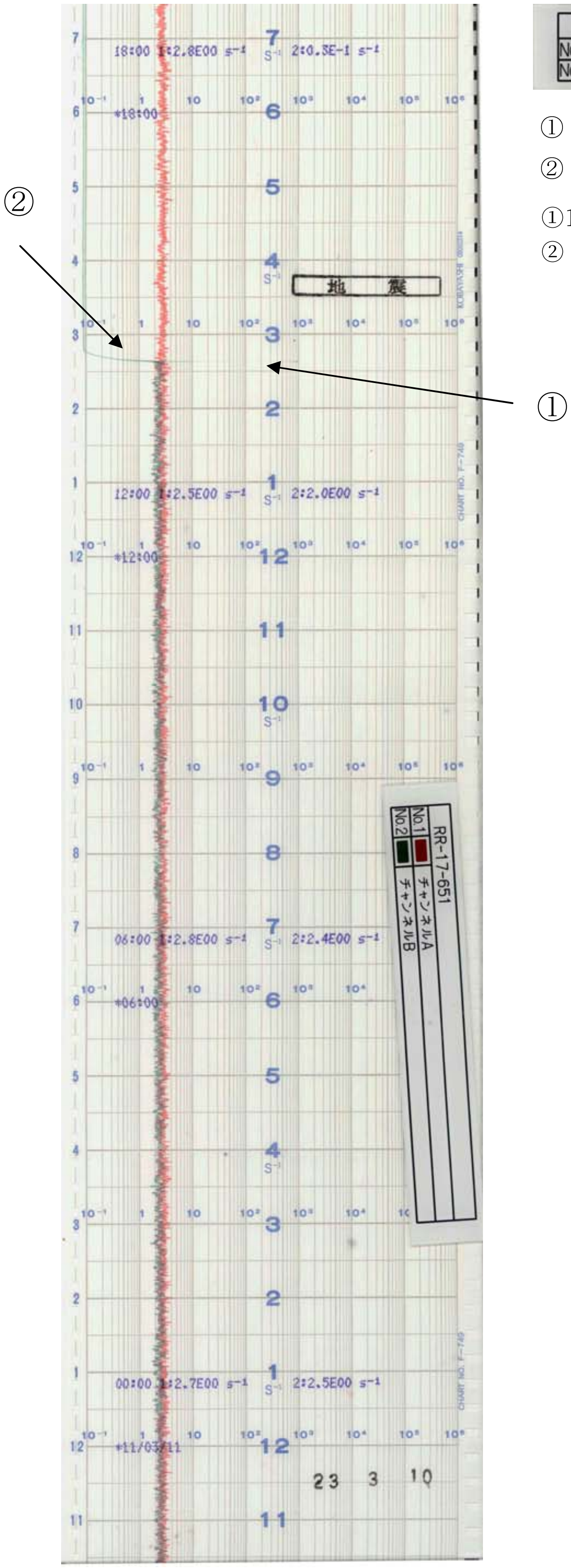
None

5. Status of waste treatment facility

None

## 【Unit 5  Main exhaust stack monitor】

## 【５号　主排気筒モニタ】



| RR-17-651 | |
|---|---|
| No.1 ■ | チャンネルA |
| No.2 ■ | チャンネルB |

①　１４時４７分　地震によるスクラム

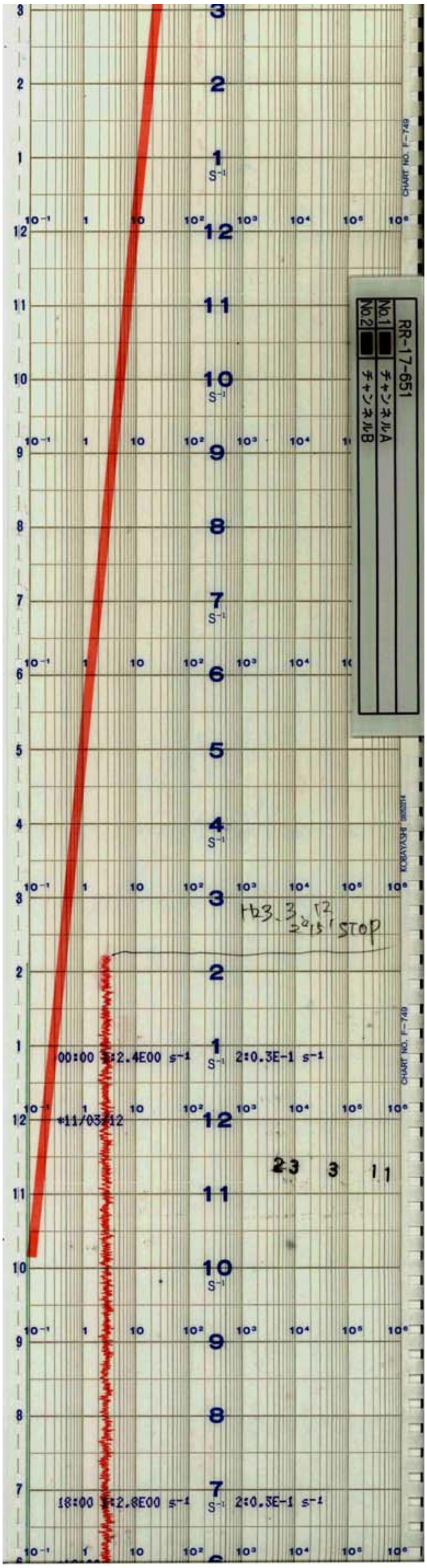
②　電源喪失によるチャンネルＢの停止

①14:47 Scram due to the earthquake

② Channel B stop due to power outage

## 【Unit 5 Main exhaust stack monitor】

## 【５号　主排気筒モニタ】



| RR-17-651 | | |
|---|---|---|
| No.1 | 🟥 | チャンネルA |
| No.2 | ■ | チャンネルB |

# 【Unit 5  Main exhaust stack monitor】

# 【５号　主排気筒モニタ】

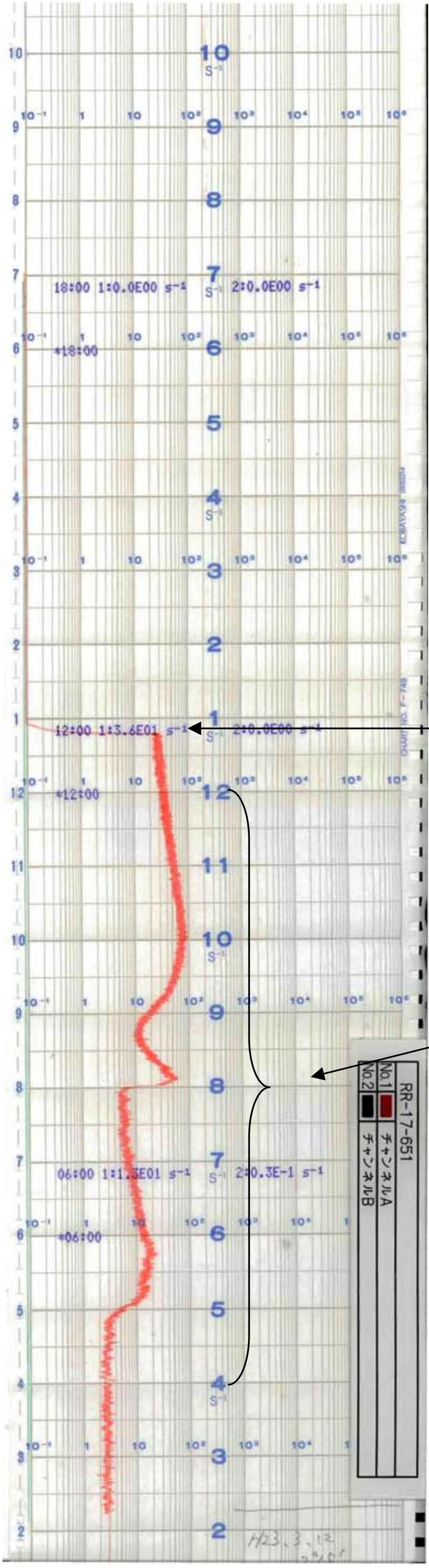
| RR-17-651 | | |
|---|---|---|
| No.1 | 🟥 | チャンネルA |
| No.2 | ■ | チャンネルB |

③　構内線量上昇の影響を考えられる指示上昇

※　電源喪失による記録停止

③ indication rising presumably  by the influence of increase in radiation in the site

※Recording stop due to power outage



## 3. Overview of Data Analysis of Unit 6

### (1) Plant Data

Plant behavior represented by data collected from Unit 6 is shown as follows.

The chart of Unit 6 recorded data when the earthquake and tsunami attacked. However, due to the loss of power sources and signals by the effects of inundation by tsunami, the chart stopped after a certain period of time. The annunciator output recorded for about 1 hour after the occurrence of the quake. However, it stopped printing by some reasons. Regarding the operation log which is the record by the operators on duty the records before the earthquake are kept, however, the records after the occurrence of the earthquake are not perfect due to the blackout and working environment in such severe conditions. Transient phenomenon recorder of Unit 6 was shut down under regular inspection, therefore no data were available.

### (2) Plant Behavior

① Unit 6 had been shut down under regular inspection since August 14, 2010. The fuel was loaded to the reactor. The hatch of RPV was closed by bolts. The reactor was on the cold shutdown status. All the control rods were inserted. According to shift supervisor task handover journal, the supervisor confirmed that the water level of common pool was full (near overflow line) and the temperature of the pool was 25℃ before the quake occurred. That was a normal condition. (Attachment-6-1～5)

② After the quake, the pressure inside the reactor gradually rose because of decay heat. Because the shutdown period is longer than that of Unit 5, the rate is smaller compared with that of Unit 5. Since March 14, 2011, like the case of Unit 5, reduction of pressure inside the reactor pressure vessel was implemented by opening the main steam safety relief valve of RPV. In parallel, we repeatedly injected water to the reactor from condensate storage tank using condensate water transferring pump, controlling the pressure and the water level inside the reactor. (Attachment-6-6, 7)

③ Three emergency diesel generators automatically started because the external power supply was lost due to the earthquake. Because the external power supply was lost, RHR system which was under operation with shutdown cooling mode and Fuel Pool Cooling and Filtering(Clean up) System also stopped its operation, though the emergency diesel generators started. Regarding the Pool Cooling and Shutdown Cooling System whose power was supplied by the emergency diesel generator, it was confirmed that the reactor was at the cold shutdown status, and that the water level of the spent fuel pool was full (around the level of overflow), and that the water temperature of the pool was 25℃ before the quake. It was not the case that the fuel cooling would face any problem in an early stage. Therefore, we did not conduct the aforementioned cooling before the tsunami arrived. Later due to the tsunami, while two diesel generators were lost, one diesel generator kept working. From this diesel generator, power which was necessary to keep water supply function to the above reactor was supplied. However, RHR system, Low Pressure Core Spray System, and High Pressure Core Spray System turned to be dysfunctional due to lost of power supply as well as disabled seawater pumps.

(Attachment-6-7, Annex-2)

④ Later, the temporary pump using seawater was started to cool RHR on March 19, 2011. Switching the system of RHR enabled cooling the spent fuel pools and the reactors by turns, achieving the cooling both of the spent fuel pool and the reactor. The reactor reached the situation of cold shutdown at 7:27 pm on March 20, 2011.

(Attachment-6-1～5)

⑤ Unit 5 and Unit 6 use an exhaust stack in common. As described in the analysis of Unit 5, radiation monitoring at the stack indicated stable values by the end of its recording even though there was some noise after the reactor scram. Abnormal situation was not recognized.

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 5 and 6

March 11, 2011, Friday, Shift 2, Shift Supervisor Task Handover Journal（2/3）

Unit 6

1. Operation Status

(1) Reactor is shutdown for periodical inspection　Residual Heat Removal (RHR) (B) system is in operation SHC mode

2. Compliance status of safety regulation

Not particular

3. Periodic test

None

4. Requested work, non compliance event

(1) Sheet pass of water level Control valve of MGCW surge tank (LCV – 46 – 692)

5. Status of waste treatment facility

None

6. Others

None

Fukushima Daiichi Nuclear Power
Station Unit 6

一発―360 運転日誌記載ガイド
2011年3月10日(00)

**太枠は炉規則第7条／保安規定第120条対象記録**

福島第一原子力発電所 6号機

# 運 転 日 誌 〔1〕

Operation log [1]

2011 年 3 月 11 日

| | | 要求記録確認表(引継ぎ後のプラント状態をチェックする) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 炉水温度 | 燃料の状態 | プールゲートの状態 | 原子炉の加圧 | 記録項目確認 2直 | 1-1直 | 1-2直 | 2直 | 記録が必要な項目 |
| 定格熱出力一定運転中 | | ↔ | ↔ | → | → | | | | | 1.5.7.8.10 |
| 発電機並列中 | | → | → | → | → | | | | | 1.7.8.10.11.<br>23.24.25 |
| 原子炉の状態 | 運転 | → | → | → | → | | | | | 1.2.3.4.6.7.8.10<br>12~18.21.22 |
| | 起動 | → | → | → | ↔ | | | | | 1.2.3.6.7.8.10<br>12~18.21.22 |
| | 高温停止 | → | → | → | → | | | | | 1.2.3.6.7.8.10.<br>12.22 |
| | 冷温停止 | 65℃以上 | → | → | 加圧なし | | | | | 1.2.6.7.10.<br>12.22 |
| | | | | | 加圧 | | | | | 1.2.6.7.10.<br>12.20.22 |
| | | 65℃未満 | → | → | 加圧なし | ✓ | ✓ | ✓ | ✓ | 1.2.6.7.10.<br>12.22 |
| | 燃料交換 | → | 1体以上炉心に装荷 | 閉鎖 | → | | | | | 1.2.6.7.10.<br>12.22 |
| | | | | 開放 | → | | | | | 1.2.6.7.10.12 |
| | | → | 全燃料取出中 | 閉鎖 | → | | | | | 1.2.7.10.22.★ |
| | | | | 開放 | → | | | | | 1.2.7.10.12 |
| 格納容器開放中 | | → | → | → | ↔ | | | | | 1.2.3.4.7.8.10 |

## 記録確認項目

| | |
|---|---|
| 1 | 原子炉水導電率 |
| 2 | サプレッションチェンバー水位 |
| 3 | サプレッションチェンバー水温度 |
| 4 | ドライウェル酸素濃度 |
| 5 | 原子炉熱出力(瞬時値、1時間平均値) |
| 6 | 原子炉熱出力(SRNM、APRM) |
| 7 | 補給水積算記録 |
| 8 | 格納容器内の原子炉冷却材漏えい率 |
| 9 | 発電機出力(読み) |
| 10 | 変圧器等積算 |
| 11 | タービン軸振動(軸番号) |
| 12 | ●再循環ポンプ入口温度 |
| 13 | ●原子炉平均給水温度 |
| 14 | ●主蒸気温度 |
| 15 | ●主蒸気流量 |
| 16 | ●給水流量 |
| 17 | ●給水圧力 |
| 18 | ●主蒸気圧力 |
| 19 | ●排ガス再結合器温度 |
| 20 | 原子炉圧力容器胴温度 |
| 21 | ●原子炉圧力 |
| 22 | ●原子炉水位 |
| 23 | ●発電機出力(電力量) |
| 24 | ●復水器真空度 |
| 25 | ●高圧第1段圧力 |

★全燃料取出中でプールゲートが閉鎖されている場合にRPVスタッドボルトの締付を行う場合はRPVスタッドボルト締付開始以降再循環ポンプ入口温度／原子炉冷却材温度変化率の記録を行う。

●の項目に記録要求がある場合でプロセス計算機打ち出しによる確認ができない場合は、別紙を使用し記録を行う。

| 確 認 | | 承 認 | 内容確認 | 作 成 | プロセス計算機データ確認 |
|---|---|---|---|---|---|
| 原子炉主任技術者 | | 当直長 | 当直副長 | 当直員 | |
| | 2直 | [redacted] | [redacted] | [redacted] | 異常なし<br>異常有り |
| | 1-1直 | [redacted] | [redacted] | [redacted] | 異常なし<br>異常有り |
| | 1-2直 | [redacted] | [redacted] | [redacted] | 異常なし<br>異常有り |
| | 2直 | [redacted] | [redacted] | [redacted] | 異常なし<br>異常有り |

1F-6-4

| 保安規定 | 9,18,120 | 9,13,40,46 | 9,13,45 | 9,13,48 | 26 | | 9,26,27,120 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 炉規則第7条 保安規定第120条 記録項目 | 原子炉に使用している冷却材並びに減速材の純度 | | | | | | 熱出力・炉心の中性子束密度 | | | | | | | |
| 記録すべき場合、頻度 | 毎日1回 | すべての期間 | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで<br>[illegible] | | 定格熱出力一定運転時 | | 原子炉に1体以上燃料が装荷されている場合運転 | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | | 6 | | | | | | | |
| 項目 | (補2) 原子炉水導電度 | サプレッションチェンバー水位 | サプレッションプール水温度 | ドライウェル酸素濃度 | 原子炉熱出力 瞬時値 | 原子炉熱出力 1時間平均値 | 原子炉熱出力(補1) ( [✓ SRNM] APRM ) | | | | | | | |
| | | | | | | | Ⓒ | Ⓐ | Ⓖ | Ⓔ | Ⓗ | Ⓕ | Ⓓ | Ⓑ |
| 時刻 | μS/cm | cm | ℃ | % | MWt | MWt | [✓ cps] % | | | | | | | |
| | H13-P602 | H13-P601 | H13-P690<br>H13-P689 | CP-5 | 計算機 | | H13-P603 | | | | | | | |
| 計器 | CRS-G33-R601 | LI-26-79.5B | TR-TT48-R600A/B | O2R-25-2 | 原子炉熱出力 | 原子炉平均熱出力 | NR-C51-R603A/B/C/D | | | | | | | |
| PID | — | — | — | — | D093 | D095 | — | — | — | — | — | — | — | — |
| 1 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 2 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 3 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 4 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 5 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 6 | | -15.0 | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 7 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 8 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 9 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 10 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 11 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 12 | 0.71 | -15.0 | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 13 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 14 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 15 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 16 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 17 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 18 | | -14.5 | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 19 | | | | | | | 60 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 20 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 21 | | | | | | | 50 | 75 | 150 | 160 | 35 | 70 | 160 | 210 |
| 22 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 23 | | | | | | | 50 | 75 | 150 | 150 | 35 | 70 | 160 | 210 |
| 24 | ※~~6.69~~ | -14.5 | | | | | 50 | 75 | 150 | 150 | 40 | 70 | 150 | 210 |

※1 誤記訂正「—」
H23.3.12 E班 [redacted]

| 9,120 | | 9,13,31 | | | | |
|---|---|---|---|---|---|---|
| 原子炉に使用している冷却材及び減速材の毎日の補給量 | | | | | | |
| 毎日1回 | | プラント起動前の格納容器閉鎖～プラント停止後の格納容器開放まで | | | | |
| 7 | | 8 | | | | |
| 補給水積算記録 | | 格納容器内の原子炉冷却材漏えい率 | | | | |
| | 純水補給水量<br>FQT-16-390.5(m³) | D/W床ドレンサンプ流量<br>FQ-E31-K608(ℓ) | D/W機器ドレンサンプ流量<br>FQ-E31-K607(ℓ) | D/W HVHドレン量<br>FQ-E31-K611(ℓ) | | |
| | 現 場 | H13-P632 | | | | |
| 24 | ※ | 43217 | 719865 | 30882.6 | D/W床ドレン | m³/h |
| 0 | 10595.1 | 43217 | 719865 | 30882.3 | 全廃液量 | m³/h |
| 差 | ※ | 0 | 0 | 0.3 | | |

| | 主発電機 | 変圧器等積算 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | | | | | | | | | | |
| | 発電機出力<br>9 | 起 動 用 連 絡 母 線 | | | | | 所 内 変 圧 器 | | | | | 所内電力量合計 |
| | 読み | 6A-1 | 6A-2 | 6B-1 | 6B-2 | 小計 | 6A-1 | 6A-2 | 6B-1 | 6B-2 | 小計 | |
| | ×100000 kWh | ×1000kWh | ×1000kWh | ×1000kWh | ×1000kWh | MWh | ×1000kWh | ×1000kWh | ×1000kWh | ×1000kWh | MWh | MWh |
| | CP-8 | CP-8 | | | | | CP-8 | | | | | |
| | WH-43-107 | WH-42-104A1 | WH-42-104A2 | WH-42-104B1 | WH-42-104B2 | | WH-42-103A1 | WH-42-103A2 | WH-42-103B1 | WH-42-103B2 | | |
| 24 | | 53765 | 86489 | 51816 | 54988 | | 28556 | 76939 | 51683 | 30557 | | |
| 0 | | 53712 | 86411 | 51760 | 54877 | | 28556 | 76939 | 51683 | 30557 | | |
| 差 | | 53 | 78 | 56 | 111 | 298 | 0 | 0 | 0 | 0 | 0 | 298 |

| 定格回転速度運転時<br>タービン軸受振動値(1日の最大値) | |
|---|---|
| 11 | |
| CP-31 | |
| S/VBR-50-40-1/2/3/4/5/6 | |
| 軸受 No. | 最大値 1/100mm |
| — | — |

補足事項
補1 炉規則第7条、保安規定第120条記録は連続記録のチャートである。
補2 原子炉水導電率が記録できない場合は代替記録採取場所により記録する。詳細は運転日誌記載ガイドを確認すること。
補3 再循環ポンプ吸込温度(原子炉冷却材浄化系入口温度)の毎正時の温度と1時間前の温度を確認し、温度差が55℃/hを超えていないことを確認する。

注意事項(運転日誌共通)
1. 運転日誌別紙の項目に●が記載されているものは、BOP打出値参照記録のため、毎時打出し記録を確認しデータに異常が無い事を確認し空欄とすること。
2. PTW以外で記録不可能な場合は「—」としその理由を余白に記載する。PTWの場合は「PTW」と記載する。
3. 記録不要な場合は当該直の欄を「／」とする。(運転日誌別紙の●項目も同様)

記事
※地震・津波の為採取出来ず

添付資料－6－2

太枠は炉規則第7条／保安規定第120条対象記録

Fukushima Daiichi Nuclear Power Station Unit 6

福島第一原子力発電所　6号機

# 運　転　日　誌　別紙

Operation log - Appendix

2011 年 3 月 11 日

| 確認 | | 承認 | 内容確認 | 作成 |
|---|---|---|---|---|
| 原子炉主任技術者 | | 当直長 | 当直副長 | 当直員 |
| | 2直 | [redacted] | | |
| | 1-1直 | | | |
| | 1-2直 | | | |
| | 2直 | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 保安規定 | 9,35,36,37,120 | | 9,120 | | | | | | | | | | 9,37 | 38 | 56 | 他Gr使用データ | | | |
| 炉規則第7条 保安規定 第120条 記録項目 | 炉心の温度 | | 冷却材流量 | | 冷却材圧力 | | 冷却材入口温度 | 冷却材出口温度 | 再結合装置内の温度 | | | | | | | | | 発電機出力 | |
| 記録すべき場合、期間 | 全燃料取り出し中で且つプールゲート閉の場合以外連続 | | 原子炉の状態が運転及び起動において1時間ごと | | | | | | | | | | 原子炉を昇圧する場合（補1） | 原子炉の状態が運転、起動の場合 | 原子炉に1体以上燃料が装荷されている場合で、プールゲートが閉の場合 | 発電機出力運転中 | | | |
| 運転日誌別紙採取計器の項目 | 12 | | 13 | 14 | 15 | 16 | 17 | 18 | 19 | | | | 20 | 21 | 22 | 23 | 24 | 25 | |
| 項目 | ※~~●再循環ポンプ入口温度~~（補2）<br>RWCUポンプ(A)入口温度 | | ●主蒸気流量 | ●給水流量 | ●給水圧力 | ●主蒸気圧力 | ●原子炉平均給水温度 | ●主蒸気温度 | ●排ガス再結合器温度 | | | | 原子炉圧力容器最低温度 | ●原子炉圧力 | ●原子炉水位 | ●復水器（B）真空 | ●高圧第1段圧力 | 読み | ●電力量 |
| | A | B | | | | | | | A | | B | | | | | | | | |
| | | | | | | | | | Upper | Lower | Upper | Lower | | | | | | | |
| 時 | ℃ | | $\times 10^3$ t/h | $\times 10^3$ t/h | MPa | MPa | ℃ | ℃ | ℃ | | | | ℃ | MPa | mm | kPa(abs) | MPa | ×100000 kWh | MWh |
| 刻 | ※ ~~H13-P603~~<br>CP-33 | | H13-P603 | | CP-3 | CP-2 | H13-P632 | | N62-P600 | | | | H13-P614 | ※ ~~H13-P603~~<br>H13-P602 | | CP-2 | | CP-8 | |
| 計器 | ※ ~~TR-B35-R650~~<br>TRS-G33-R601 ⑦ | | FR-C34-R607 | | PI-4-20.50 | PI-EHC-001 | TRS-E31-R612 | | TR-23-1A | | TR-23-1B | | TRS-E12-R601 | FR/PR-C34-R609 | ※~~LR-C34-R608~~ | PI-2-19.61B | PI-1-04.14 | WH-43-107 | |
| PID | D001 | D002 | C002 | C000 | F075 | T000 | C042 | D000 | L055 | L057 | L056 | L058 | - | B016 | LI-B21-R609<br>B035 | T018 | T002 | | – |
| 0 | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | ▨ | | |
| 1 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 2 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 3 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 4 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 5 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 6 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 7 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 8 | 26 | | | | | | | | | | | | | | 1400 | | | | 停 |
| 9 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 10 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 11 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 12 | 26 | | | | | | | | | | | | | | 1400 | | | | 止 |
| 13 | 26 | | | | | | | | | | | | | | 1400 | | | | |
| 14 | 26 | | | | | | | | | | | | | | 1450 | | | | |
| 15 | ※2 | | | | | | | | | | | | | | ※1 1600 | | | | |
| 16 | ※2 | | | | | | | | | | | | | | ※1 1600 | | | | 中 |
| 17 | ※2 | | | | | | | | | | | | | | ※1 1600 | | | | |
| 18 | ※2 | | | | | | | | | | | | | | ※1 1600 | | | | |
| 19 | ※2 | | | | | | | | | | | | | | ※1 1600 | | | | |
| 20 | ※2 | | | | | | | | | | | | | | ※1 1600 | | | | |
| 21 | ※2 | | | | | | | | | | | | | | ※1 1800 | | | | |
| 22 | ※2 | | | | | | | | | | | | | | ※1 1800 | | | | |
| 23 | ※2 | | | | | | | | | | | | | | ※1 1800 | | | | |
| 24 | ※2 | | | | | | | | | | | | | | ※1 1800 | | | | |

※ 監視計器変更
H23.3.11 E3班 [redacted]

※2 電源喪失につき採取不可

※1 代替計器にて採取
H13-P603 LR-C34-R608

補足事項
補1 原子炉圧力容器漏えい(水圧)検査等で原子炉を加圧する場合に採取する。
補2 再循環系ループ温度が記録できない場合は、代替記録採取場所により記録する。
詳細は運転日誌記載ガイドを確認すること。

記事

1F-6-5

添付資料－6－3

・一発−３５６　日常点検表運用ガイド
２０１１年３月１日 (00)

様式2

# Fukushima Daiichi Nuclear Power Station Unit 6 Daily Inspection Sheet (for "Cold Shutdown" and "Fuel Exchange") 1/2

# 福島第一原子力発電所　6号機　日常点検表（「冷温停止」・「燃料交換」用）１／２

記録採取：（2直①　５時〜６時）・（1−1直　１２時〜１３時）・（1−2直　１９時〜２０時）・（2直②　2４時）

2011 年 3 月 11 日

|  | 承認 | 作成 |  |
|---|---|---|---|
|  | 当直長 | 当直副長 | 主任・副主任・主機 |
| 2直① | [redacted] | [redacted] | [redacted] |
| 1-1直 | [redacted] | [redacted] | [redacted] |
| 1-2直 | [redacted] | [redacted] | [redacted] |
| 2直② | [redacted] | [redacted] | [redacted] |

| 動作不能の確認項目 |
|---|
| ①当該チャンネルが設定値に達している場合，当該チャンネルがトリップしていること（誤不動作していないこと） |
| ②当該チャンネルの指示値に異常な変動がないこと |
| ③他のチャンネルと比較して有意な差異がないこと |

承認時確認事項
- 全ての枚数が揃っていること。
- 全ての枚数が片面印刷であること。
- ホチキス等で離散防止が図られていること。

## １．計測及び制御設備

### (1) 核計装の確認

a. 起動領域モニタの確認　　関連規定　保安規定第27条

- 計数率の指示が３ＣＰＳ以上であることを確認する。（起動領域モニタ周りの燃料が４体未満を除く）
- 動作不能でないことを「動作不能の確認項目」①〜③により確認する。

[除外条件]
- 全燃料が取り出されている場合は記入不要一括斜線とする。

| P N L | 機器名称 | 設定値 | 2直① | 1−1直 | 1−2直 | 記入例 |
|---|---|---|---|---|---|---|
| H13-P635 | SRNM　A | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ | 異常なし「レ」<br>異　常「×」<br>SRNM検出器廻りに燃料が無い場合「−」印を記入する |
|  | SRNM　E | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ |  |
|  | SRNM　B | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ |  |
|  | SRNM　F | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ |  |
| H13-P636 | SRNM　C | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ |  |
|  | SRNM　G | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ |  |
|  | SRNM　D | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ |  |
|  | SRNM　H | ペリオド短短10秒以下/下限３CPS以下 | ✓ | ✓ | ✓ |  |

### (2) 原子炉建屋換気系放射線モニタの確認

関連規定　保安規定第27条

- 動作不能でないことを「動作不能の確認項目」①〜③により確認する。

（炉心変更時＜停止余裕確認後の制御棒１本の挿入，引き抜きを除く＞又は原子炉建屋内で照射された燃料に係る作業時において動作不能でないこと）

| P N L | 機器名称 | 機器番号 | 設定値 | 1−2直 | 記入例 |
|---|---|---|---|---|---|
| H13-P635 | 原子炉建屋排気プレナム放射線モニタＡ | RIS-D17-K609A | 0.0069mSv/h以上 | × | 異常なし「レ」<br>異　常「×」 |
|  | 原子炉建屋排気プレナム放射線モニタＢ | RIS-D17-K609B | 0.0069mSv/h以上 | × |  |
| H13-P636 | 原子炉建屋排気プレナム放射線モニタＣ | RIS-D17-K609C | 0.0069mSv/h以上 | × |  |
|  | 原子炉建屋排気プレナム放射線モニタＤ | RIS-D17-K609D | 0.0069mSv/h以上 | × |  |

## ２．外部電源

関連規定　保安規定第69条

- 外部電源１系列が動作可能であることを外部電源の電圧が確立していることで確認する。

| 確認項目 | 2直① | 記入例 |
|---|---|---|
| 夜の森線１号 | ✓ | 異常なし「レ」，異常「×」<br>停止中の場合は「−」 |
| 夜の森線２号 | ✓ |  |

## ３．所内電源系統母線受電状態確認

関連規定　保安規定第66条

### （１）原子炉保護系母線

- 原子炉保護系母線が受電されていることを母線受電状態表示白ランプ点灯により確認する。

| PNL | 確認項目 | 2直② | 記入例 |
|---|---|---|---|
| H13-P609 | RPS A系母線受電　白ランプ点灯 | × | 異常なし「レ」，異常「×」，<br>停止中の場合は「−」 |
| H13-P611 | RPS B系母線受電　白ランプ点灯 | × |  |

### （２）非常用交流高圧電源母線

- 非常用交流高圧電源母線が受電されていることを電圧指示計等で確認する。

| PNL | 機器番号 | 確認項目 | 2直② | 記入例 |
|---|---|---|---|---|
| CP-1 | EI-45 | 非常用交流高圧電源母線６Ｃ電圧正常 | × | 異常なし「レ」，異常「×」，<br>停止中の場合は「−」 |
|  | EI-48 | 非常用交流高圧電源母線６Ｄ電圧正常 | ✓ |  |
| H13-P601 | EI-1 | 非常用交流高圧電源母線ＨＰＣＳ電圧正常 | × |  |

### （３）直流電源母線

- 直流電源母線が受電されていることを電圧指示計にて確認する。

| PNL | 機器番号 | 確認項目 | 2直② | 記入例 |
|---|---|---|---|---|
| CP-1 | EI-61 | ＤＣ１２５Ｖ母線Ａ電圧正常 | ✓ | 異常なし「レ」，異常「×」，<br>停止中の場合は「−」 |
|  | EI-62 | ＤＣ１２５Ｖ母線Ｂ電圧正常 | ✓ |  |
| H13-P601 | EI-9 | ＤＣ１２５Ｖ ＨＰＣＳ母線電圧正常 | ✓ |  |

### （４）設備維持に対する機能満足の確認

| 確認項目 | 2直② | 記入例 |
|---|---|---|
| 設備維持に対する機能満足 | × | 要求機能を満足する「レ」<br>要求機能を満足しない「×」 |

- 設備維持に対する機能満足の確認とは，保安規定第27条、第35条、第36条、第40条で要求される設備の維持に必要な原子炉保護系母線，非常用交流高圧電源母線，直流電源母線が受電されていること。
- 原子炉保護系母線，非常用交流高圧電源母線，直流電源母線が停止中の場合において設備維持に対する機能満足を判断した場合は，その理由を備考欄に記載する。
（例．Ｍ／Ｃ６Ｃ停止中　　Ｂ系角落とし中につき設備維持に対する機能満足）

## ４．使用済燃料プールの水温

関連規定　保安規定第55条

- 使用済燃料プールの水温が６５℃以下であることを確認する。

| PNL | 確認項目 | 機器番号 | 制限値 | 2直② |  | 記入例 |
|---|---|---|---|---|---|---|
|  |  |  |  | 記録欄［℃］ | 確認欄 |  |
| H13-P614 | 使用済燃料プールの水温（１日の最大値） | TRS-E12-R601<br>打点9 | 65℃以下<br>※ | ※ | × | 記録欄：最大値を記入する。<br>確認欄：異常なし「レ」，異常「×」 |

※管理目標値５２℃以下

## ５．使用済燃料プールの水位

関連規定　保安規定第55条

| 確認項目 | 2直② | 記入例 |
|---|---|---|
| 使用済燃料プールの水位がオーバーフロー水位付近にあること | × | 異常なし「レ」，異常「×」 |

備考

※ 電源喪失の為読めず

1F-6-6

添付資料−６−４

# Fukushima Daiichi Nuclear Power Station Unit 6 Daily Inspection Sheet (for "Cold Shutdown" and "Fuel Exchange") 2/2

# 福島第一原子力発電所　６号機　日常点検表（「冷温停止」・「燃料交換」用）２／２

記録採取：（２直①　５時～６時）・（１－１直　１２時～１３時）・（１－２直　１９時～２０時）・（２直②、２４時）

2011 年 3 月 11 日

## ６．原子炉停止時冷却系の確認

(1)原子炉の状態確認　　（該当項目を ⬭ で囲む）

| 確　認　項　目 | ２直① | １－１直 | １－２直 | 備　　考 |
|---|---|---|---|---|
| 原子炉の状態 | [✓ 冷温停止] | [✓ 冷温停止] | [✓ 冷温停止] | → (2)-1をチェック |
| | 燃料交換 | 燃料交換 | 燃料交換 | → (2)-2をチェック |

(2)-1原子炉停止時冷却系の状態確認（原子炉の状態が”冷温停止”の場合）　**関連規定** 保安規定第35条

［除外条件］（以下の３つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉の状態が”燃料交換”の場合
- 原子炉停止時冷却系起動準備時（停止時冷却系起動前に実施する配管洗浄及びウォーミング）
- 原子炉の昇温を伴う検査時（原子炉冷却材の昇温開始から降温開始までの期間）

| 確　認　項　目 | ２直① | １－１直 | １－２直 | 記入例 |
|---|---|---|---|---|
| RHR　A系ポンプ　SHC運転中 | ─ | ─ | ─ | 運転中「レ」，停止中（待機中）「─」，作業中「×」 |
| RHR　A系ポンプ　SHC運転可能 | レ | レ | × | 運転可能「レ」，運転不可能「×」，SHC運転中は「─」 |
| RHR　B系ポンプ　SHC運転中 | レ | レ | ─ | 運転中「レ」，停止中（待機中）「─」，作業中「×」 |
| RHR　B系ポンプ　SHC運転可能 | ─ | ─ | × | 運転可能「レ」，運転不可能「×」，SHC運転中は「─」 |
| 原子炉冷却材温度（℃）<br>（１００℃未満確認） | 26 | 26 | ※ | （備考）原子炉冷却材温度<br>(1)原子炉冷却材再循環ポンプ入口温度<br>(2)停止時冷却熱交換器入口温度 |
| 原子炉冷却材温度採取場所(備考を参照し番号を記入) | (5) | (5) | ※ | (3)ＦＰＣポンプ入口温度<br>(4)給水ノズル温度<br>(5)ＲＷＣＵポンプ入口温度 |
| 原子炉状態に対する要求機能満足 | レ | レ | × | 要求機能を満足する「レ」，要求機能を満足しない「×」 |

※電源喪失の為確認ng"

原子炉状態に対する要求機能満足（ＯＲ条件）
- １系列が運転中であること及び原子炉で発生する崩壊熱が原子炉停止時冷却系以外の手段で除去出来ると判断するまでさらに１系列の原子炉停止時冷却系が動作可能であること。
- 原子炉停止時冷却系が停止した場合においても、原子炉冷却材温度を１００℃未満に保つことができること。

(2)-2原子炉停止時冷却系の状態確認（原子炉の状態が”燃料交換”の場合）　**関連規定** 保安規定第36条

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉の状態が”冷温停止”の場合
- 原子炉内から全燃料が取り出された場合

| 確　認　項　目 | ２直① | １－１直 | １－２直 | 備　　考 |
|---|---|---|---|---|
| 原　子　炉　水　位 | ＯＦ水位 | ＯＦ水位 | ＯＦ水位 | 該当項目を ⬭ で囲む |
| | 上記以外 | 上記以外 | 上記以外 | |

ＯＦ：オーバーフロー

| 確　認　項　目 | ２直① | １－１直 | １－２直 | 記入例 |
|---|---|---|---|---|
| RHR　A系ポンプ　SHC運転中 | | | | 運転中「レ」，停止中（待機中）「─」，作業中「×」 |
| RHR　A系ポンプ　SHC運転可能 | | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「─」 |
| RHR　B系ポンプ　SHC運転中 | | | | 運転中「レ」，停止中（待機中）「─」，作業中「×」 |
| RHR　B系ポンプ　SHC運転可能 | | | | 運転可能「レ」，運転不可能「×」，SHC運転中は「─」 |
| 原子炉冷却材温度（℃）<br>（６５℃以下確認） | | | | （備考）原子炉冷却材温度<br>(1)原子炉冷却材再循環ポンプ入口温度<br>(2)停止時冷却熱交換器入口温度 |
| 原子炉冷却材温度採取場所(備考を参照し番号を記入) | | | | (3)ＦＰＣポンプ入口温度<br>(4)給水ノズル温度<br>(5)ＲＷＣＵポンプ入口温度 |
| 原子炉状態に対する要求機能満足 | | | | 要求機能を満足する「レ」，要求機能を満足しない「×」 |

原子炉状態に対する要求機能満足（ＯＲ条件）
- １系列が運転中であること及び原子炉水位がオーバーフロー水位となるまでの期間は、さらに１系列の原子炉停止時冷却系が動作可能であること。
- 原子炉停止時冷却系が停止した場合においても、原子炉冷却材温度を６５℃以下に保つことができること。

## ７．非常用炉心冷却系の確認

**関連規定** 保安規定　第40条

(1)原子炉の状態確認

| 確　認　項　目 | ２直① | １－１直 | １－２直 | 記入例 |
|---|---|---|---|---|
| 原子炉の状態 | [✓ 冷温停止]<br>燃料交換 | [✓ 冷温停止]<br>燃料交換 | [✓ 冷温停止]<br>燃料交換 | 該当項目を ⬭ で囲む<br>ＯＦ：オーバーフロー |
| プールゲート | 開　[✓ 閉] | 開　[✓ 閉] | 開　[✓ 閉] | |
| 燃料の状態 | [✓ 装荷]<br>全取出 | [✓ 装荷]<br>全取出 | [✓ 装荷]<br>全取出 | |
| 原　子　炉　水　位 | ＯＦ水位付近<br>[✓ 上記以外] | ＯＦ水位付近<br>[✓ 上記以外] | ＯＦ水位付近<br>※[✓ 上記以外]<br>※1 | |

(2)-1非常用炉心冷却系統の水源の確認

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバーフロー付近で，かつプールゲートが開の場合

| 確　認　項　目 | ２直① | １－１直 | １－２直 | 記入例 |
|---|---|---|---|---|
| ＥＣＣＳ系水源 | [✓ S/C]・[✓ CST] | [✓ S/C]・[✓ CST] | [✓ S/C]・[✓ CST] | 該当項目を ⬭ で囲む |

(2)-2非常用炉心冷却系統の水源の確認（ＣＳＴが水源の場合）

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバーフロー付近で，かつプールゲートが開の場合

| 確　認　項　目 | | ２直① | １－１直 | １－２直 | 記入例 |
|---|---|---|---|---|---|
| ＣＳＴレベル | ＨＰＣＳ系ポンプ水源の場合１７７ｃｍ以上 | レ | レ | ※ | 異常なし「レ」，異常「×」<br>ＨＰＣＳ系ポンプ水源がＳ／Ｃの場合または復水移送ポンプを注水系統として確保しない場合「─」 |
| | 復水移送ポンプを注水系統として確保する場合４３７ｃｍ以上 | レ | レ | ※ | |

(2)-3非常用炉心冷却系統の水源の確認（Ｓ／Ｃが水源の場合）

［除外条件］（以下の３つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- ＥＣＣＳ系水源がCSTの場合
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバーフロー付近で，かつプールゲートが開の場合

| 確　認　項　目 | | ２直① | １－１直 | １－２直 | 記入例 |
|---|---|---|---|---|---|
| Ｓ／Ｃレベル | ＥＣＣＳ系ポンプ水源の場合－４０７cm以上 | レ | レ | レ | 確認項目を満足する場合「レ」，満足しない場合「×」 |

(2)-4非常用炉心冷却系統の状態確認

［除外条件］（以下の２つの条件のどれかが（ＯＲ条件）成立時は記入不要、一括斜線とする。）
- 原子炉内から全燃料が取出され，かつプールゲートが閉の場合
- 原子炉水位がオーバー水位付近で、かつプールゲートが”開”の場合

| 確　認　項　目 | ２直① | １－１直 | １－２直 | 記入例 |
|---|---|---|---|---|
| 低圧炉心スプレイ系注入可能 | レ | レ | × | 注入可能「レ」，注入不可能「×」 |
| 高圧炉心スプレイ系注入可能 | レ | レ | × | 注入可能「レ」，注入不可能「×」 |
| RHR　A系　低圧注水系　注入可能※ | レ | レ | × | 注入可能「レ」，注入不可能「×」 |
| RHR　B系　低圧注水系　注入可能※ | レ | レ | × | 注入可能「レ」，注入不可能「×」 |
| RHR　C系　低圧注水系　注入可能※ | レ | レ | × | 注入可能「レ」，注入不可能「×」 |
| 復水移送ポンプ１台以上運転中 | レ | レ | レ | 満足する場合「レ」，満足しない場合「×」 |
| 原子炉状態に対する要求機能満足 | レ | レ | × | 要求機能を満足する「レ」，要求機能を満足しない「×」 |

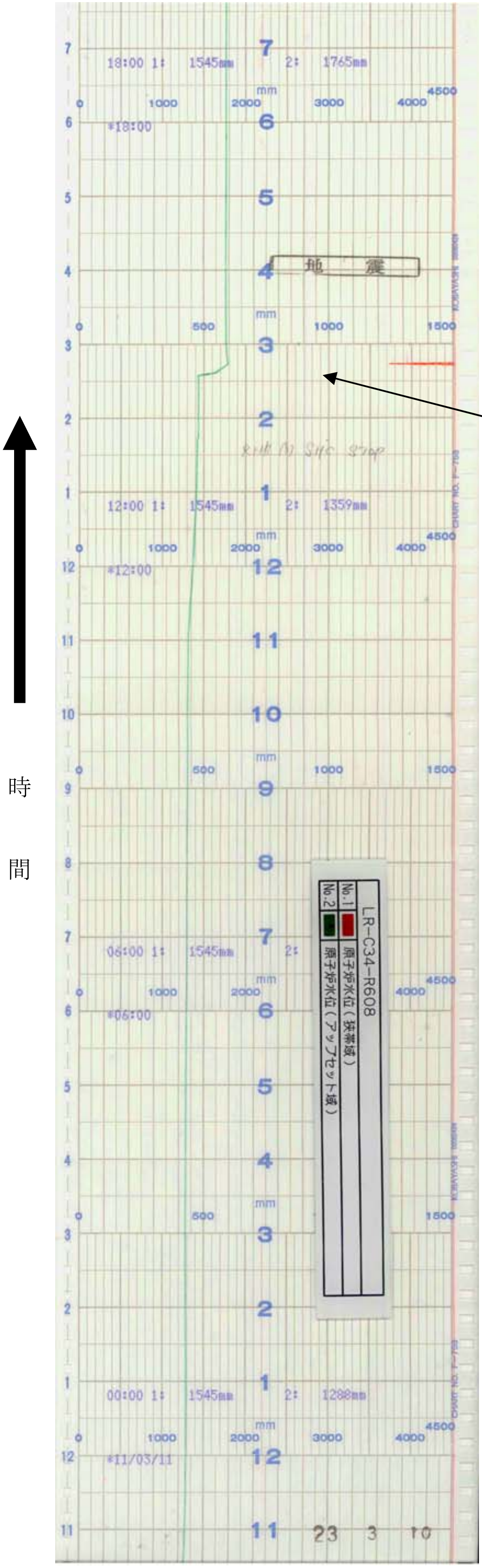
※原子炉停止時冷却系起動準備及び原子炉停止時冷却系の運転中は、低圧注水系の動作不能とはみなさない。

原子炉状態に対する要求機能満足（ＯＲ条件）
- 動作可能であるべき非常用炉心冷却系、系統数２系列（自動減圧系及び高圧注水系を除く）
- 動作可能であるべき非常用炉心冷却系、系統数１系列（自動減圧系及び高圧注水系を除く）及び復水補給水１系列

備考
※1　誤記削除
H23. 3. 11
A班 [redacted]

## 【Unit 6 reactor water level (narrow band, upset band)】

## 【６号　原子炉水位（狭帯域、アップセット域）】



LR-C34-R608

| | | | |
|---|---|---|---|
| No.1 | 🟥 | 原子炉水位（狭帯域） | Reactor level (narrow band) |
| No.2 | ■ | 原子炉水位（アップセット域） | Reactor level (upset band) |

①　１４時４６分　地震発生と地震に伴う水位変動

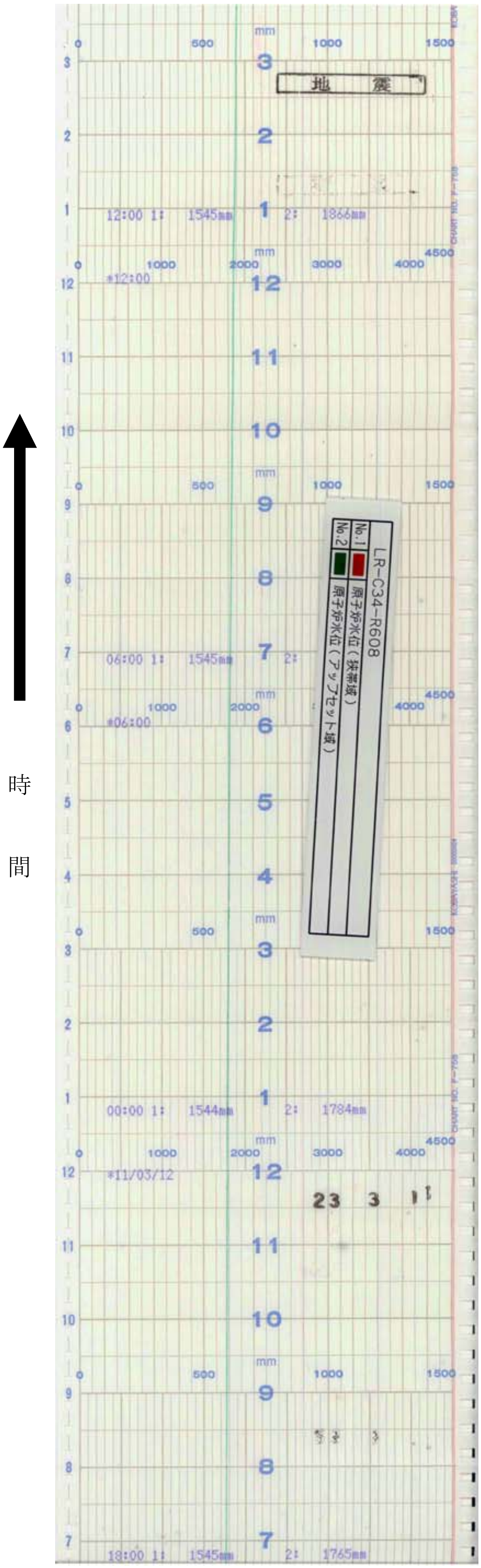
① 14:46 Occurance of the earthquake and water level fluctuation due to the earthquake

①

2011/3/11 0:00

## 【Unit 6 reactor water level (narrow band, upset band)】

## 【６号　原子炉水位（狭帯域、アップセット域）】



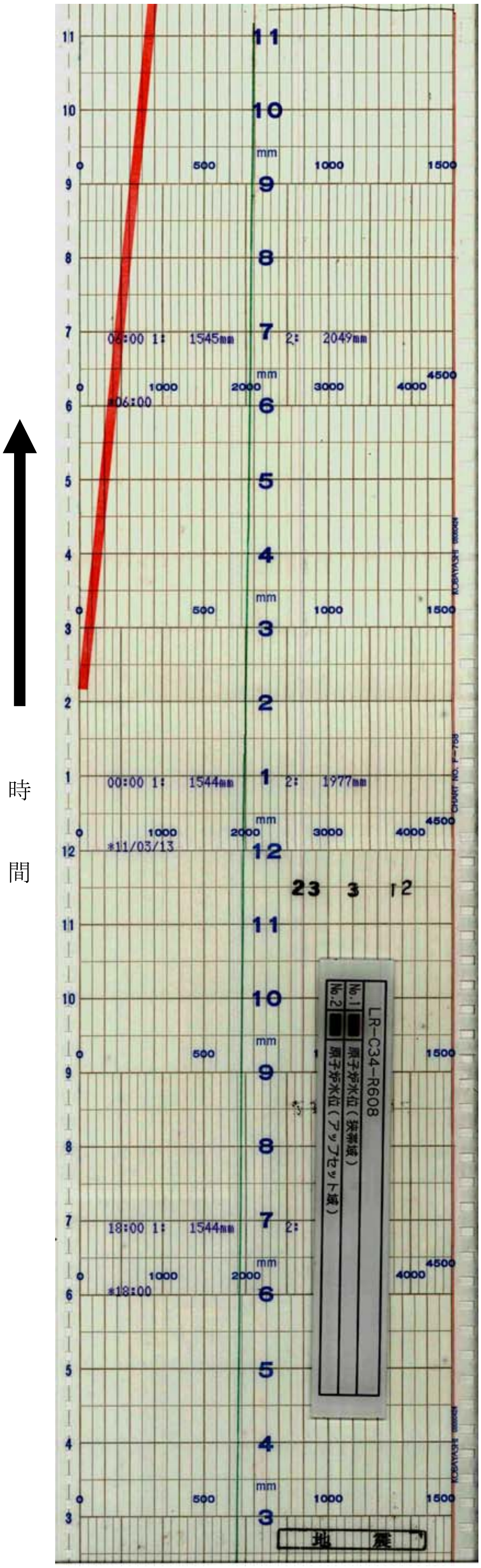
時

間

| LR-C34-R608 | | |
|---|---|---|
| No.1 | 🟥 | 原子炉水位（狭帯域） Reactor level (narrow band) |
| No.2 | 🟩 | 原子炉水位（アップセット域） Reactor level (upset band) |

## 【Unit 6 reactor water level (narrow band, upset band)】

## 【６号　原子炉水位（狭帯域、アップセット域）】

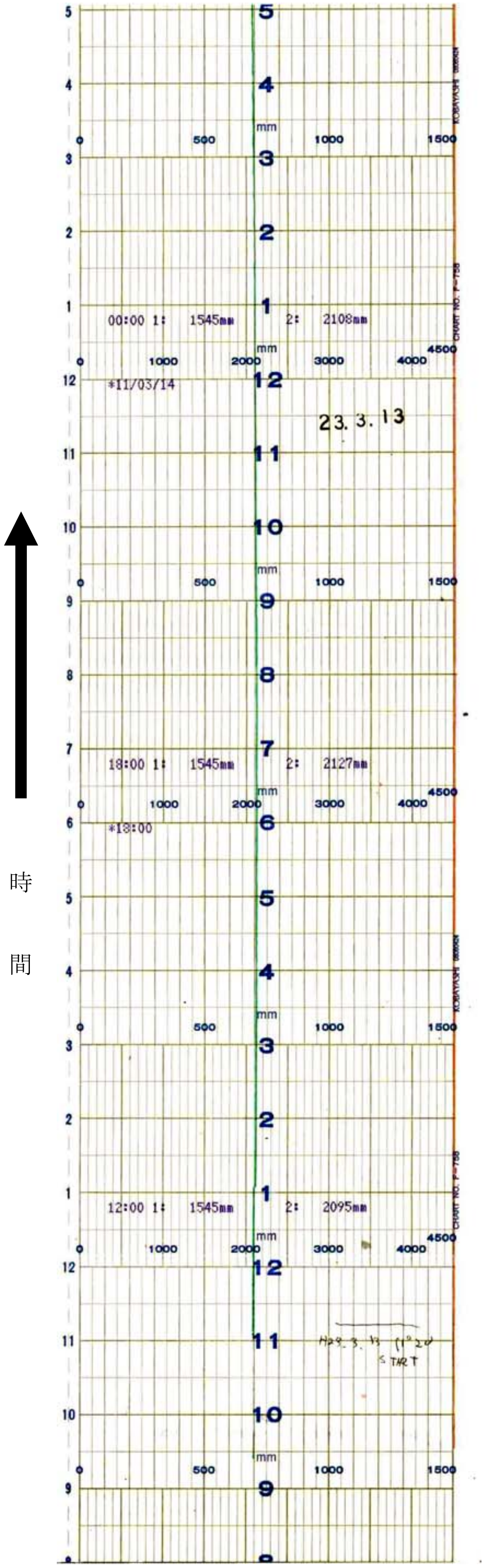


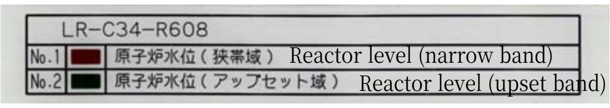
LR-C34-R608

| | | | |
|---|---|---|---|
| No.1 | 🟥 | 原子炉水位（狭帯域） | Reactor level (narrow band) |
| No.2 | ■ | 原子炉水位（アップセット域） | Reactor level (upset band) |

## 【Unit 6 reactor water level (narrow band, upset band)】

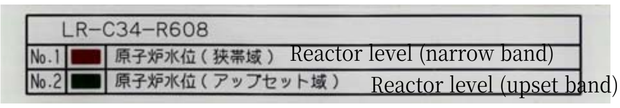
## 【６号　原子炉水位（狭帯域、アップセット域）】





| LR-C34-R608 | | |
|---|---|---|
| No.1 | 🟥 | 原子炉水位（狭帯域） Reactor level (narrow band) |
| No.2 | ■ | 原子炉水位（アップセット域） Reactor level (upset band) |

# 【Unit 6 reactor water level (narrow band, upset band)】
# 【６号　原子炉水位（狭帯域、アップセット域）】

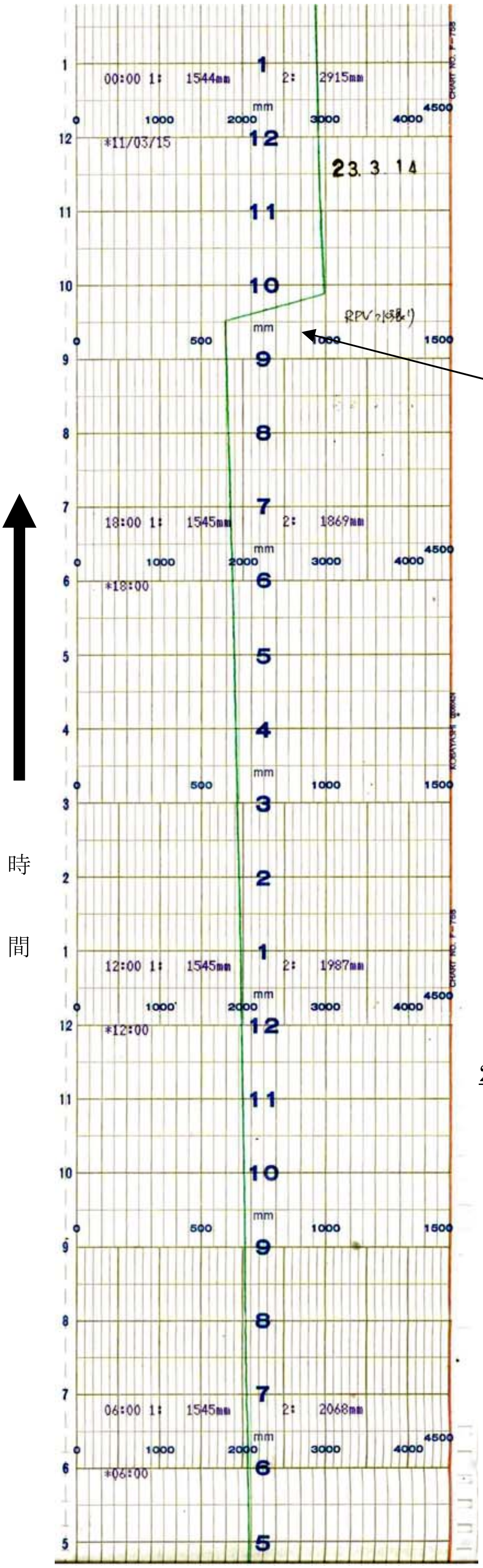


LR-C34-R608

| | | |
|---|---|---|
| No.1 | ■ | 原子炉水位（狭帯域） Reactor level (narrow band) |
| No.2 | ■ | 原子炉水位（アップセット域） Reactor level (upset band) |

② 補給水の注水、以降この操作を繰り返す

② Makeup water injection, after that repeat this action



②

2011/3/14 12:00

Form-2

Fukushima Daiichi Nuclear Power Station Unit6

# Operator Task Handover Journal

Operator Task Handover Journal（ 1／5 ）

| | | |
|---|---|---|
| March 11, 2011, Friday | Shift 1　Group A | ［Approved by］<br>Shift Supervisor |
| Name of predecessor（Recorder） | [redacted] (Group A) | |
| Name of successor | [redacted] (Group E) | |

**Operation Status**

| Reactor Status | In Operation | Start up | Hot shutdown | [✓ Cold shutdown] | fuel exchange |
|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reactor water level | ※1400 | mm | S/P water level | -14.9 | cm | SW pressure | 0.33 | MPa |
| Reactor water temperature | 26.0 | ℃ | CST water level | 729 | cm | RCW pressure | 0.65 | MPa |
| Reactor water conductivity | 0.69 | μS/cm | | | | TCW pressure | 0.51 | MPa |
| FPC temperature | 25.0 | ℃ | SW temperature | 7.2 | ℃ | | | |
| Skimmer water level | 1650 | mm | RCW temperature | 15.8 | ℃ | | | |
| | | | TCW temperature | 8.3 | ℃ | | | |

※By water level indicator when stopped　　（Sampled Time：20:00）

| | |
|---|---|
| Exception of interlock regarding LCO | None |

**Regular tests・Operation status of switching**

| Operated time | Content | Result | Status |
|---|---|---|---|
| 10：06～10：36 | RCW Hx (B) back wash | Pass・Fail | [✓ Fine]・caution・in progress・cancelled |
| | TCW Hx (A) back wash | Pass・Fail | [✓ Fine]・caution・in progress・cancelled |
| ＊ | RCW Freshwater sampling before switching Hx | Pass・Fail | Fine・caution・in progress・[✓ cancelled] |
| 11:15 | TCW Freshwater sampling before switching Hx | Pass・Fail | [✓ Fine]・caution・in progress・cancelled |
| 10:33～10:44 | Automatic start-up test conducted for emergency seal oil pump | [✓ Pass]・Fail | [✓ Fine]・caution・in progress・cancelled |
| 9:57 | SA compressor load switching (1→2) | Pass・Fail | [✓ Fine]・caution・in progress・cancelled |
| ＊1 | Ferrous sulfate injected to ASW system | Pass・Fail | Fine・caution・in progress・[✓ cancelled] |
| ＊1 | Ferrous sulfate injected to MGSW system | Pass・Fail | Fine・caution・in progress・[✓ cancelled] |

**Note**

・RHR　System B　SHA mode　In operation (flow rate: 440l/s)

＊　Stopped as a countermeasure against TOC increase (Unit5)

＊1　Stopped due to the earthquake

Form-2

Fukushima Daiichi Nuclear Power Station Unit 6

March 11, 2011 （ Shift 1 ） Operator Task Handover Journal（ 2／5 ）

| | Time | Context | Classification |
|---|---|---|---|
| Operation ・ Time of Event | 8:08 | Main Control Room PNL (Back side, CP-32)　ANN Test…pursuant to Ministerial Order issue 62 | O |
| | 8:08～8:14 | Main Control Room ANN test …pursuant　to Ministerial Order issue62 | O |
| | | | |
| | 9：02～ | C/D9DT New resin washing (Step5:RST→CRT) | P |
| | | | |
| | 9:24～ | Cleaning the controlled area | P |
| | | | |
| | 9：55～10：08 | FPC pump (B) ISOL | P |
| | | | |
| | 10:02 | FCS(B-1) Defect in recirculation flow rate meter ISOL | P |
| | | | |
| | 10:04～10:30 | M/D RFP(A) Vibration test for Motor for outflow valve of cooling water | Others |
| | | | |
| | 10:08 | FPC pump (B) NFB “OFF” | P |
| | | | |
| | 10:53～11:00 | T/B North side of HVS H/C cut | O |
| | | H/B(A) 11.4t/h↓ | |
| | | | |
| | 10:55 | Switching of feed water heater from (A)→(B) | O |
| | | | |
| | 11:00～11:07 | T/B South side of HVS H/C cut | |
| | | | |
| | 11:07～11:18 | RW/B HVS(A), E.SWGR(B)H/C cut | O |
| | | H/B(A)　↓8.5t/h | |
| | | | |
| | 11:07～11:17 | RWCU recovery Hx by-path valve “Full open” (RWCU SHC operation) | O |
| | 11:20 | RWCU outflow valve (F042) “Full open”　＊Due to RHR(B)SHC stop | |
| | | | |
| | 11:09 | D/G　Power of priming pump for lubricant oil 6A “On” | P |
| | 11:12～12:28 | D/G　Priming pump for lubricant oil 6A　T/R | P |
| | 12:29～12:30 | D/G ISOL resumed | P |
| | 12:30 | D/G 6A INOP “Deactivated” | Others |
| | | | |
| | 13:38～13:42 | H/B Chemical dissolution　Morpholine 70ml　Undiluted solution tank 52→51L | P |
| | | | |
| | 13:56 | RHR pump(B) stopped　SHC stopped Reactor water temperature 26C° | O |
| | 13:59 | RHR(B) pressure valve(F085B) “Open” | O |
| | | | |
| | 14:08 | RW/B　HVS(A)H/C blow | O |
| | | | |
| | 14:09 | Cooling water injection to OG air conditioning system | O |
| | | | |
| | 14:29 | T/B　South side of HVS H/C blow | O |
| | Notes on classification | M : MRF issued　N : Non compliant report　R : Regular Test・Switching<br>O：Operation<br>P : PTW　RW:R/W related　Mon : Monitoring　Others：Others | |

Form-2

Fukushima Daiichi Nuclear Power Station Unit6

March 11, 2011 （ Shift 1 ） Operator Task Handover Journal（ 3／5 ）

| | Time | Context | Classification |
|---|---|---|---|
| Operation ・ Time of Event | 14:40 | T/B　North side of HVS H/C blow | O |
| | | | |
| | 14:46 | Occurrence of the earthquake (Magnitude 9.0 offshore of Miyagi pref.) Intensity 6 upper at Hamadori | Other |
| | | ANN「SYSTEM A REACTOR AUTO SCRAM」 generated | |
| | | ANN「SYSTEM B REACTOR AUTO SCRAM」 generated | |
| | | RHR pump(B) tripped･･･Under surveillance prior to activation (S/C cooling line) | |
| | | RHR pump(B/D) tripped | |
| | | RWCU isolation | |
| | | CRD pump (B) “Manually stopped” | |
| | | LPCP(A), HPCP(C) tripped | |
| | | ASW pump(B/C) tripped | |
| | | TCW pump(B) tripped | |
| | | CWP(A/B/C) tripped | |
| | 14:47 | D/G(HPCS, 6A, 6B)　Automatic start-up/Synchronized | |
| | | PLRMG EOP(A/B) stopped | |
| | | Fire alarm activated･･･Confirmed all the lights off by resetting | |
| | | | |
| | 15:33 | DTr pump(B) stopped･･･Pure water all stopped | O |
| | | | |
| | 15:36 | Fire alarm activated(D/G room 6B)･･･Resetting failed | O |
| | | | |
| | 15:36 | HPCS, 6AD/G tripped (SW pumps were flooded by tsunami) | Other |
| | | | |
| | 15:36 | M. Tb MSOP, TGOP, EOP stopped | O |
| | 15:36 | RFP-T(A/B) EOP stopped | O |
| | | | |
| | 15:45 | Unit6 regular inspection ancillary device　Main control room standby confirmed | Other |
| | | | |
| | 15:45 | Unit5 reported pursuant to article 10 | Other |
| | | | |
| | 15:52 | SGTS(A) Trip confirmed (No power) | Other |
| | | | |
| | 16:36 | Reported pursuant to article 15 of Act on Special Measures Concerning Nuclear Emergency Preparedness | Other |
| | | | |
| | 16:41 | ANN”T/B B1F CONDENSER AREA LEAK DETECTION” occurred | Other |
| | | | |
| | 17:04 | ANN ”IA COMP DICSH AIR TEMP HIGH” occurred | Other |
| | 17:10 | ANN ”IA RECEIBER PRESS LOW” occurred | Other |
| | | | |
| | 19:12 | RCW pump(B) stopped･･･RCW all stopped | O |
| | | | |
| | 19:14 | D/G6B frequency adjustment 50.6→50.0Hz | O |
| | Notes on classification | M : MRF issued　N : Non compliant report　R : Regular Test・Switching<br>O：Operation<br>P : PTW　RW:R/W related　Mon : Monitoring　Others : Others | |

Form-2

Fukushima Daiichi Nuclear Power Station Unit6

March 11, 2011 （ Shift 1 ） Operator Task Handover Journal（ 4／5 ）

| | Time | Context | Classification |
|---|---|---|---|
| Operation ・ Time of Event | 21:27 | ANN "TURBINE MAIN OIL TANK LEVEL HIGH" Cleared<br>Level: Gradually decreasing from +100mm | Others |
| | Notes on classification | M : MRF issued　N : Non compliant report　R : Regular Test・Switching<br>O : Operation<br>P : PTW　RW:R/W related　Mon : Monitoring　Others : Others | |

Form-1

Fukushima Daiichi Nuclear Power Plant Unit 5 and 6

March 11, 2011, Friday, Shift 1, Shift Supervisor Task Handover Journal（2/3）

| | |
|---|---|
| Unit 6 | |
| 1. Operation Status | |
| (1) Reactor is shutdown for periodical inspection | |
| (2) D/G 6A standby (completion of maintenance of lubricant oil priming pump) | 12:30 |
| (3) Stoppage of RHR pump(B) system SHC mode | 13:56 |
| (4) Alarm “SEISMIC MONITORING TRIP” occurred | 14:46 |
| (5) Alarm “SYSTEM A/B REACTOR AUTO SCRAM” occurred | 14:46 |
| (6) 6A, 6B, HPCS　D/G 1A/1B　automatic start up/synchronized | 14:46 |
| (7) 6A, HPCS D/G trip | 15:36 |
| | |
| | |
| | |
| | |
| 2. Compliance status of safety regulation | |
| (1) Safety regulation, article 17 (procedures at the time of earthquake and fire) | |
| - report to O&M general manager at the occurrence of earthquake with an intensity of more than lower 5 | 14:50 |
| (2) Safety regulation, article 76 (basic procedures at the occurrence of abnormal event) | |
| - report to O&M general manager at the occurrence of reactor automatic scram | 14:50 |
| | |
| | |
| | |
| 3. Periodic test | |
| None | |
| | |
| | |
| 4. Requested work, non compliance event | |
| None | |
| | |
| | |
| 5. Status of waste treatment facility | |
| None | |
| | |
| | |
| 6. Others | |
| (1) Occurrence of the earthquake | 14:46 |
| Intensity of upper 6:　Futawa Town (Shinzan),　Okuma town (Nogami, Shimonogami),　Tomioka town (Motooka), Naraha town (Kitada) | |
| (2) Alarm warning for huge Tsunami | 14:58 |
| | |

## 3. Overview of Data Analysis of Common Pool

### (1) Plant Data

Plant behavior represented by data collected from common pool is shown as follows.

The chart of common pool recorded data when the earthquake and tsunami attacked. However, due to the loss of power sources and signals by the effects of inundation by tsunami, the chart stopped immediately after the earthquake or after a certain period of time. Regarding the operation log which is the record by the operators on duty the records before the earthquake are kept, however, the records after the occurrence of the earthquake are not perfect due to the blackout and working environment in such severe conditions.

### (2) Plant Behavior

① Before the occurrence of the earthquake at 14:46 on March 11, 2011, the data of common pool indicated normal conditions, keeping the fuels stored stably with temperature of approximately 30 ℃. According to shift supervisor task handover journal, the supervisor confirmed that the water level of common pool was full (near overflow line) and the temperature of the pool was 34℃. That was a normal condition.

(Attachment-common-1, 2)

② Water temperature gauge of the pool stopped recording immediately after the quake due to the loss of power source resulted from the quake. Immediately after the quake, the pump to cool the fuel pool stopped its operation due to the loss of power, though the emergency diesel generator started. The pumps to cool the fuel pool can receive power from the emergency diesel generators of Units 2 and 4. The reboot of the pump to cool the fuel pool using the power supply from the emergency diesel generator was not implemented before the tsunami’s arrival, because it was confirmed that the water level of fuel pools was full before the quake (around the level of overflow) and that the water temperature of the pool was approximately 34℃. The pump to cool the pool was not able to be started due to the loss of power supply after all the AC power supply was lost due to the tsunami. Because of this, the water temperature of the pool was considered to have risen, though it is confirmed at the site on March 18, 2011 that the water level of the common pool was secured, and that the water temperature was 55℃ (around 11:00 am on the same day). Because the power supply was restored on March 24, 2011, the pump to cool the fuel pool was started at 18:05 on the same day. Since then, the pool has been kept cooled stably.

③ Radiation monitoring for exhaust air of spent fuel pool indicated stable values until the end of its recording after the earthquake. Abnormal situation was not recognized.

(Attachement-common-3)

様式－1

福島第一原子力発電所 ３・４号機

Major test items

# 主要測定項目

平成２３年 ３月 １１日 金曜日（２直） 当直長引継日誌（３／３）

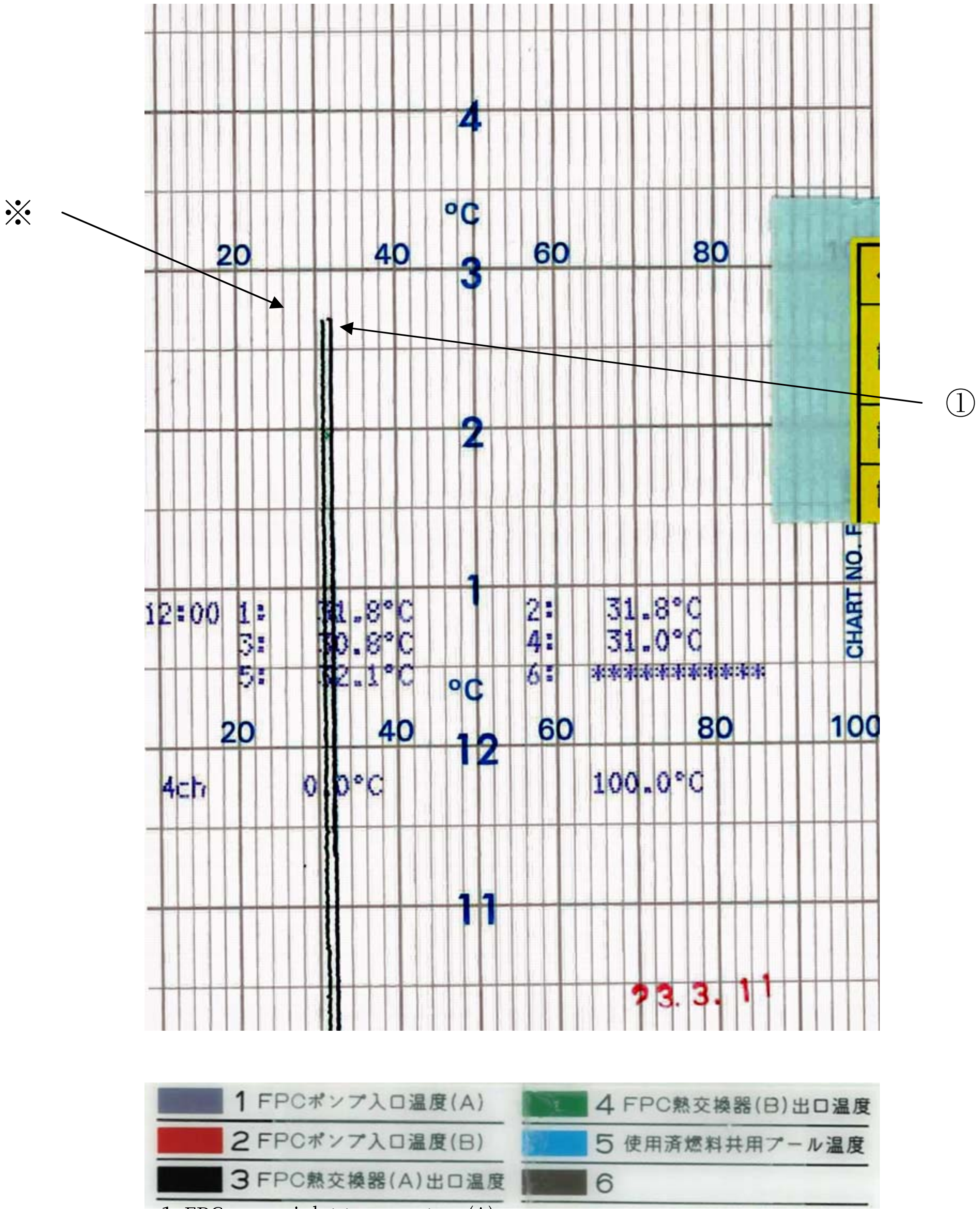
| Test items | | Test frequency | ３ 号 機 | ４ 号 機 | Notes |
|---|---|---|---|---|---|
| 1 | Core Minimum Fraction of Limiting Critical Power Ratio (CMFCP) | １回／直<br>1/shift | ０．８８ | － | |
| 2 | Core Maximum Fraction of Limiting Power Density (CMFLPD) | １回／直<br>1/shift | ０．９３ | － | |
| 3 | Reactor lowest water level | １回／直<br>1/shift | １１５６㎜ | － | Unit 4 all fuel outside |
| 4 | Spent fuel pool highest temperature | １回／直<br>1/shift | ２５℃ | ２７℃ | |
| 5 | Spent fuel pool water level status | １回／直<br>1/shift | Around overflow water level | Around overflow water level | |
| 6 | Reactor coolant maximum temperature change rate | at the time of start-up and shutdown | － ℃／hr | － ℃／hr | |
| 7 | RPV lowest temperature | At the time of pressure resistance test of RPV | － ℃ | － ℃ | |
| 8 | Common spent pool facility pool temperature | １回／直 | ３４℃ | | |
| 9 | Common spent pool facility pool water level status | １回／直 | Around overflow water level | | |

注：測定項目8, 9については，3･4号機のみ対象（３・４号の様式）　（記録用紙の単位変更は可能とする。）

Note: Test items No.8,9 are only for unit 3,4 (format for unit 3,4)　The unit in recording sheet can be changed

## 【Common spent fuel pool　Common spent fuel pool temperature】

## 【共用プール　共用プール温度】



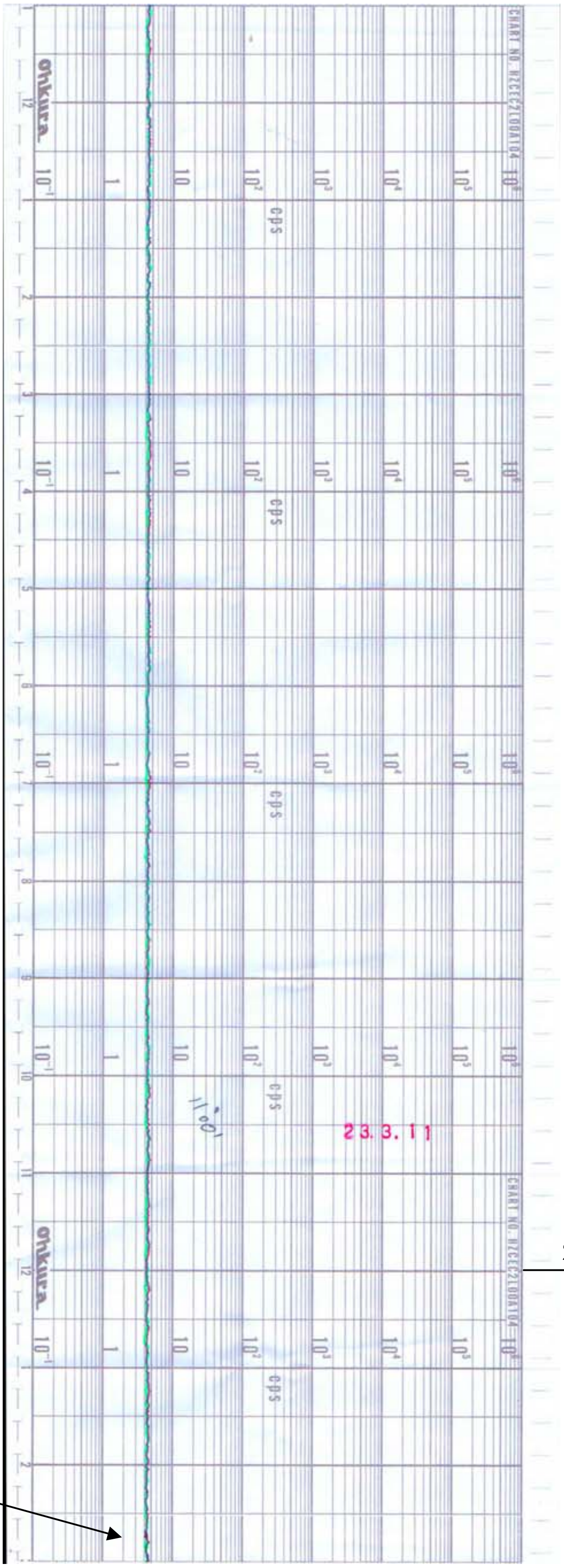
1 FPC pump inlet temperature(A)
2 FPC pump inlet temperature(B)
3 FPC heat exchanger outlet temperature
4 FPC heat exchanger outlet temperature
5 Common spent fuel pool temperature

①　１４時４６分　地震発生
※　電源喪失による記録の停止

①　14:46 Occurrence of the earthquake
※　Recording stop due to power outage

## 【Common spent pool, SFP (Spent Fuel Pool) exhaust radioactivity monitor】

## 【共用プール　ＳＦＰ（使用済燃料プール）排気放射線モニタ】



| SFP 排気放射線モニタ |
|---|
| 🟥　SFP 排気放射線モニタ A |
| 🟩　SFP 排気放射線モニタ B |

2011/3/11 12:00

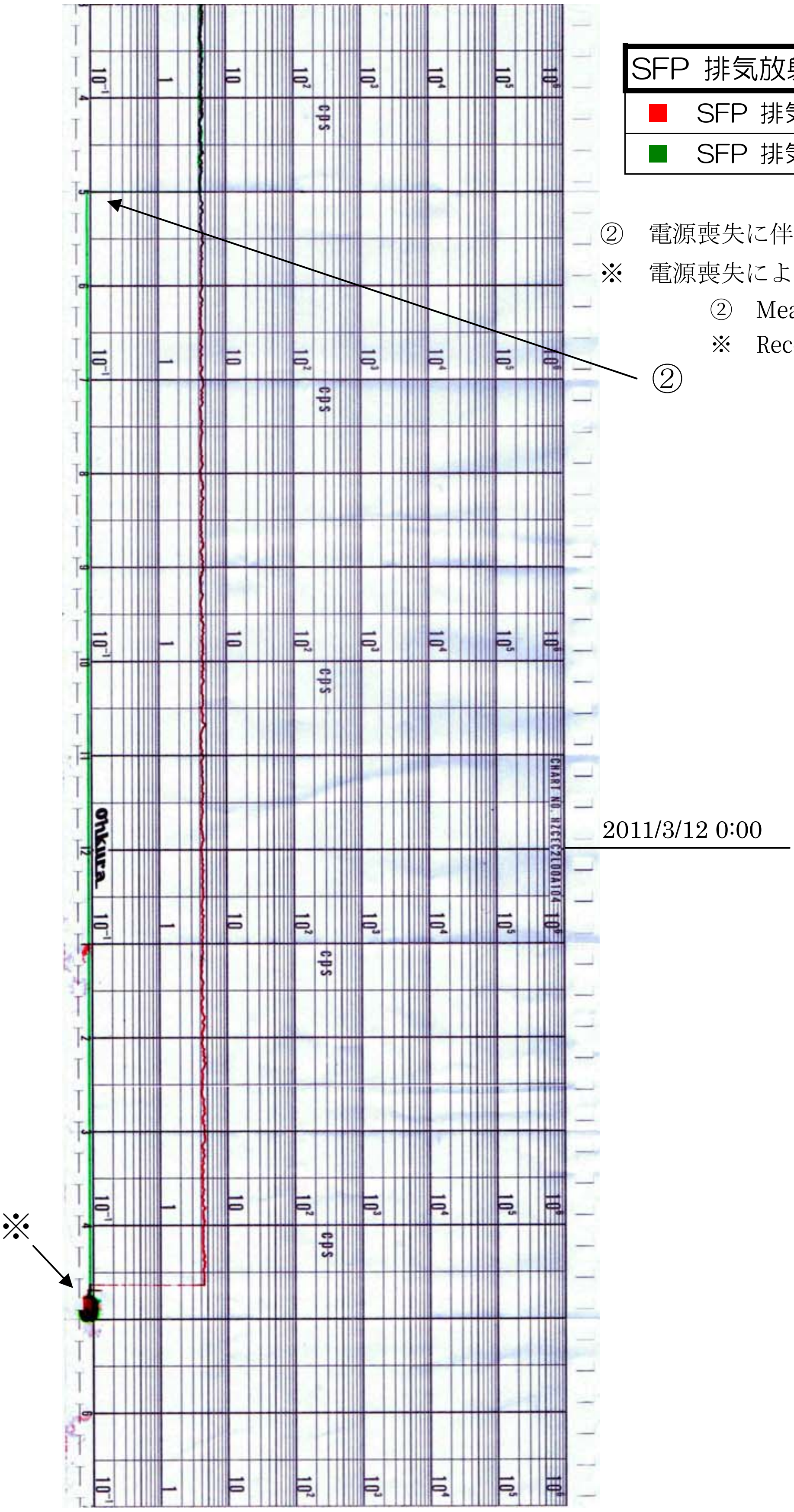
①

①　１４時４６分　地震発生

①　14:46 Occurrence of the earthquake

## 【Common spent pool, SFP (Spent Fuel Pool) exhaust radioactivity monitor】

## 【共用プール　ＳＦＰ（使用済燃料プール）排気放射線モニタ】



| SFP 排気放射線モニタ | |
|---|---|
| 🟥 | SFP 排気放射線モニタ A |
| 🟩 | SFP 排気放射線モニタ B |

② 電源喪失に伴うダウンスケール

※ 電源喪失による記録の停止

② Measurement failure due to power outage

※ Recording stop due to power outage

2011/3/12 0:00

Annex-1

# Reactor core conditions of Units 1 to 3 of Fukushima Daiichi Nuclear Power Station

## Table of Contents

## 1. Introduction

Due to the Tohoku-Chihou-Taiheiyou-Oki Earthquake centered off the coast of Sanriku which occurred on March 11, 2011, Units 1 to 3 of Fukushima Daiichi Nuclear Power Station got into conditions beyond which design basis events went by far and which exceeded extent of multiple breakdowns assumed in the preparation for accident management measures. The conditions resulted in an accident that no Emergency Core Cooling System of Unit 3 and other neighboring units worked or stopped working and failure of all AC sources occurred and continued. In order to stabilize and restore the accident in the future, we think it is important to understand how events of the plant have been going since the earthquake and what current conditions of the plant are like.

On April 25, 2011 we received an instruction document from Nuclear and Industrial Safety Agency (NISA) titled “Collection of Report on the Section 1 of the Article 67 of Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors” (April 24, 2011 NISA No.1). On May 16, 2011, based on the instruction document, we collected as many plant data as possible at the time of the earthquake, sorted them and reported to NISA. Based on the above mentioned information on equipment status and operations at the early period when the earthquake occurred, we have evaluated plant status and sorted the information by means of Modular Accident Analysis Program (hereinafter called “MAAP”).

We have had this analysis result from an analysis on information obtained when we made out this report and on required conditions for the analysis under estimates and assumptions. There is extremely great uncertainty in the analysis result. Therefore, as we proceed with investigation of causes, we may have a widely different result from this one.

## 2. Summary of Evaluation Result

As a result of an analysis by means of MAAP code, we have obtained an analysis result that after an isolation condenser system (hereinafter called “IC”) of Unit 1 of Fukushima Daiichi Nuclear Power Station (hereinafter called “Unit 1”) was assumed to stop, reactor core damage began at the relatively early period and then the reactor pressure vessel resulted in breakage.

In Unit 2 of Fukushima Daiichi Nuclear Power Station (hereinafter called “Unit 2”) and Unit 3 of Fukushima Daiichi Nuclear Power Station (hereinafter called “Unit 3”), though reactor core damages began as water levels of reactors decreased due to decline in a function of Reactor Core Isolation and Cooling System (hereinafter called “RCIC”) and High Pressure Coolant Injection System (hereinafter called “HPCI”), we have had an analysis result that reactor cores in reactor pressure vessels were finally maintained. However, we have had another analysis result that core damages further increased and then reactor pressure vessels resulted in breakage in case actual water levels were lower than those of reading and bottoms of active fuel.

According to current plant parameters of Units 1 to 3 such as temperatures of their reactor pressure vessels, temperatures changes indicate most of heat sources (fuel) are supposed to be located in their reactor pressure vessels. We think that, even if reactor pressure vessels may be damaged, damages are estimated not to be larger than those obtained from the analysis result. Therefore, we consider the analysis result is stricter than in reality.

Hence, we have evaluated that melting of substantial quantities of pellets in reactor cores of any plants has increased and figures and locations of reactor cores have been significantly changed, judging from both this analysis result and this consideration of plant parameters.

According to current temperatures near reactor pressure vessels, we think such events as leaks of huge quantities of radioactive materials will develop in the future, as we have sufficiently cooled down currently.

# 3. Analysis and evaluation regarding condition of reactor core

## 3.1 Unit 1 of Fukushima Daiichi Nuclear Power Station

### 3.1.1 Analysis condition

Principal conditions of analysis regarding Unit 1 of Fukushima Daiichi Nuclear Power Station are shown in the Table 3.1.1 and 3.1.2.

We implemented the analysis regarding leak from Primary containment vessel and IC based on the assumptions below.

① Assumption of the gas phase leak from Primary containment vessel

In the analysis, we presumed that a leak (about **ϕ**3 cm) from gas phase of Primary containment vessel (dry well, hereafter called “D/W”) occurred 18 hours after the earthquake occurred, in order to accommodate the figure to the actually measured pressure of primary containment vessel to an extent.

However, as it is just an assumption for analysis, it is unclear whether a leak from D/W occurred actually, or it is a mismatch of measured figure and analyzed figure caused by the problem of the gauge.

② Observation of the operating condition of IC

As the operating condition of IC after outage of all AC power is still unclear, we did not presume the operation of IC after outage of all AC power in the analysis. In addition, we also analyzed the case that IC temporary operated after outage of all AC power as a sensitivity analysis.

We presumed that one side of the system of IC has operated intermittently before outage of all AC power, as reactor pressure has been fluctuated below the set pressure level (about 7.4MPa[abs]) for operation of safety relief valve (hereinafter called “SRV”) as well.

**Table 3.1.1 Plant Conditions**

| Items | Conditions |
|---|---|
| Initial reactor output | 1380 MWt (rated power output) |
| Initial reactor pressure | 7.03MPa[abs] (normal operation pressure) |
| Initial reactor water level | Normal level |
| Open space volume of primary containment vessel | D/W open space : 3410m$^3$<br>S/C open space : 2620m$^3$ |
| Suppression pool water volume | 1750m$^3$ |

### Table 3.1.2 Events

Explanatory notes ○：Records available △：Estimates based on records □：Assumption used on analysis

| Analysis Condition | | | | Classification | Notes | In case of ○：Referred part of the records<br>In case of △ or □：Estimated, presumed reasons etc. |
|---|---|---|---|---|---|---|
| No | Time and Date | | Analyzed Events | | | |
| 1 | May 11th | 2:46 pm | Earthquake occurred | ○ | － | |
| 2 | | 2:46 pm | Reactor scram occurred | ○ | Report on May 16th, 4. Operation daily, Handover diary of shift supervisor | |
| 3 | | 2:47 pm | MSIV closed | ○ | Report on May 16th, 4. Operation daily, Handover diary of shift supervisor | |
| 4 | | 2:52 pm | IC(A) (B) activated automatically | ○ | Report on May 16th, 3. Data of records on alarm generation, Alarm timer | |
| 5 | | Around 3:03 pm | IC(A) stopped | △ | It is assumed that IC stopped based on 6.The record of transient recorder described the report on May 16th. | |
| 6 | | Around 3:03 pm | IC(B) stopped | △ | Same as above | |
| 7 | | 3:17 pm | IC(A) restarted | △ | Estimated behavior of IC based on the transition of reactor pressure (described in 2.Record of the chart in the report on May 16th) ※1 | |
| 8 | | 3:19 pm | IC(A) stopped | △ | Same as above | |
| 9 | | 3:24 pm | IC(A) restarted | △ | Same as above | |
| 10 | | 3:26 pm | IC(A) stopped | △ | Same as above | |

| | | | | | |
|---|---|---|---|---|---|
| 11 | | 3:32 pm | IC(A) restarted | △ | Same as above |
| 12 | | 3:34 pm | IC(A) stopped | △ | Same as above |
| 13 | | 3:37 pm | Outage of all AC power occurred | ○ | Report on May 16th, 4. Operation diary, Handover diary of shift supervisor |
| 14 | | 6:10 pm | IC(A) system 2A, 3A valve opened, and steam generation was confirmed | □ | It is described in 7.operation record in the report on May16, however, we presumed in the analysis that the function of IC has been lost since outage of all AC power ※2 |
| 15 | | 6:25 pm | IC(A) system 3A valve was closed | □ | Same as above |
| 16 | | 9:19 pm | The lineup from Diesel Driving Fire Protection Pump (D/D-FP) was implemented. | □ | Same as above |
| 17 | | 9:30 pm | IC 3A valve was opened | □ | Same as above |
| 18 | | 9:35 pm | Regarding IC, water was supplied from D/D-FP | □ | Same as above |
| 19 | May 12th | 1:48 am | Regarding IC, D/D-FP stopped supplying water by pump trouble, not by fuel run-out | □ | Same as above |
| 20 | | 5:46 am | Injection of fresh water by the fire pump started | ○ | Report on May16th, 7. Operation records ※3 |
| 21 | | 2:30 pm | Regarding the containment vessel vent, operation of AO valve of suppression chamber | △ | Report on May16th, 7. Operation records<br>We presumed that the success of vent is at 2:30pm, time when a pressure decrease was confirmed. |

| | | | | | |
|---|---|---|---|---|---|
| | | | side was implemented at 10:17am, and a pressure decrease was confirmed at 2:30pm. | | |
| 22 | | 2:49 pm | Vent valve of primary containment vessel was closed | △ | We presumed the event based on the pressure increase of primary containment vessel |
| 23 | | 2:53 pm | Injection of fresh water terminated | ○ | Report on May16th, 7. Operation records |
| 24 | | 3:36 pm | Explosion of reactor building of Unit 1 occurred | ○ | Report on May16th, 7. Operation records |
| 25 | | 8:20 pm | Injection of sea water started | ○ | Report on May16th, 7. Operation records ※3 |

※1 There are unclear points on the behavior of IC before outage of all AC power, however, reactor pressure fluctuates between about 6.2 to 7.2MPa[abs] based on the 2.Records of charts in the report on May 16th, we presumed that the one of the system of IC has operated intermittently, as set pressure of SRV no.1 relief valve is 7.4 MPa[abs], and reseating pressure is 6.9MPa[abs].

※2 There are also unclear points on the operation of IC after outage of all AC power, however, we presumed that the function of IC is lost as we only have the insufficient amount of record which show IC is functioning.

※3 We set up the injection amount of water and the time we changed the amount based on the daily injection amount described in 7.Operation records of the report on March 16th, in order not to exceed the daily average injection amount and total injection amount.

### 3.1.2 Analysis Result

Table 3.1.3 shows the result of analysis based on the condition shown in 3.1.1. And from Fig. 3.1.1 to Fig 3.1.12 show the result of analysis about the trend of reactor water level etc.

**Table 3.1.3 Summary of Analysis Result on Unit 1**

| Item | Analysis Result |
|---|---|
| Start of reactor core exposure | Approx. 3 hours after earthquake |
| Start of reactor core damages | Approx. 4 hours after earthquake |
| Start of reactor pressure vessel damages | Approx. 15 hours after earthquake |

The detail of analysis result is as follows.

The reactor water level comes at the top of active fuel (hereinafter called TAF) approximately 2 hours after assumed timing of IC stop, and then the reactor core has been broken (see Fig. 3.1.1).

After the earthquake occurred, the actual data of reactor water level was changing within the fuel range. It differs dramatically from the analysis result, but the analysis result shows that the reactor pressure vessel has been broken, so that it is impossible to keep the reactor water level in the reactor pressure vessel. Regarding this matter, there is a possibility that the correct level is not shown because the water in the level gauge boiled away as the temperature of the primary containment vessel rose high. About Unit 1, after calibration of level gauge, it is confirmed that the water level is under fuel range.

Regarding reactor pressure, after assumed timing of IC stop, the reactor pressure increases, but it remains around 8MPa because of the Safety Relief Valve. After the timing of reactor core damage, the melting pellet move to the lower plenum, and then after 15 hours from the earthquake occurrence, the reactor pressure vessel has been broken and the reactor pressure decreases rapidly (see Fig. 3.1.2).

The pressure of Primary containment vessel temporary increases because of the steam which is discharged from the reactor pressure vessel and hydrogen gas which is formed by the reaction of water and metal in the reactor, but after that the pressure decreases because of the leakage from the Primary containment vessel which is assumed at the analysis, and then it decreases rapidly by the vent operation on Mar. 12 (see Fig. 3.1.3).

By the way, at the beginning the measured pressure of Primary containment vessel is higher than the analysis result, the reasons are assumed that some kind of situation with the discharge of steam from the reactor pressure vessel occurred such as that the instrumentation pipe in the reactor was broken at the beginning of reactor core damage and then steam was flowed into the vessel, or that the sealing capability of a gasket used at the main steam system was lost because of high temperature, however currently the cause is unknown including whether it is a problem of measurement equipment or not.

Regarding the assumption about the leakage of the Primary containment vessel, at the time after 18 hours of the earthquake occurrence when the leakage is assumed, the Primary containment vessel temperature is over 300 degree C, which well exceeds the designed temperature of the vessel (138 degree C). There is an knowledge by the past power sector cooperated study, it says that, there is a possibility for the gasket to damage such an over-temperature condition, so that if the leakage from the vessel is true, the damage of gasket by over-temperature is assumed to be one of the reason. And also regarding the assumption of leakage from the vessel after 50 hours of earthquake occurrence, according to the behavior of the vessel temperature by analysis that remains high temperature( see Fig. 3.1.5), it is assumed to be one of the reason that the leakage points increase gradually.

Although the water injection to the reactor starts at 14 hours after the assumed timing of IC stop, but until that the fuel melts by the decay heat and moves to the lower plenum, and then the reactor pressure vessel damage after 15 hours of earthquake occurrence (see Fig 3.1.4 and Fig 3.1.9).

Regarding the fission products which are discharged by the reactor core damage (hereinafter called FP), the noble gas is almost discharged to the atmosphere by the vent operation. According to the analysis result, approximately 1% discharge for cesium iodide and under 1% discharge for other materials (see Fig 3.1.7 and Fig 3.1.8). Also regarding Plutonium, it belongs to $UO_2$ group as $PuO_2$, the analysis result said that the discharge rate is under $10^{-7}$.

Regarding hydrogen production, the hydrogen is produced at the same time of the timing of reactor core damage start, it is possible that the cause of explosion on Mar. 12 is the hydrogen produced in this time (see Fig. 3.1.6).

Regarding IC, it is not sure about the action after Tsunami arrival, we analyzed about a case under assumption that IC is temporary working (from approx. 6:00 pm, Mar. 11 to approx. 2 am, Mar. 12, assume half line was working). The behavior of the reactor water level is similar although the absolute value is different (see Fig. 3.1.10). However, based on this assumption, the Primary containment vessel pressure shows perfectly different behavior from measured value (see Fig.3.1.11), it is impossible to clear up by this analysis about the action of IC after outage of all AC power. Because the water level also cannot be kept in the fuel range in this sensitivity analysis of IC, so that it means the reactor core damages (see Fig.3.1.12).

This evaluation is implemented based on the analysis using MAAP code; it has some uncertainty on the determination of analysis condition and on the analysis model, so that it is necessary to take notices that the progresses of phenomenon as the result also have some uncertainty. Especially, the amount of discharged FP receives a great amount of influence from these uncertainties, so that the data should be used as a reference.

### 3.1.3 Evaluation Result

As previously mentioned, we have had an analysis result that, after failure of all AC sources (arrival of the tsunami), reactor core damages began at the relatively early period and the reactor pressure vessel has resulted in breakage. However, we consider the analysis result is stricter than in reality, when we refer to plant status estimated from temperatures in each part etc. in the following pages.

When we could measure temperatures in each part, those of reactor pressure vessels were above 400 degrees Celsius in multiple measuring points. We think that at that time, though the condition of insufficient cool-down to the reactor core had continued, they have then sufficiently cooled down since we sprayed water through the feed-water line and, due to the secured water spray to the reactor, temperatures in each part suddenly decreased.

In addition, as a result of calibration of the water-level gauge, we have found that the water level in reactor pressure vessels is not within fuel ranges.

On the other hand, we think that most of fuel is cooled down in the reactor pressure vessel, because we can still measure temperatures in CRD housing etc. at the lower reactor pressure vessel (if the reactor pressure vessel is damaged, we may not be able to measure temperatures) and temperatures of the steel of the reactor pressure vessel currently change around between 100 degrees Celsius and 120 degrees Celsius and correlate changes in amount of water spray in multiple measuring points and temperatures in multiple points of the upper reactor pressure vessel are higher and their heat sources are estimated to come from the inside of the reactor pressure vessel.

Hence, according to the analysis and plant parameters (temperatures near the reactor pressure vessel), we think that the reactor core has been significantly damaged, but moved below or dropped to the lower plenum from the fixed position of fuel loading and most of it can be stably cooled down around there.

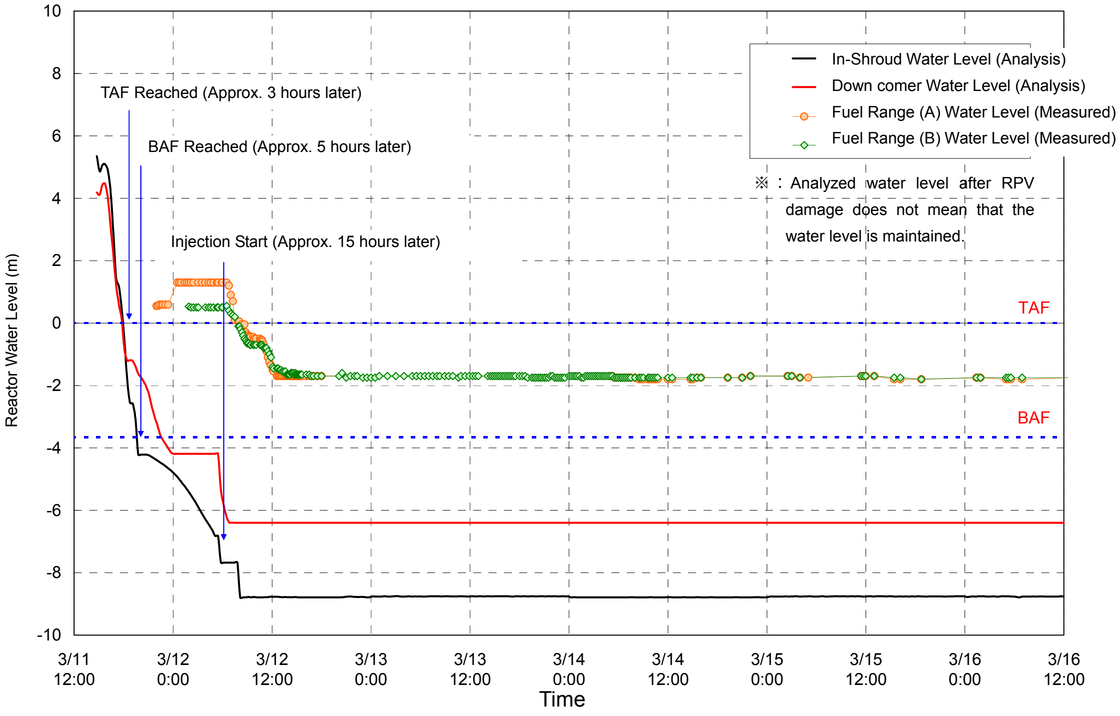


Figure3.1.1 Unit1 Reactor Water Level

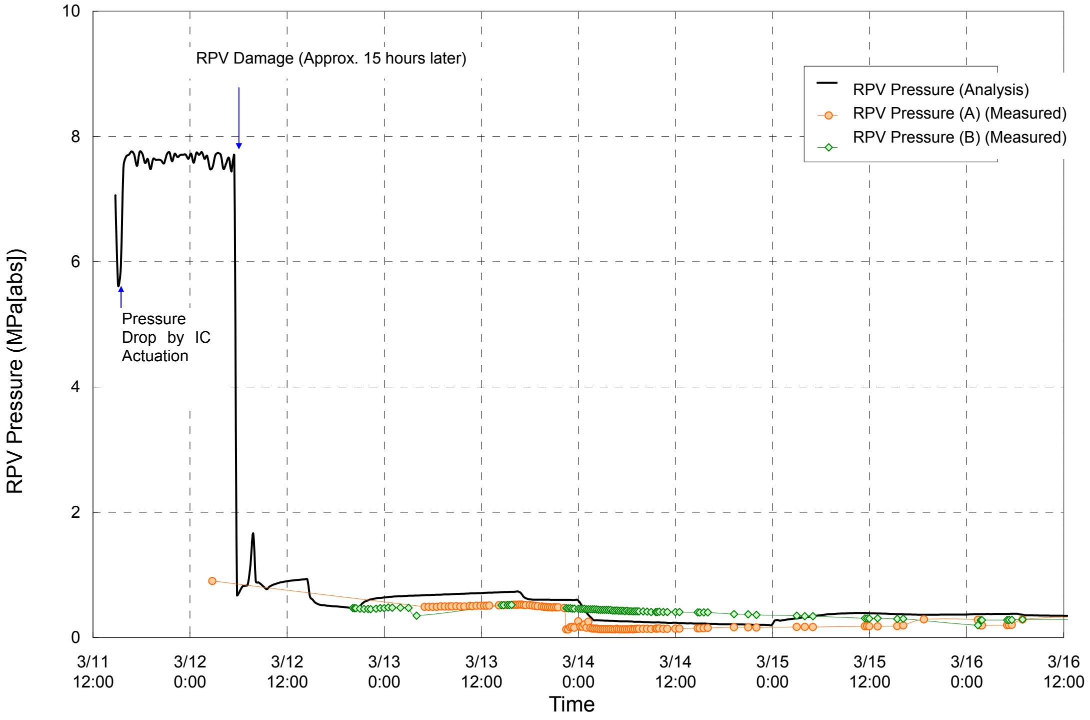


Figure3.1.2 Unit1 RPV Pressure

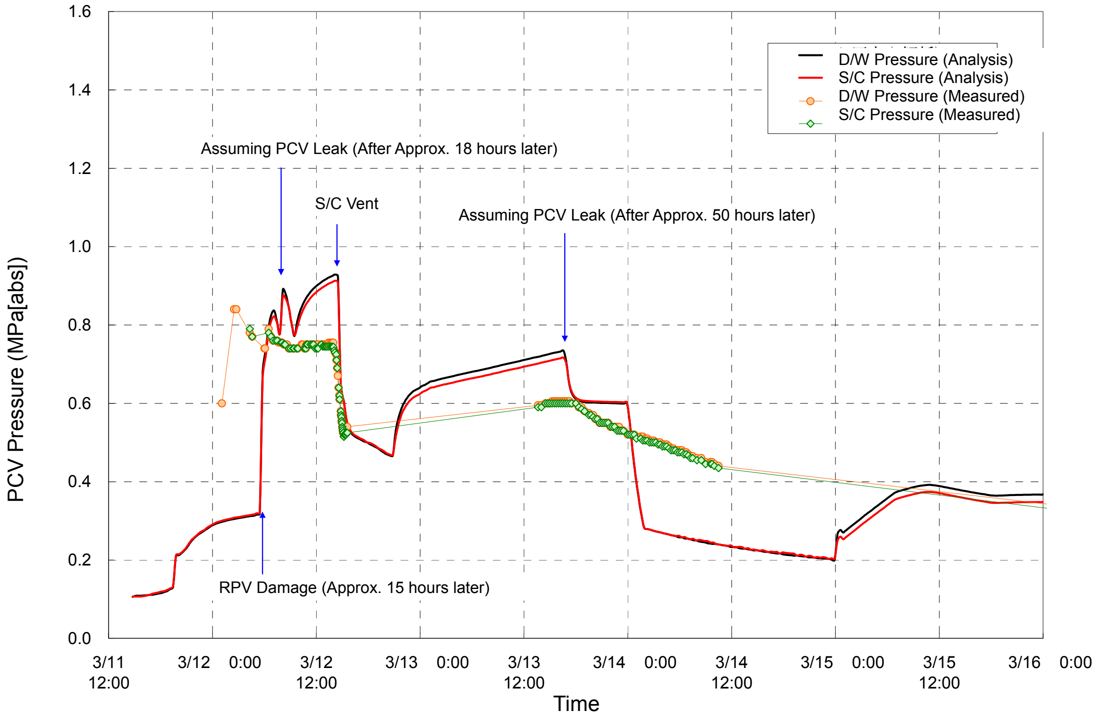


Figure3.1.3　Unit1 PCV Pressure

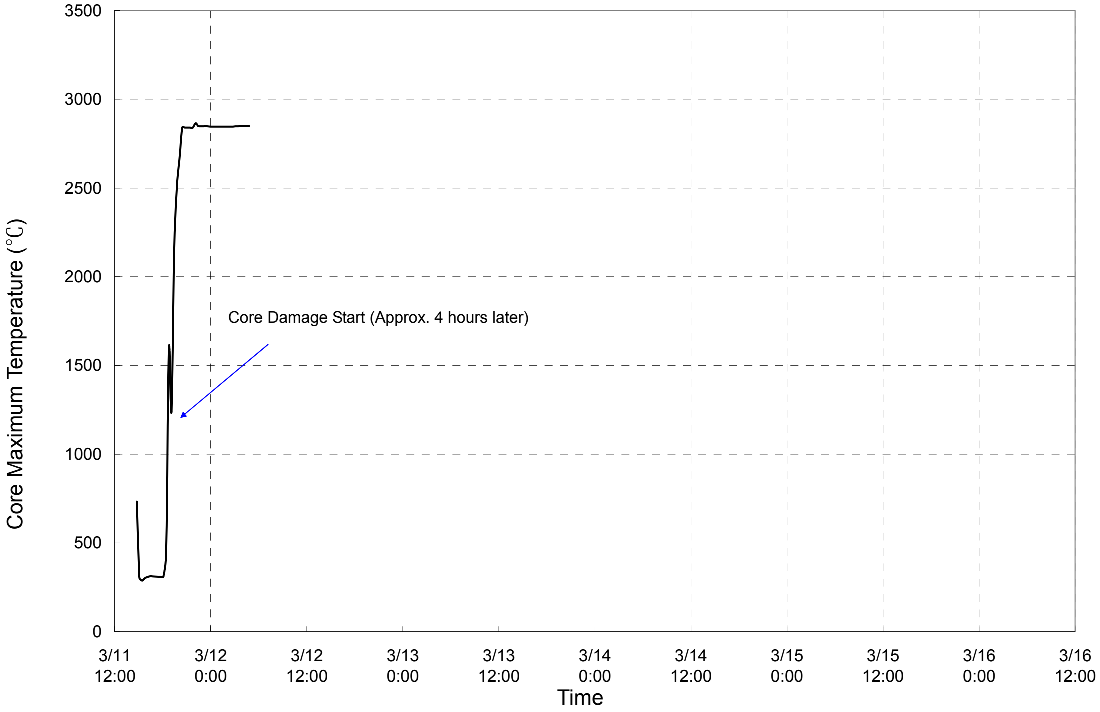


Figure3.1.4　Unit1 Core Temperature

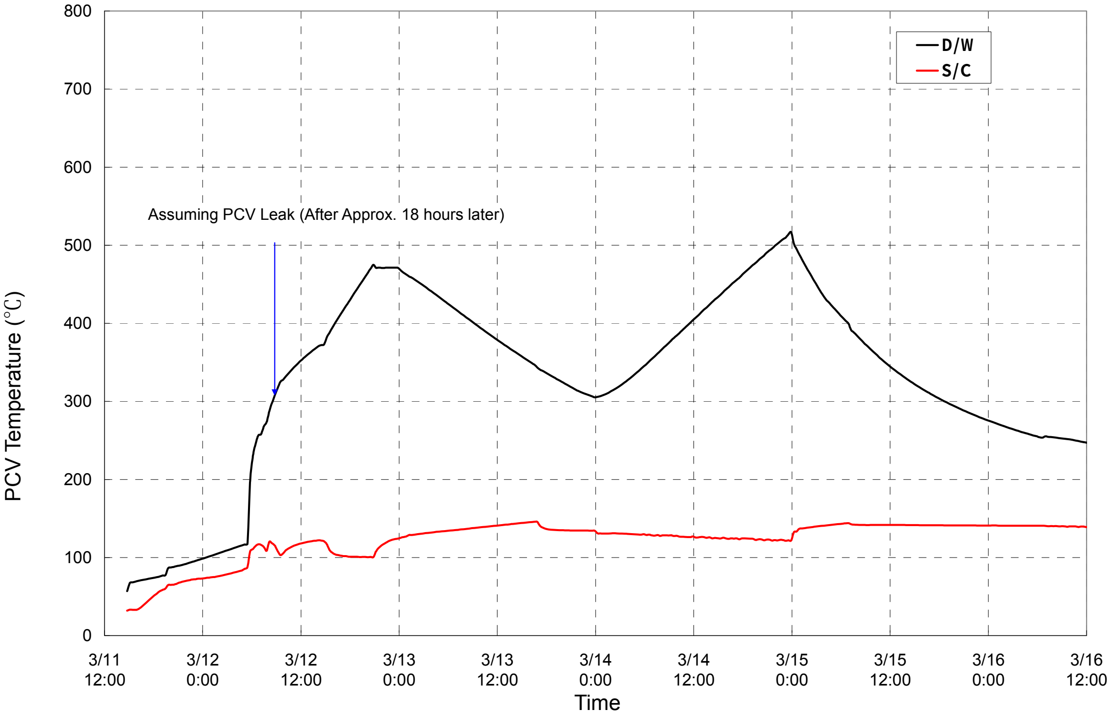


Figure3.1.5 Unit1 PCV Temperature

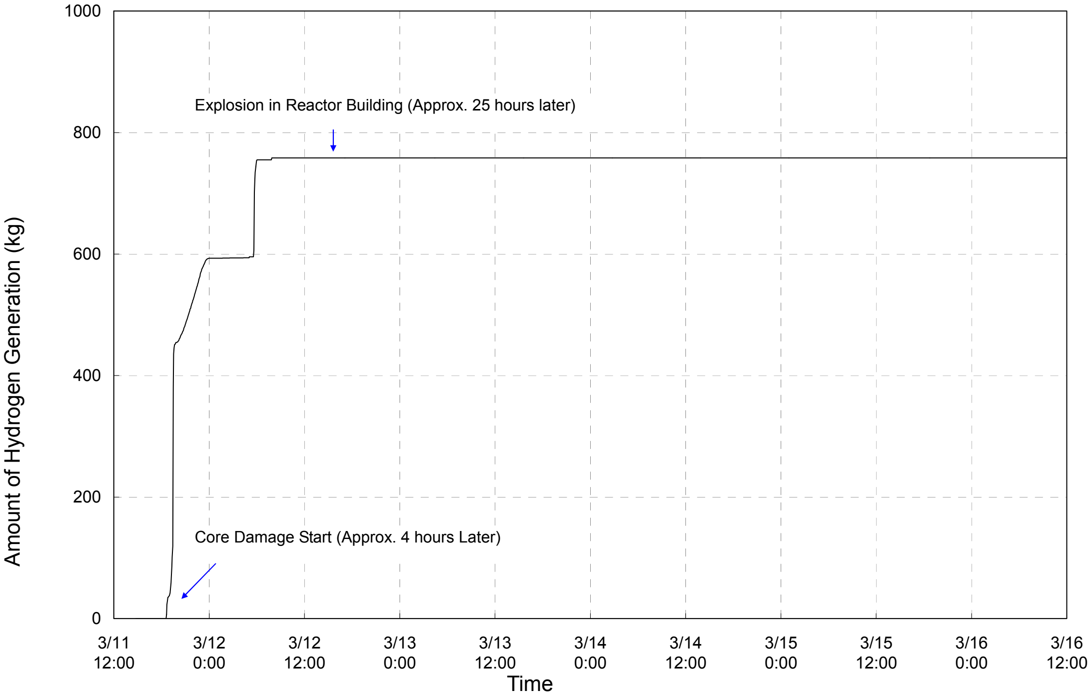


Figure3.1.6 Unit1 Amount of Hydrogen Generation

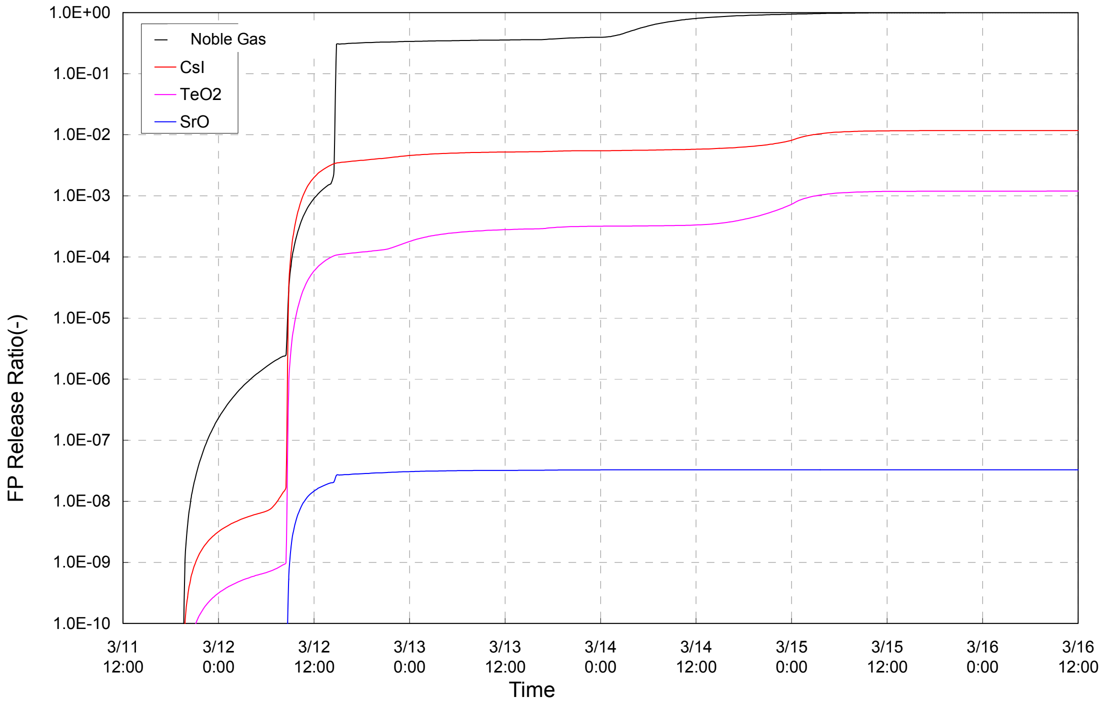


Figure3.1.7　Unit1 FP Release Ratio（1／3）

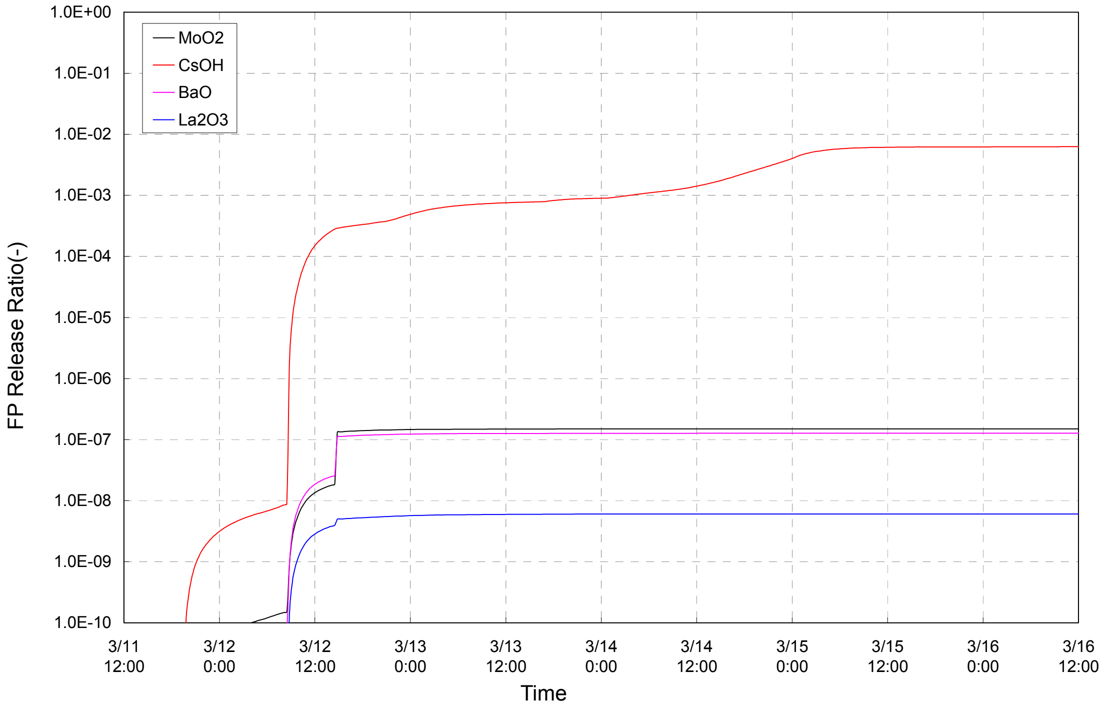


Figure3.1.7　Unit1　FP Release Ratio（2／3）

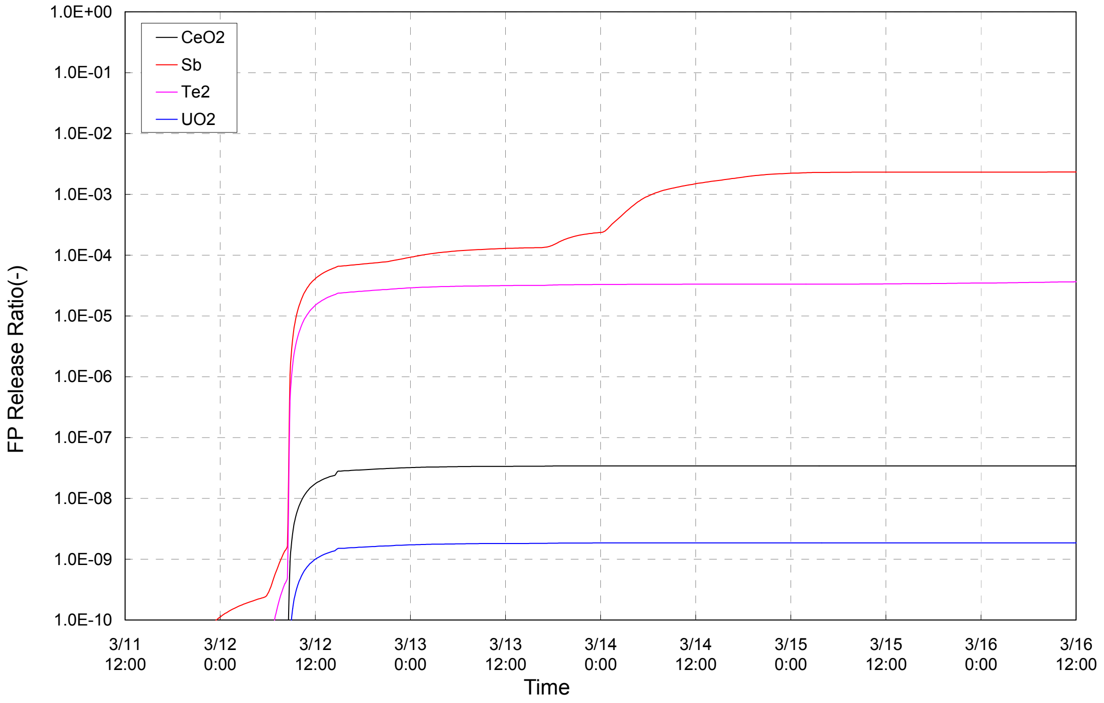


Figure3.1.7　Unit1　FP Release Ratio（3／3）

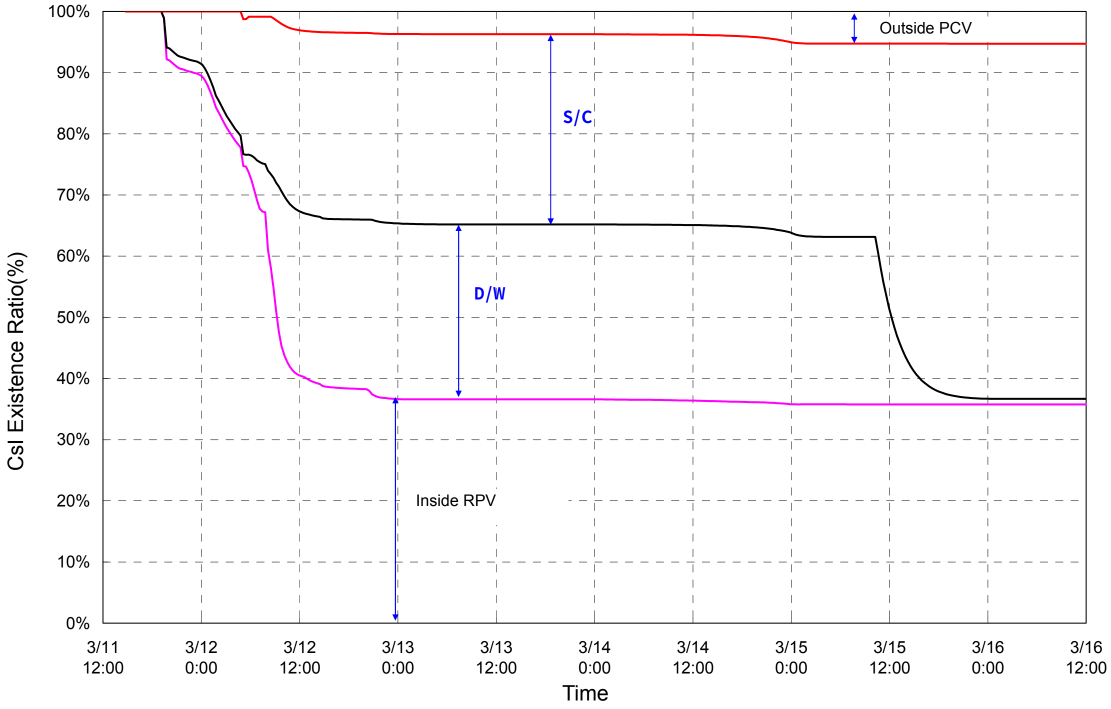


Figure3.1.8　Unit1　FP Existence Ratio（1／2）

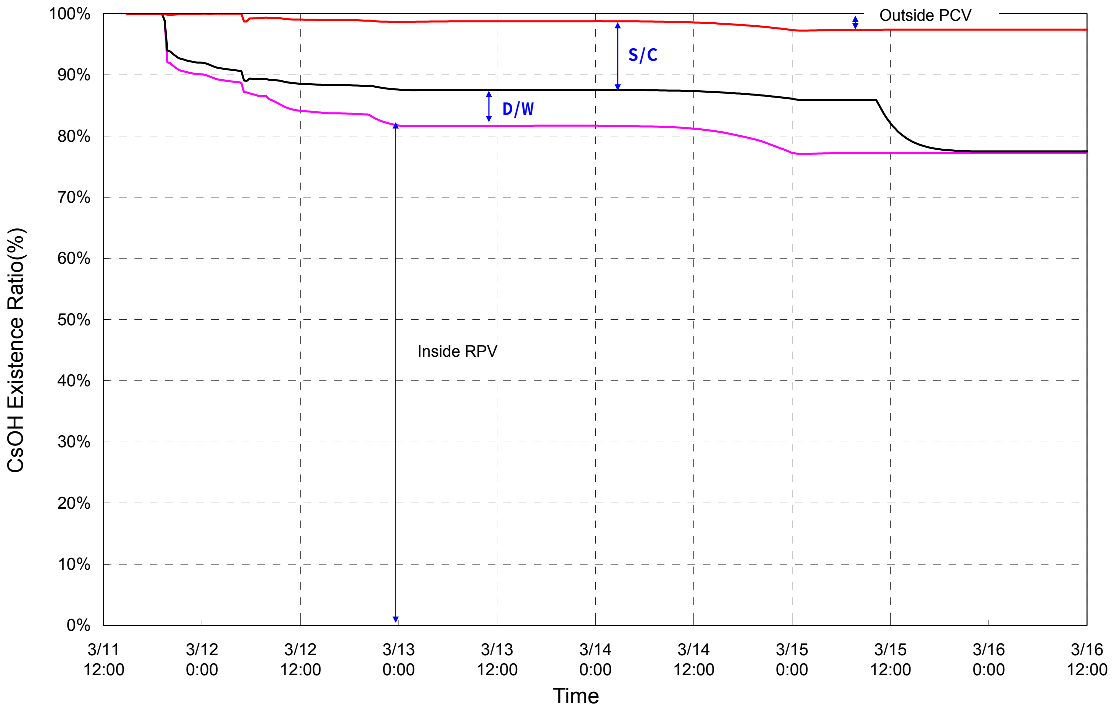
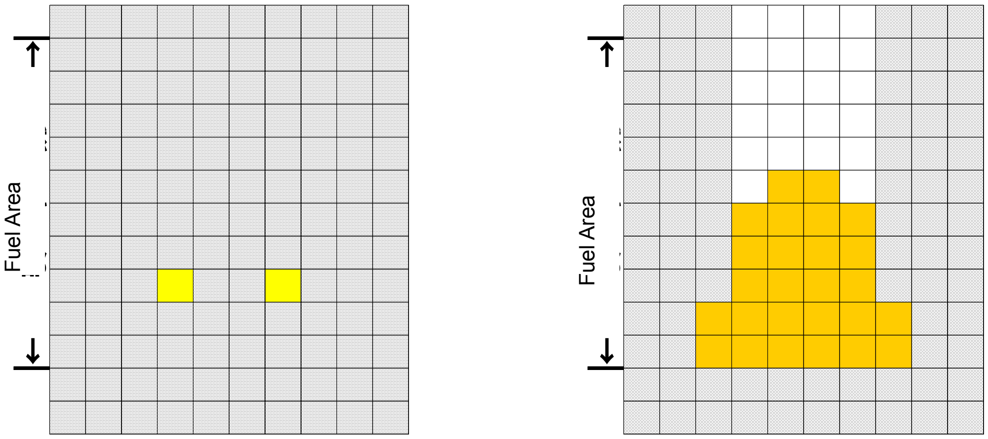
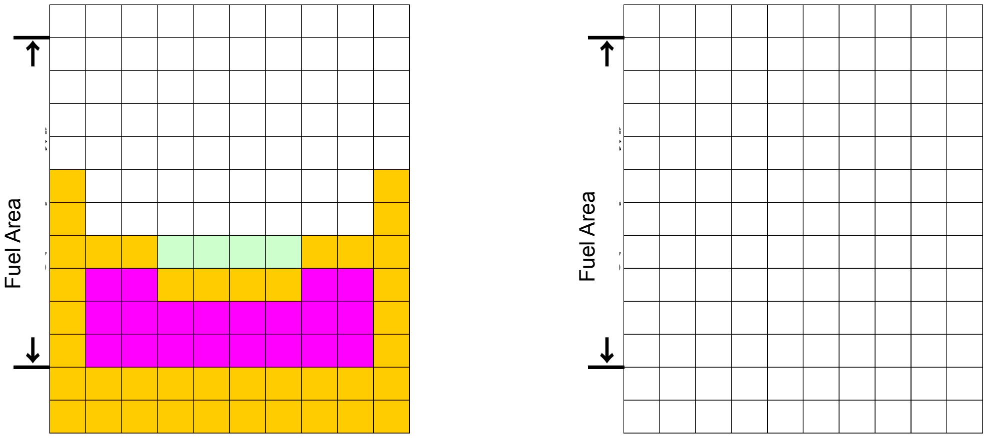


Figure3.1.8　Unit1　FP Existence Ratio（2／2）



Approx. 4.7 hours after SCRAM    Approx. 5.3 hours after SCRAM



Approx. 14.3 hours after SCRAM    Approx. 15 hours after SCRAM

Model of Fuel Damage
□：No Fuel（Slumped）
▨：Normal Fuel
🟩：Accumulation of Slumped Fuel
🟨：Accumulation of Melted Fuel

🟧：Flow Channel Blockage with Melted Fuel
🟪：Molten Core Pool

Figure3.1.9　Unit1　Core Status

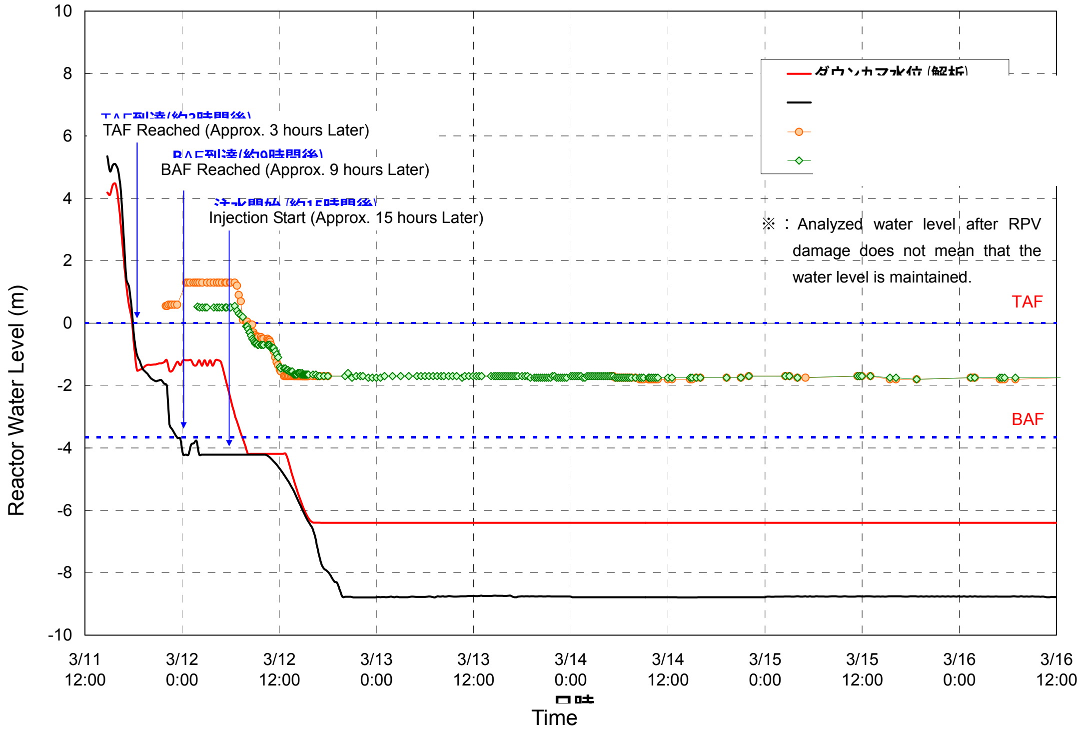


Figure3.1.10 Unit1 Reactor Water Level (IC Continued Operation Case)

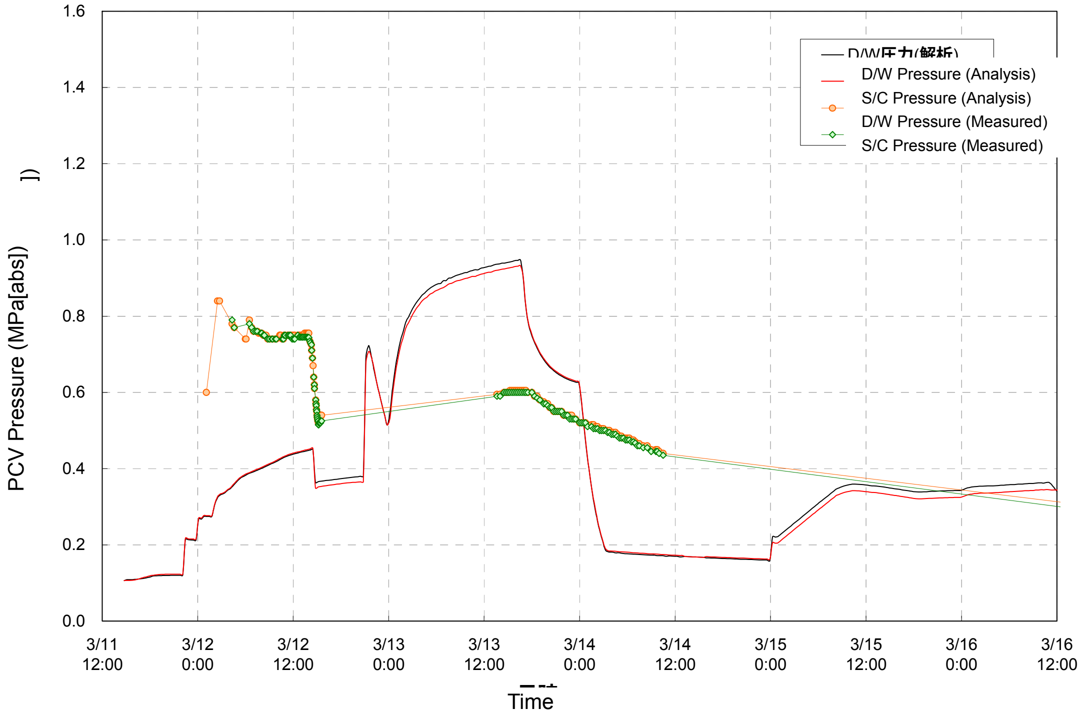


Figure3.1.11 Unit1 PCV Pressure（IC Continued Operation Case）

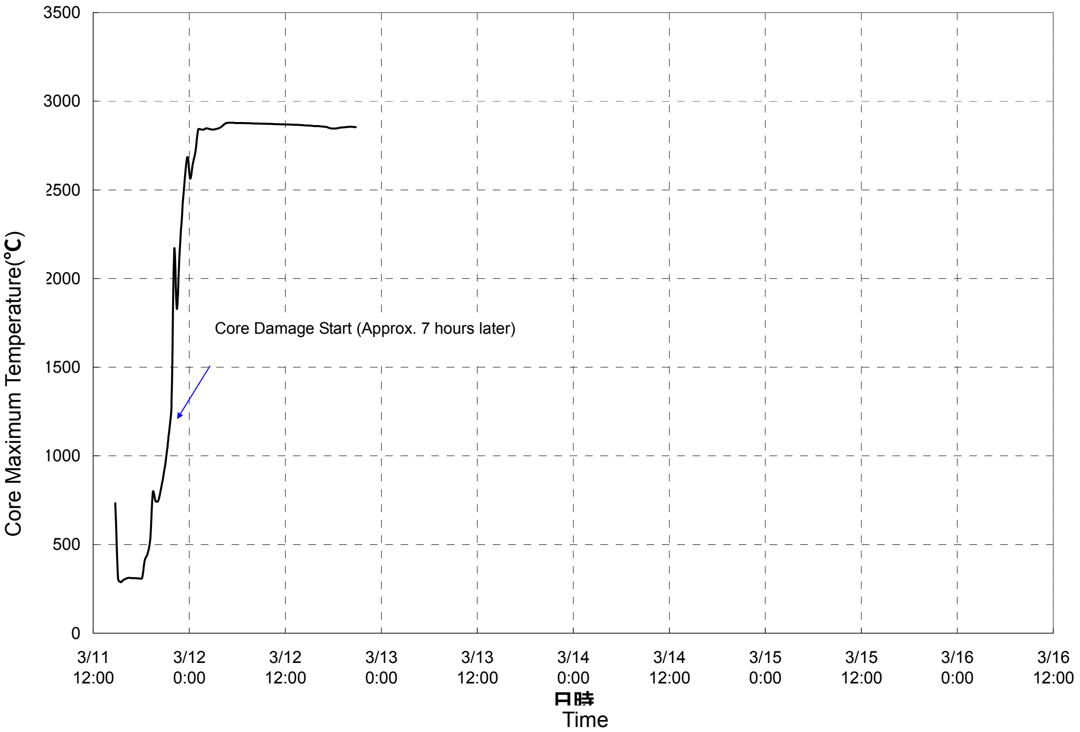


Figure3.1.12　Unit1　Core Temperature（IC Continued Operation Case）

## 3.2 Unit 2 of Fukushima Daiichi Nuclear Power Station

### 3.2.1 Analysis condition

Principal conditions of analysis regarding Unit 2 of Fukushima Daiichi Nuclear Power Station are shown in the Table 3.2.1 and 3.2.2.

We implemented the analysis in two cases below, and regarding a leak from primary containment vessel and IC, we implemented the analysis based on the assumptions below.

① Cases of analysis

【Case 1】In order to accommodate to the measured figure of reactor water level, we presumed less the amount possible to maintain the reactor water level, not using the flow volume of discharge side of the fire pump.

【Case 2】Based on the premise that it is impossible to maintain the reactor water level in the fuel range, we presumed the injection amount to maintain slightly below the level of the fuel range, not the flow volume of discharge side of the fire pump.

② Assumption of the gas phase leak from Primary containment vessel

In the analysis, we presumed that a leak (about **Φ**10 cm) from gas phase of Primary containment vessel (D/W) has occurred 21 hours after the earthquake occurred, in order to accommodate the figure to the actually measured pressure of Primary containment vessel to an extent. We also presumed a leak (about **Φ**10 cm) from gas phase of Primary containment vessel since an allophone occurred near the suppression chamber (hereinafter called “S/C”) on May 15th.

However, as it is just an assumption for analysis, it is unclear whether the leak from D/W occurred actually, or it is a mismatch of measured figure and analyzed figure caused by the problem of the gauge.

**Table 3.2.1 Plant Conditions**

| Items | Conditions |
|---|---|
| Initial reactor output | 2381 MWt (rated power output) |
| Initial reactor pressure | 7.03MPa[abs] (normal operation pressure) |
| Initial reactor water level | Normal level |
| Open space volume of primary containment vessel | D/W open space : 4240m$^3$<br>S/C open space : 3160m$^3$ |
| Suppression pool water volume | 2980m$^3$ |

## Table 3.2.2 Events

Explanatory notes ○：Records available △：Estimates based on records □：Assumption used on analysis

| Analysis Condition | | | | Classification | Notes | In case of ○：Referred part of the records<br>In case of △ or □：Estimated, presumed reasons etc. |
|---|---|---|---|---|---|---|
| No | Time and Date | | Analyzed Events | | | |
| 1 | March 11th | 2:46 pm | Earthquake occurred | ○ | － | |
| 2 | | 2:47 pm | Reactor scram occurred | ○ | Report on May 16th, 4. Operation daily, Handover diary of shift supervisor | |
| 3 | | 3:02 pm | RCIC activated manually | ○ | Report on May16th, 7. Operation records | |
| 4 | | 3:28 pm | RCIC tripped (L-8) | ○ | Same as above | |
| 5 | | 3:41 pm | Outage of all AC power occurred | ○ | Report on May 16th, 4. Operation daily, Handover diary of shift supervisor | |
| 6 | March 12th | 4:20 am - 5:00 am | Changed the water source of RCIC from condensate storage tank to suppression chamber | ○ | Report on May16th, 7. Operation records | |
| 7 | March 14th | 1:25 pm | RCIC stopped | ○ | Same as above | |
| 8 | | 4:34 pm | Started the operation of pressure reduction of Reactor Pressure Vessel (SRV1 valve open) | ○ | Same as above | |
| | | 4:34 pm | Started the injection of sea water through the fire protection system | ○ | Report on May16th, 7. Operation records ※1 | |
| 9 | | Around | Confirmed the decrease of the | ○ | Report on May16th, 7. Operation records | |

| | | | | | |
|---|---|---|---|---|---|
| | | 6:00 pm | reactor pressure | | |
| 10 | | 7:20 pm | The fire pump stopped resulted from fuel run-out | ○ | Report on May16th, 7. Operation records ※1 |
| 11 | | 7:54 pm | The fire pump activated | ○ | Report on May16th, 7. Operation records ※1 ※2 |
| | | 7:57 pm | The second fire pump activated | ○ | Report on May16th, 7. Operation records ※1 |
| 12 | | 9:20 pm | By opening SRV2 valve, reactor pressure decreased and water level recovered | ○ | Same as above |
| 13 | | Around 11:00 pm | It is presumed that the SRV1 valve was closed | □ | As reactor pressure increased at around 11:00pm, it is presumed that the SRV1 valve was closed at this time. |
| 14 | March 15th | Around 6:14 am | An allophone has occurred near the suppression chamber, and the pressure inside decreased | ○ | From the press release of Tokyo Electric Power Company (http://www.tepco.co.jp/index-j.html) |

※1 There is a possibility that the certain amount of sea water was injected since 4:34pm, March 14th based on the record of 7:20pm, March 14th which describes “The fire pump has stopped”, however, we presumed 7:54pm, March14th as the time which started the injection, as the water level has rose since then.

※2 We set up the injection amount of water and the time we changed the amount based on the daily injection amount described in 7.Operation records of the report on March 16th, in order not to exceed the daily average injection amount and total injection amount.

### 3.2.2.1 Analysis Result (Analysis Case 1)

Table 3.2.3 shows the result of analysis based on the condition shown in 3.2.1. And from Fig. 3.2.1.1 to Fig 3.2.1.10 show the result of analysis about the trend of reactor water level etc.

**Table 3.2.3 Summary of Analysis Result on Unit 2**

| Item | Analysis Result |
|---|---|
| Start of reactor core exposure | Approx. 75 hours after earthquake |
| Start of reactor core damages | Approx. 77 hours after earthquake |
| Start of reactor pressure vessel damages | (reactor pressure vessel damage did not occur in this analysis) |

The details of analysis result are as follows.

The reactor water level gradually comes down after RCIC stop and the reactor core starts exposed, and the reactor core exposed perfectly by opening SRV and the reactor core damage starts (see Fig.3.2.1.1). Although the water injection starts approximately at the same time, but in this analysis, because the water injection flow is assumed that it is commensurate with the reactor water level indicated by measurement equipment, so that the water injection flow is not enough and the water level is remained around a half level of the reactor core range. Therefore, the reactor core is damaged.

The reactor pressure is kept high around the pressure of SRV action until RCIC stops. By SRV open after RCIC stop the reactor pressure decreases rapidly, after that go down to around atmosphere pressure.

During the action of RCIC, the measured value of the reactor pressure is lower than analyzed value, it means it is an possibility that the leak path was formed through SRV to S/C, but currently it is not sure whether there is an actual path or it is only a problem of measuring equipment. The behavior of analyzed value and measured value is almost consistent after SRV open (see Fig.3.2.1.2).

The pressure of Primary containment vessel increases with the increase of suppression pool water temperature, but because the leak from the Primary containment vessel (D/W) is assumed, the increase from earthquake occurrence becomes slow which is same as measured value. After that, temporary increase of pressure occurs by SRV open on Mar. 14, and then at the measured value, the pressure changes decrease. Also regarding the analysis, the analysis was implemented on the condition that the timing of the irregular sound noticed near S/C on Mar. 15 is set as a boundary; it means a leak is occurred at the vapor phase part of S/C at this moment (see Fig. 3.2.1.3).

Regarding the assumption of leak from the Primary containment vessel, considering that the vessel temperature is already exceed designed temperature at the timing of assumption, the increase of leak from the vessel which is caused by the influence of over-temperature could be assumed as one of the reason (see Fig.3.2.1.5). In case there is no assumption of leak for the vessel, the vessel pressure should reach 2Pd (twice of designed pressure) in relatively early (see Fig. 3.2.1.10). And after the moment of irregular sound noticed near S/C the pressure decrease rapidly, also the leak is assumed in the analysis, however currently it is not sure whether there is an actual leak on the vessel or it is only a problem of measuring equipment.

Regarding reactor core temperature trend, after RCIC stop, the temperature increase with the decrease of reactor water level, the pellet starts melting (see Fig.3.2.1.4).

A big amount of hydrogen is produced when the reactor core is exposed and the temperature of clad start increasing. After 1 week of earthquake occurrence, the amount equal to the reaction of 79% of active clad is produced (see Fig.3.2.1.6).

Regarding the discharge of FP, after reactor core damage, the noble gas is discharged from the reactor pressure vessel to S/C, and according to the assumption of leak for this analysis, the result is that almost full amount of noble gas is discharged. For cesium iodide, the discharge rate is about 1% and almost exist in S/C, However, the discharge out of the Primary containment vessel is by the assumption of leak from the vessel, so it is possible that the result is different from actual situation (see Fig.3.2.1.7 and Fig.3.2.1.8).

The result says that, about the reactor core of Unit 2, there partially exists a melted pool, but it remains in fuel range and does not lead to the reactor pressure vessel damage. The reason is that, the water injection by RCIC in the early stage was implemented constantly, and the period after RCIC stop until start water injection is shorter than Unit 1 (see Fig.3.2.1.9).

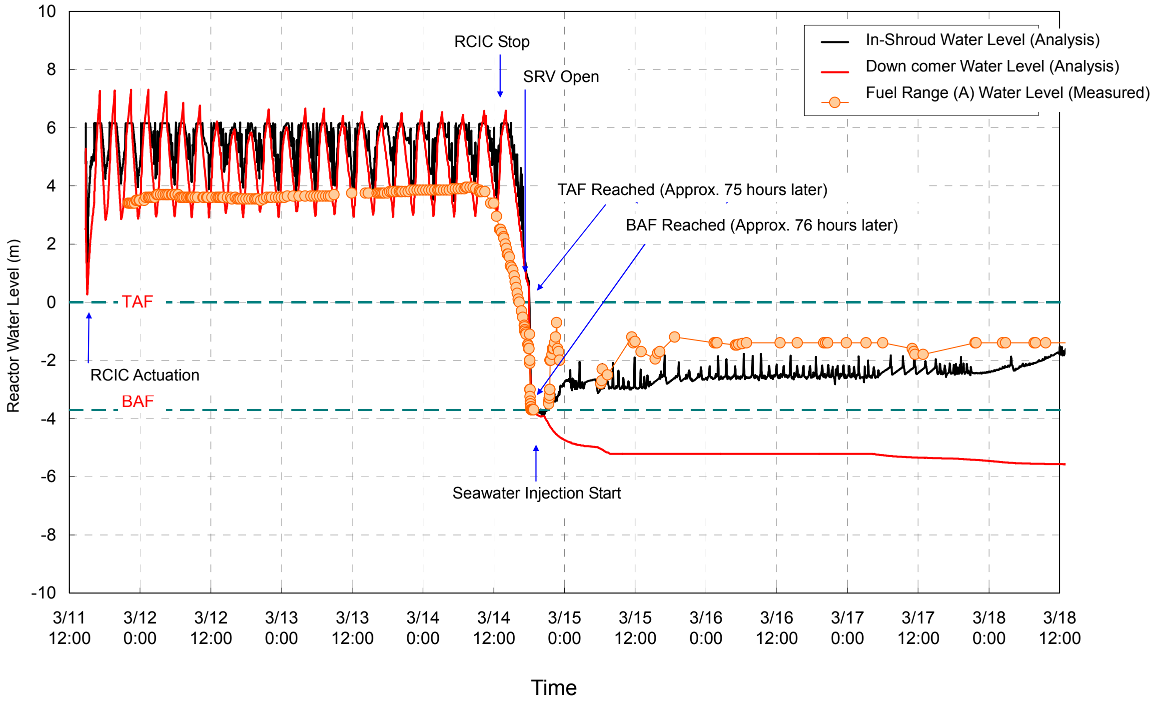


Figure3.2.1.1 Unit2 Reactor Water Level[Case1]

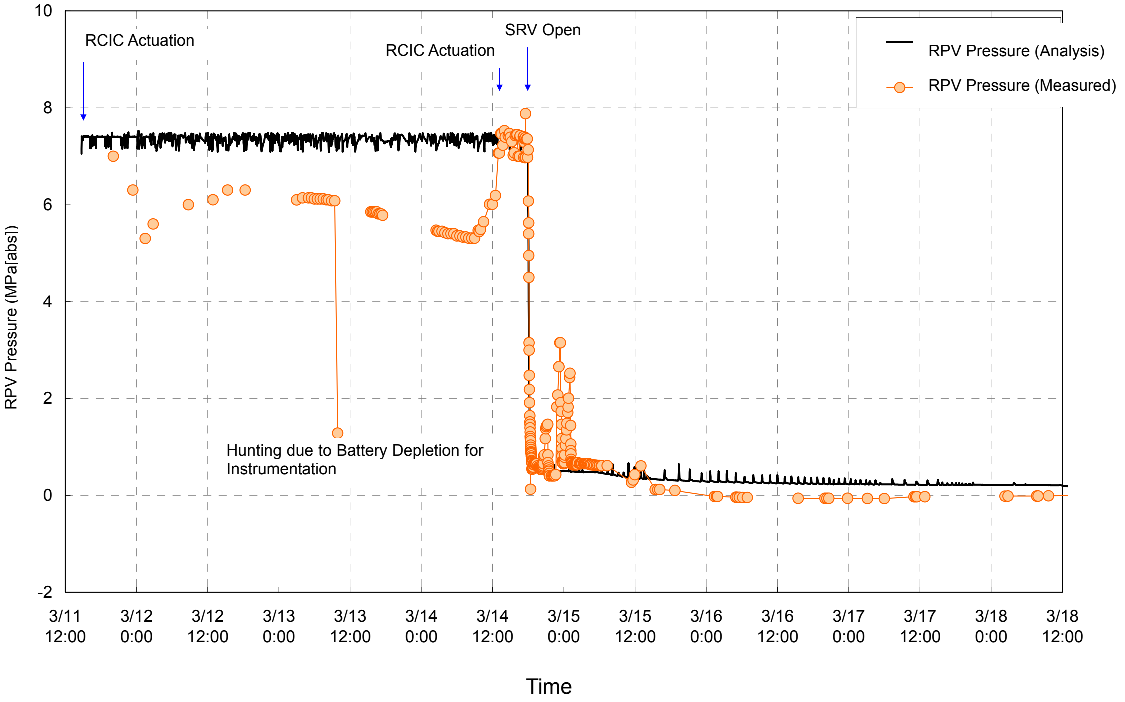


Figure3.2.1.2 Unit2 RPV Pressure[Case1]

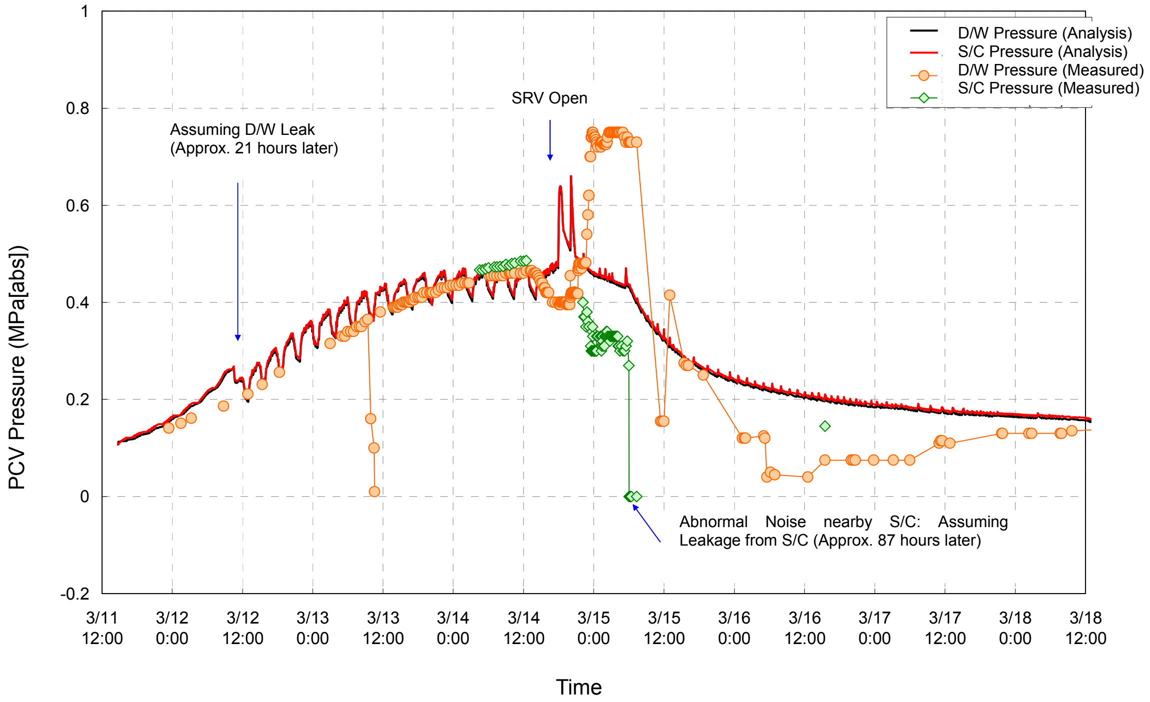


Figure3.2.1.3　　Unit2 PCV Pressure[Case1]

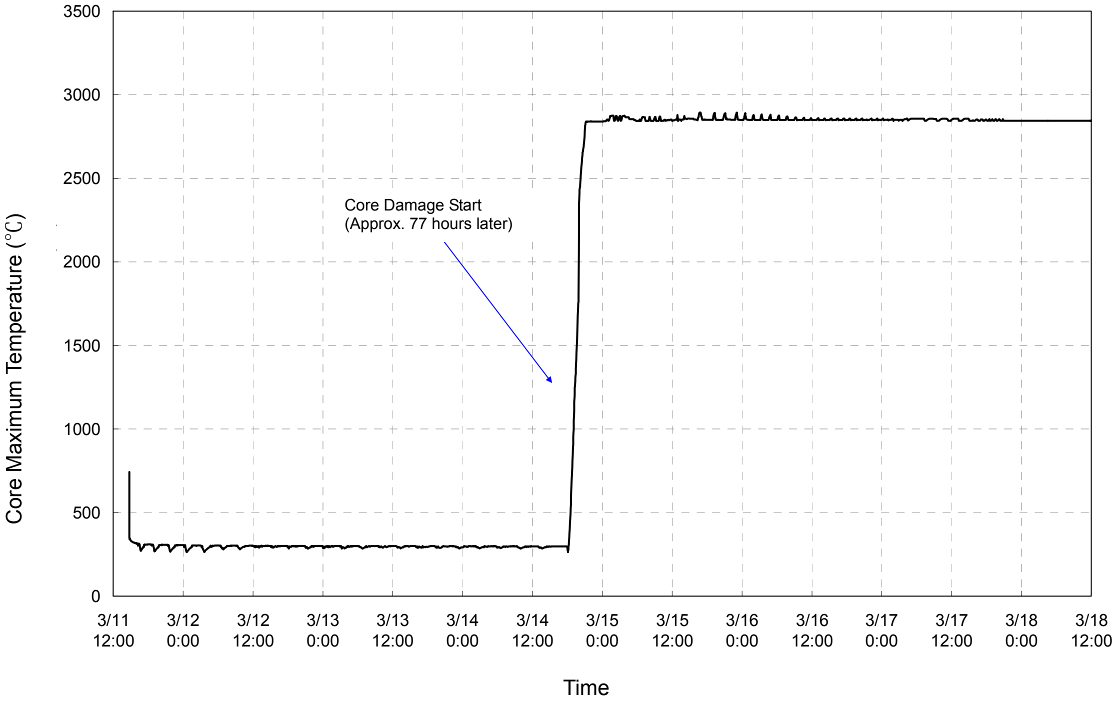


Figure3.2.1.4　　Unit2 Core Temperature[Case1]

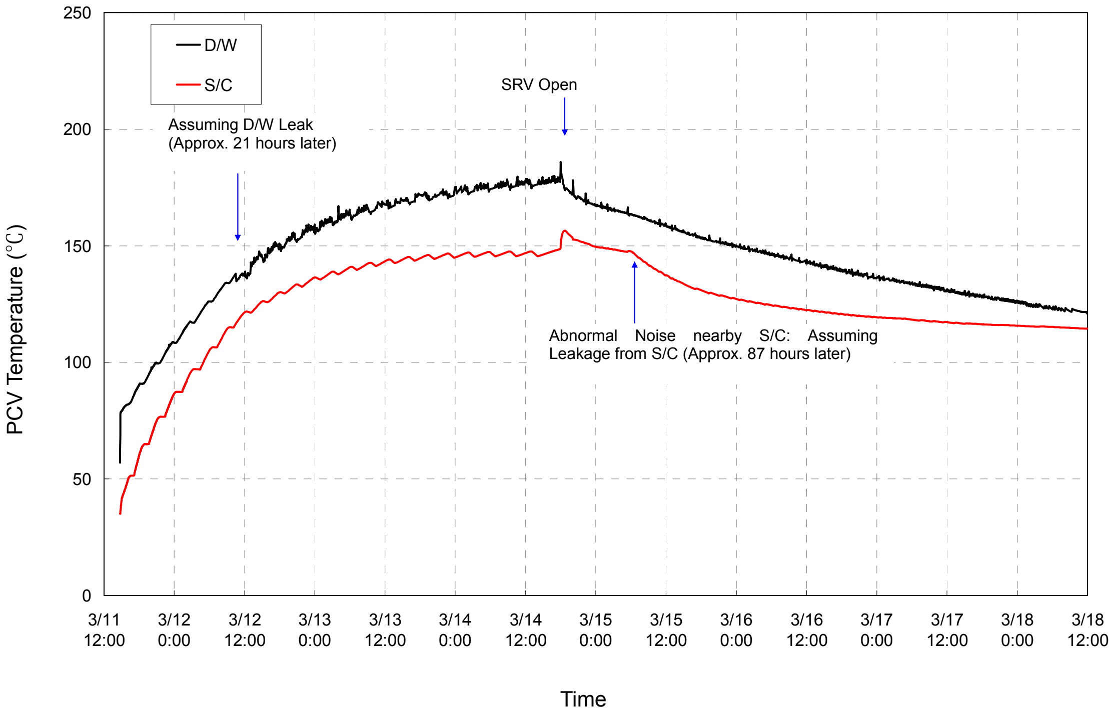


Figure3.2.1.5 Unit2 PCV Temperature[Case1]

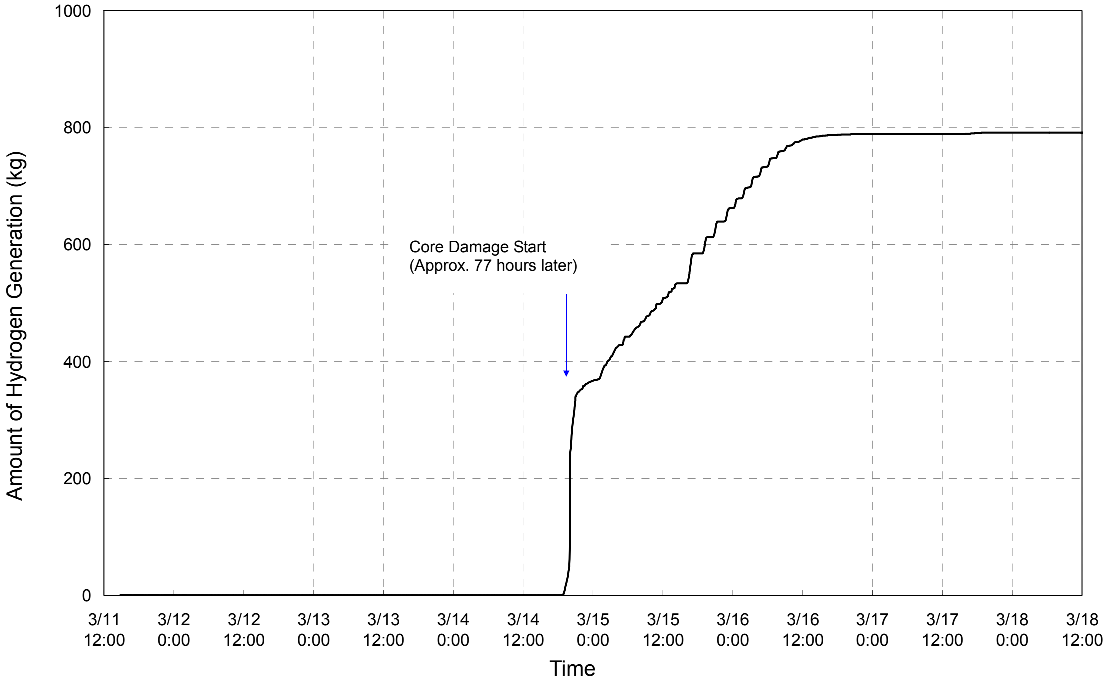


Figure3.2.1.6 Unit2 Amount of Hydrogen Generation[Case1]

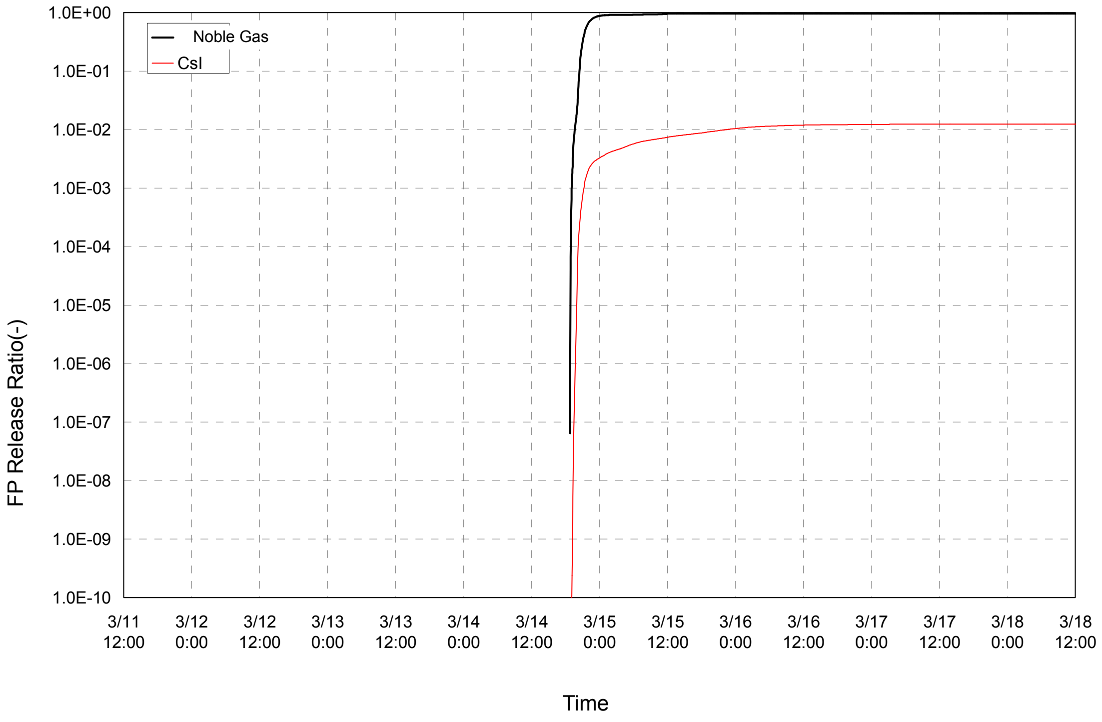


Figure3.2.1.7 Unit2 FP Release Ratio[Case1]

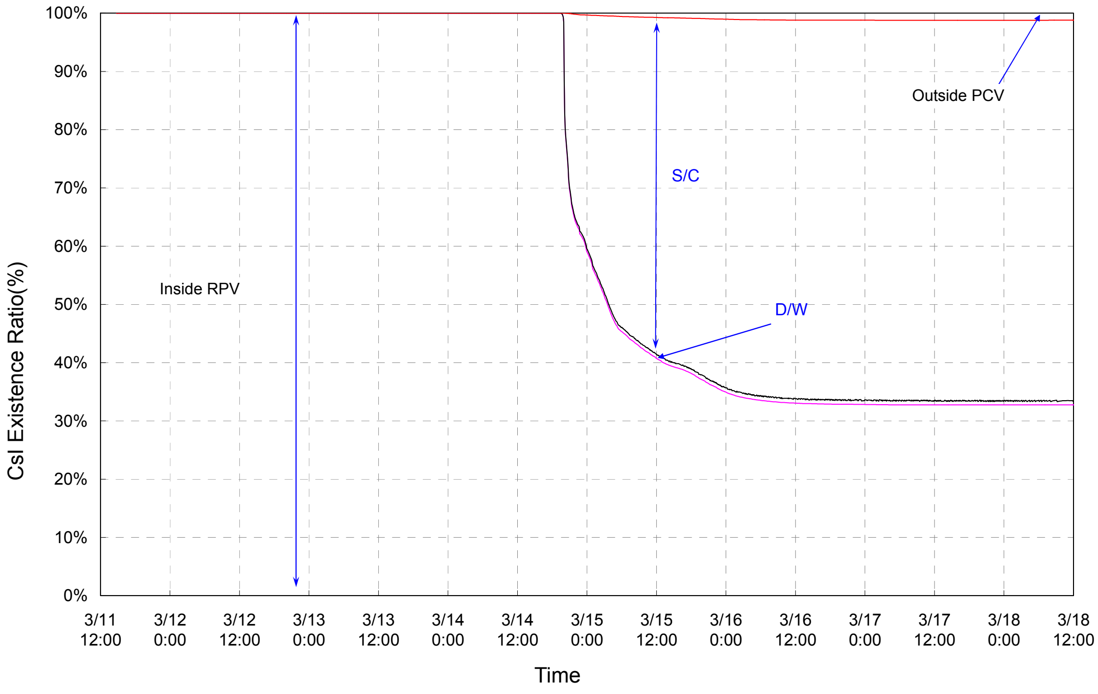


Figure3.2.1.8 Unit2 FP Existence Ratio(1/2)[Case1]

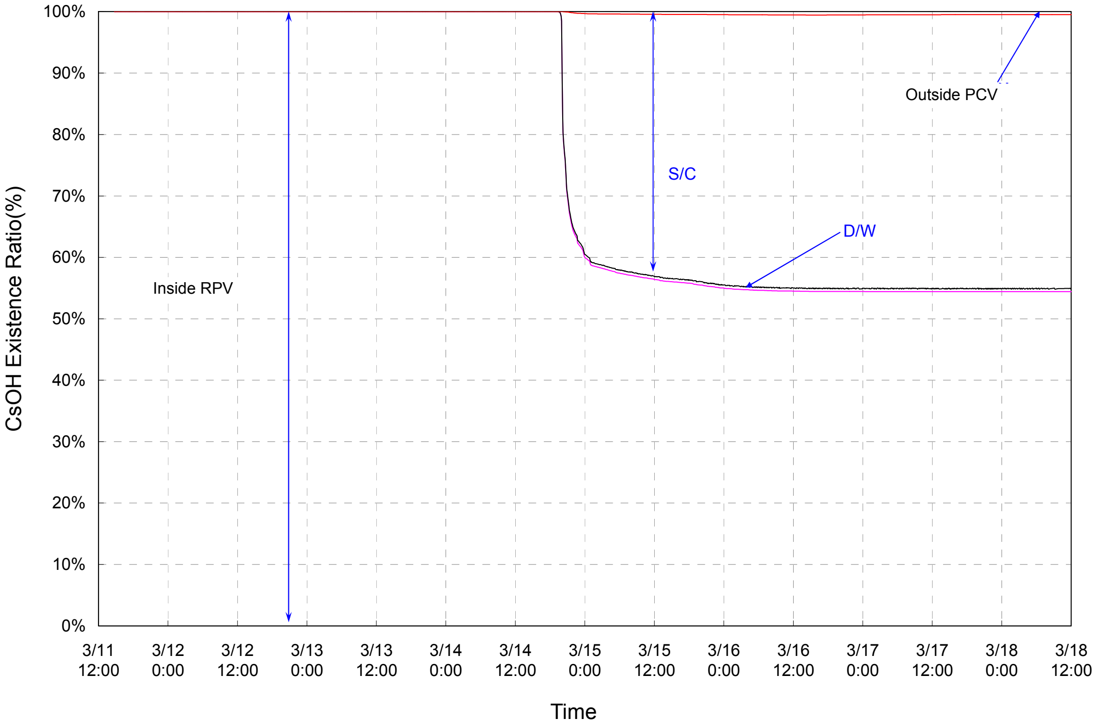
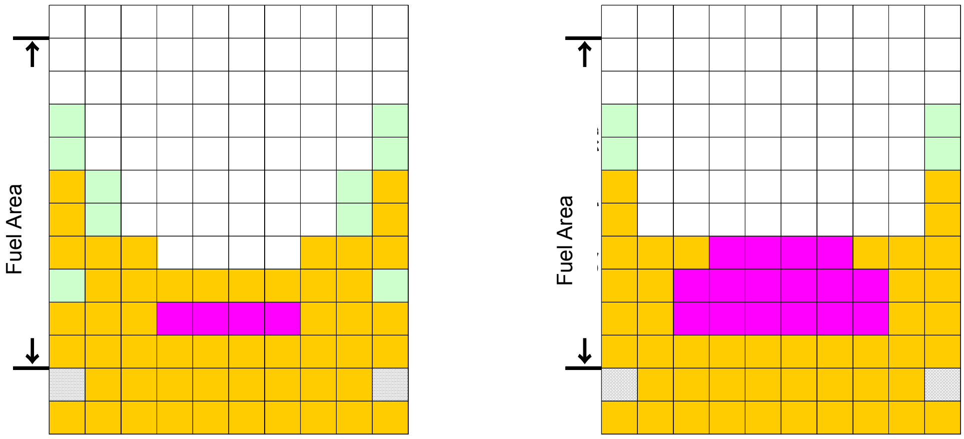


Figure3.2.1.8　Unit2 FP Existence Ratio(2/2)[Case1]



Approx. 87 hours after SCRAM

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Approx. 96 hours after SCRAM

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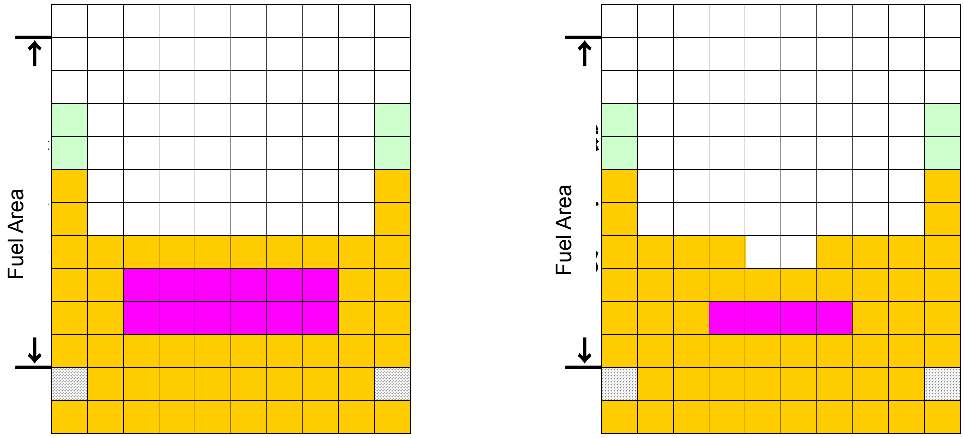

Approx. 120 hours after SCRAM

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Approx. 1 week after SCRAM

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| ⬜ | ⬜ | ⬜ | ⬜ | ⬜ | ⬜ | ⬜ | ⬜ | ⬜ | ⬜ |
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Model of Fuel Damage
⬜：No Fuel（Slumped）
▨：Normal Fuel
🟩：Accumulation of Slumped Fuel
🟨：Accumulation of Melted Fuel

🟧：Flow Channel Blockage with Melted Fuel
🟪：Molten Core Pool

Figure3.2.1.9 Unit2 Core Status[Case1]

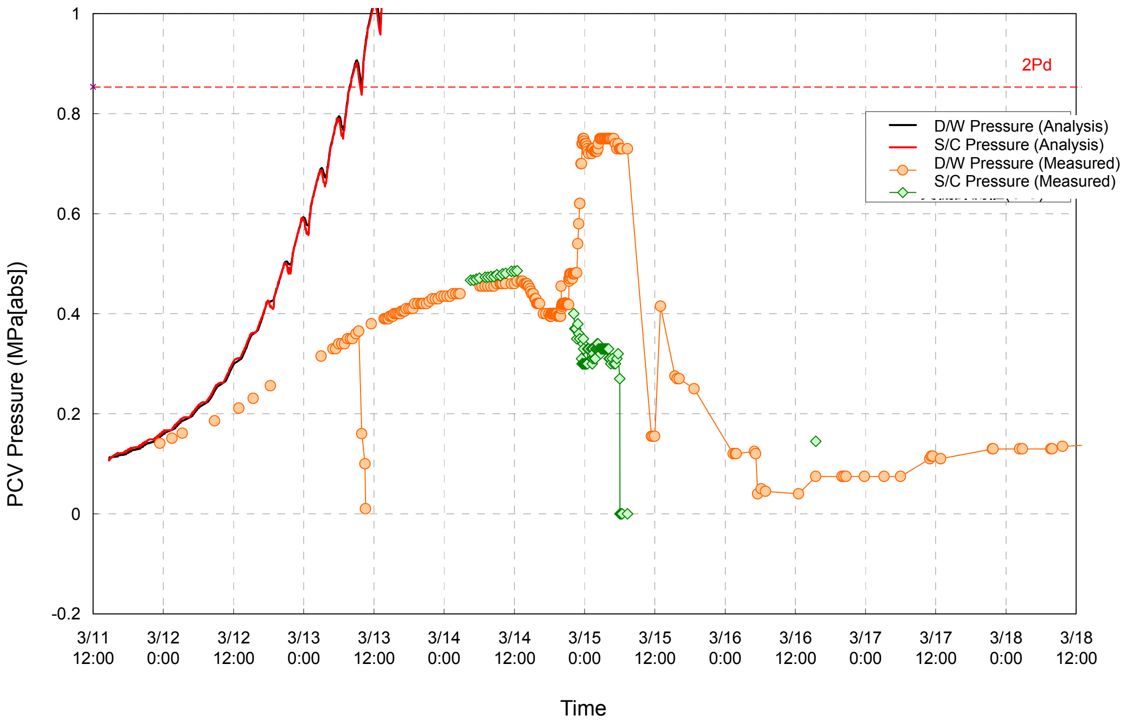


Figure3.2.1.10　 Unit2 PCV Pressure[Case1]（Without Assuming Leak due to Superheat）

#### 3.2.2.2 Analysis Result (Analysis Case 2)

Table 3.2.4 shows the result of analysis based on the condition shown in 3.2.1. And from Fig. 3.2.2.1 to Fig 3.2.2.9 show the result of analysis about the trend of reactor water level etc.

**Table 3.2.4 Summary of Analysis Result on Unit 2**

| Item | Analysis Result |
|---|---|
| Start of reactor core exposure | Approx. 75 hours after earthquake |
| Start of reactor core damages | Approx. 77 hours after earthquake |
| Start of reactor pressure vessel damages | Approx. 109 hours after earthquake |

The detail of analysis result is as follows.

The reactor water level gradually comes down after RCIC stop and the reactor core starts exposed, and the reactor core exposed perfectly by opening SRV and the reactor core damage starts. Although the water injection starts approximately at the same time, the assumed water injection flow is not enough so that the water level does not increase over the bottom of active fuel (see Fig.3.2.2.1).

Regarding the reactor pressure, there is a temporary increase by the steam produced by the movement of reactor core to the lower plenum, but other behavior is almost same as the result of Case 1 (see Fig.3.2.2.2).

Regarding the pressure of Primary containment vessel, it is similar to the reactor pressure, there is a temporary increase by the steam produced by the movement of reactor core to the lower plenum, but other behavior is almost same as the result of Case 1 (see Fig.3.2.2.3).

Regarding reactor core temperature trend, the temperature increase with the decrease of reactor water level, the pellet starts melting (see Fig.3.2.2.4).

A big amount of hydrogen is produced when the reactor core is exposed and the temperature of clad start increasing, the amount equal to the reaction of 36% of active clad is produced (see Fig.3.2.2.6).

Regarding the discharge of FP, for the noble gas, the result is that almost full amount is discharged by the leak from S/C, which is similar to Case 1. For other materials such as cesium iodide, the discharge rate is under 1% (see Fig.3.2.2.7 and Fig.3.2.2.8).

The result says that, parts of the fuel remain in the reactor pressure vessel, but the reactor pressure vessel is damaged. As the water injection flow in the early stage is assumed smaller than Case 1, then the result says the damage of reactor core is more serious (see Fig.3.2.2.9).

### 3.2.3 Evaluation Result

In Analysis Case 1, we have had an analysis result that the reactor core of Unit 2 stays within the fuel range, though a partial fuel-melting pool exists, and the reactor pressure vessel will not be damaged. In Analysis Case 2, we have had an analysis result that the reactor vessel has been damaged, though part of fuel stays within it.

In addition, as a result of calibration of water-level gauge of Unit 1, we have found that the water level in reactor pressure vessel is not within fuel ranges. We cannot deny the possibility that a similar event has occurred in Unit 2.

We think that most of fuel is cooled down in the reactor pressure vessel, because, according to plant parameters, the temperatures at the bottom of the reactor pressure vessel currently change around between approximately 100 degrees Celsius and approximately 120 degrees Celsius and correlate changes in amount of water spray in multiple measuring points and temperature of the upper reactor pressure vessel is higher and its heat source is estimated to come from the inside of reactor pressure vessel.

Hence, according to the analysis and plant parameters, we think that reactor cores have been significantly damaged, but moved below or dropped to the lower plenums from fixed positions of fuel loading and most of them can be stably cooled down around there.

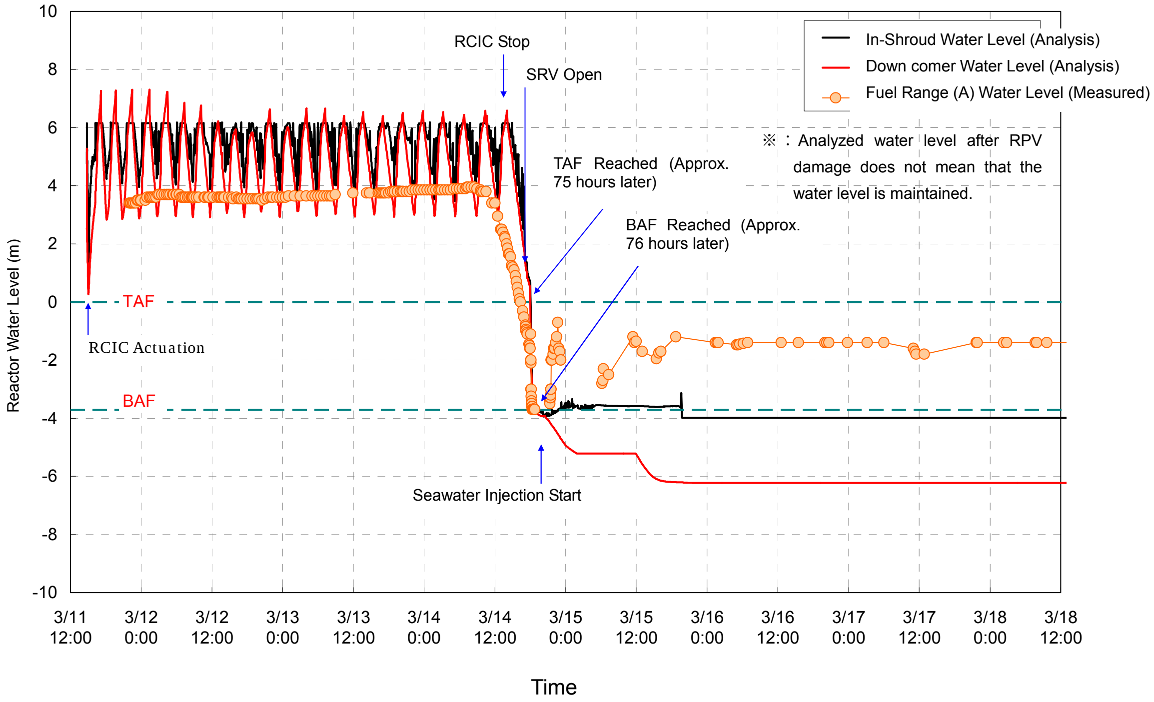


Figure3.2.2.1 Unit2 Reactor Water Level[Case2]

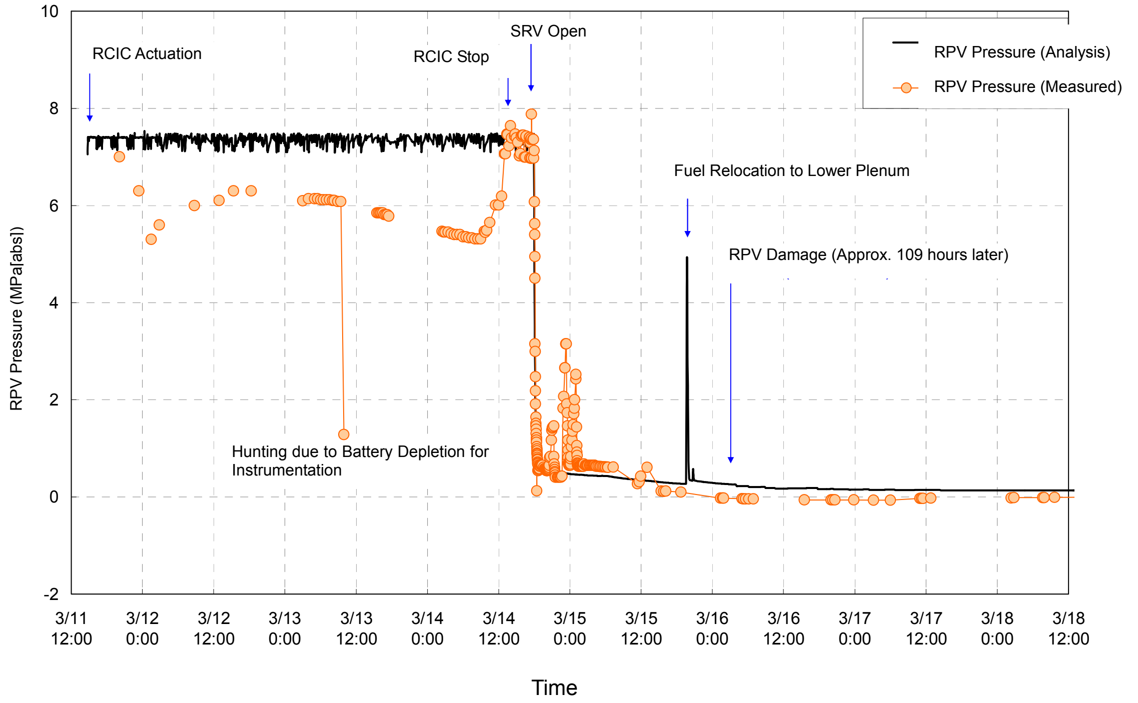


Figure3.2.2.2 Unit2 RPV Pressure[Case2]

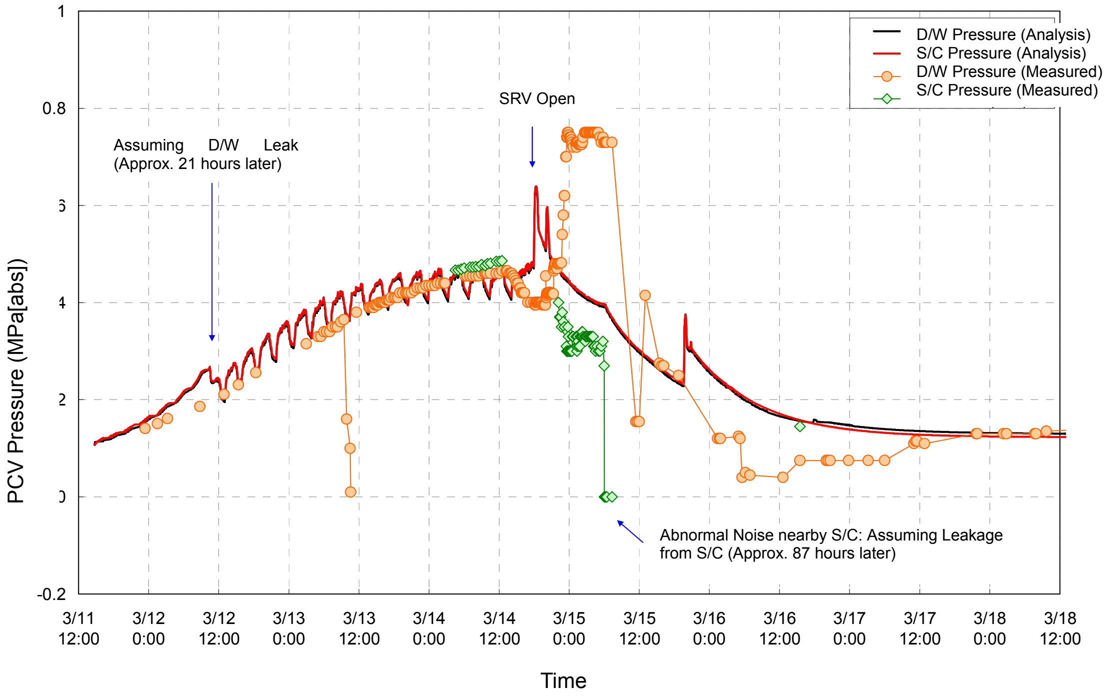


Figure3.2.2.3 Unit2 PCV Pressure[Case2]

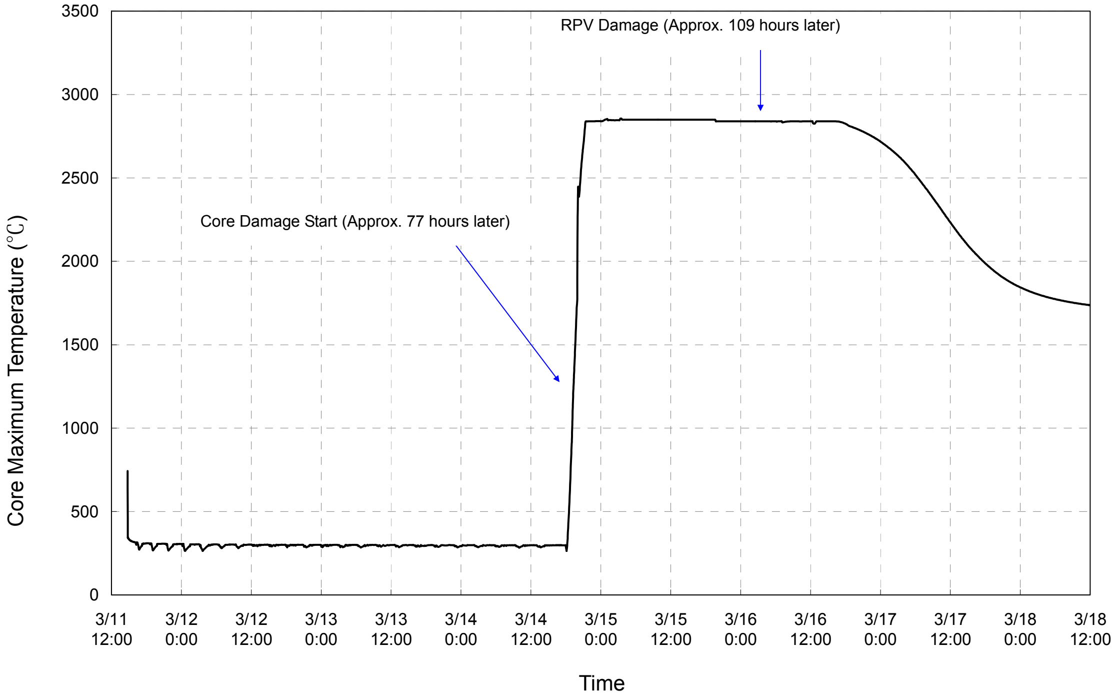


Figure3.2.2.4 Unit2 Core Temperature[Case2]

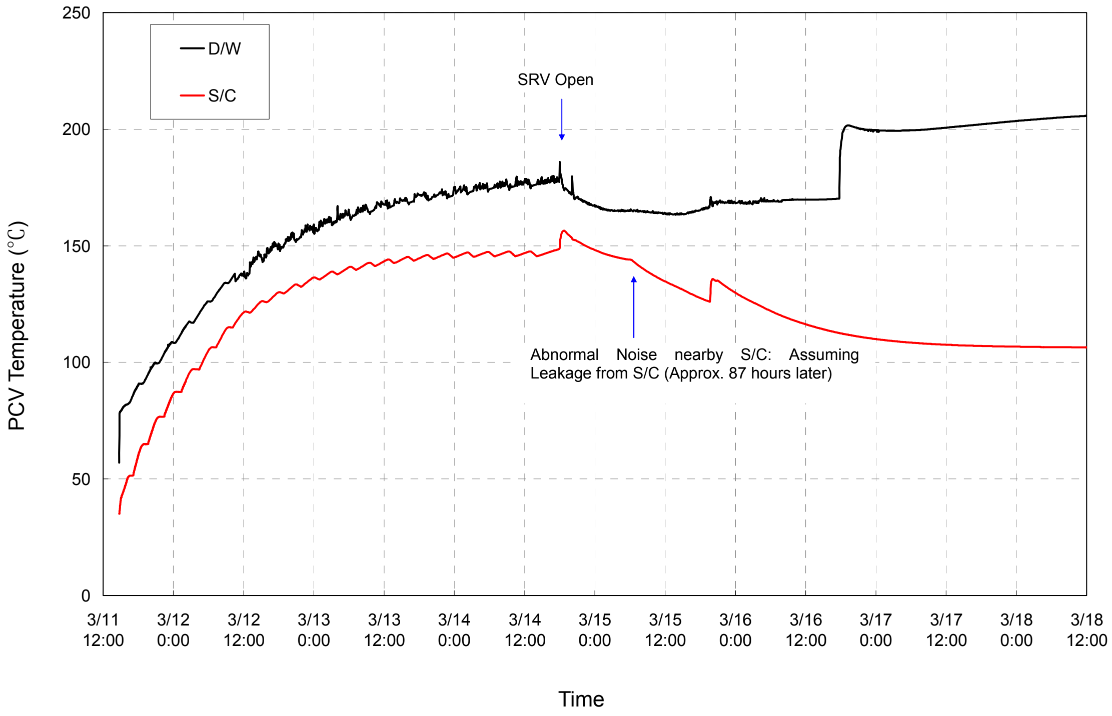


Figure3.2.2.5 Unit2 PCV Temperature[Case2]

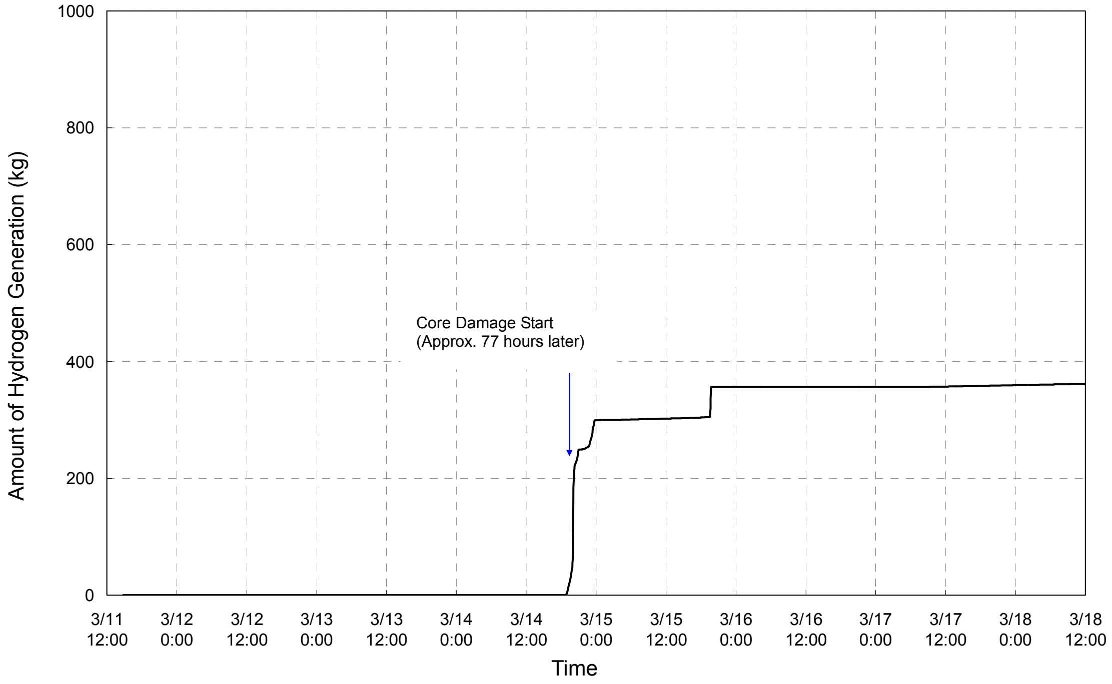


Figure3.2.2.6 Unit2 Amount of Hydrogen Generation[Case2]

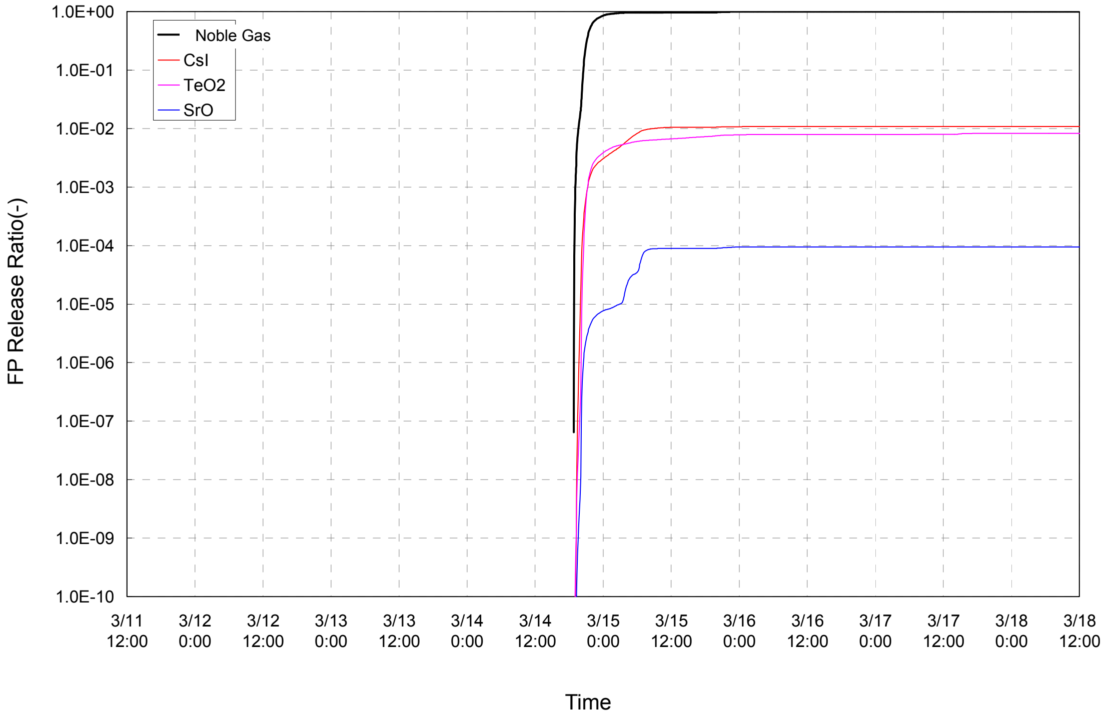


Figure3.2.2.7 Unit2 FP Release Ratio(1/3)[Case2]

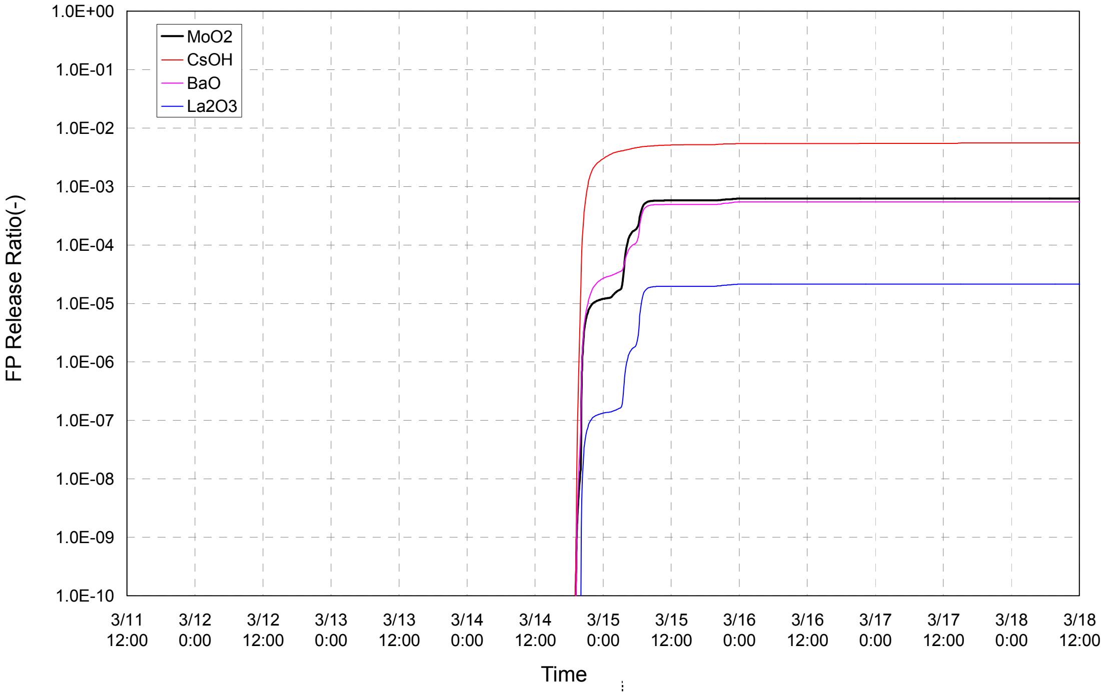


Figure3.2.2.7 Unit2 FP Release Ratio(2/3)[Case2]

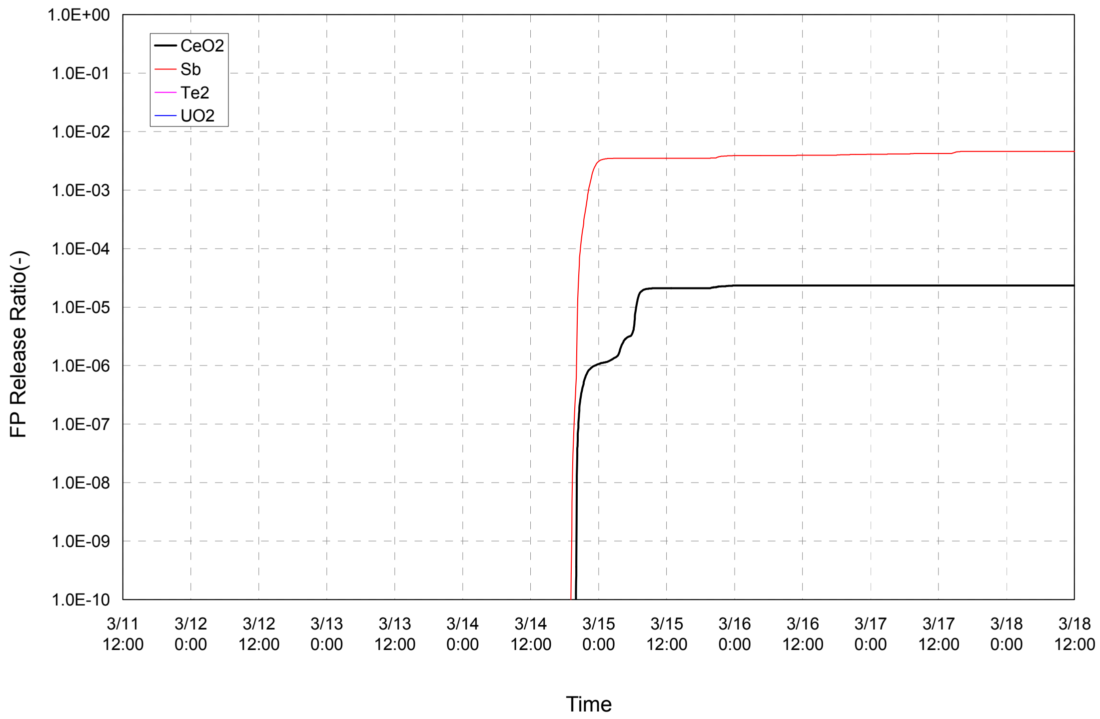


Figure3.2.2.7　Unit2 FP Release Ratio(3/3)[Case2]

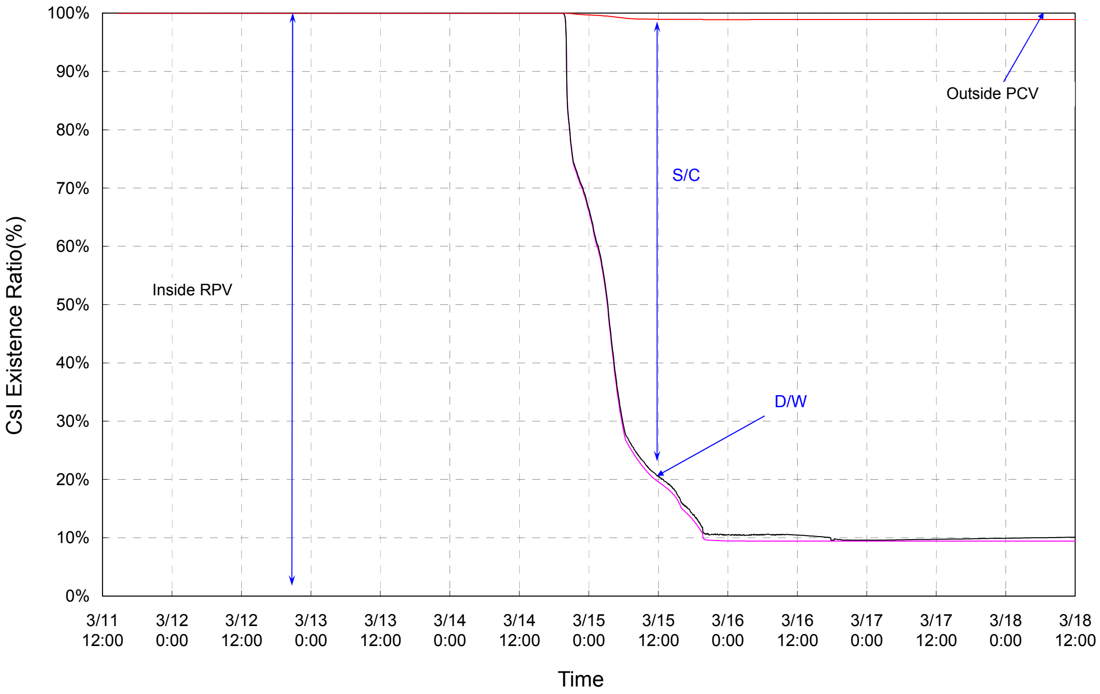


Figure3.2.2.8　Unit2 FP Existence Ratio(1/2)[Case2]

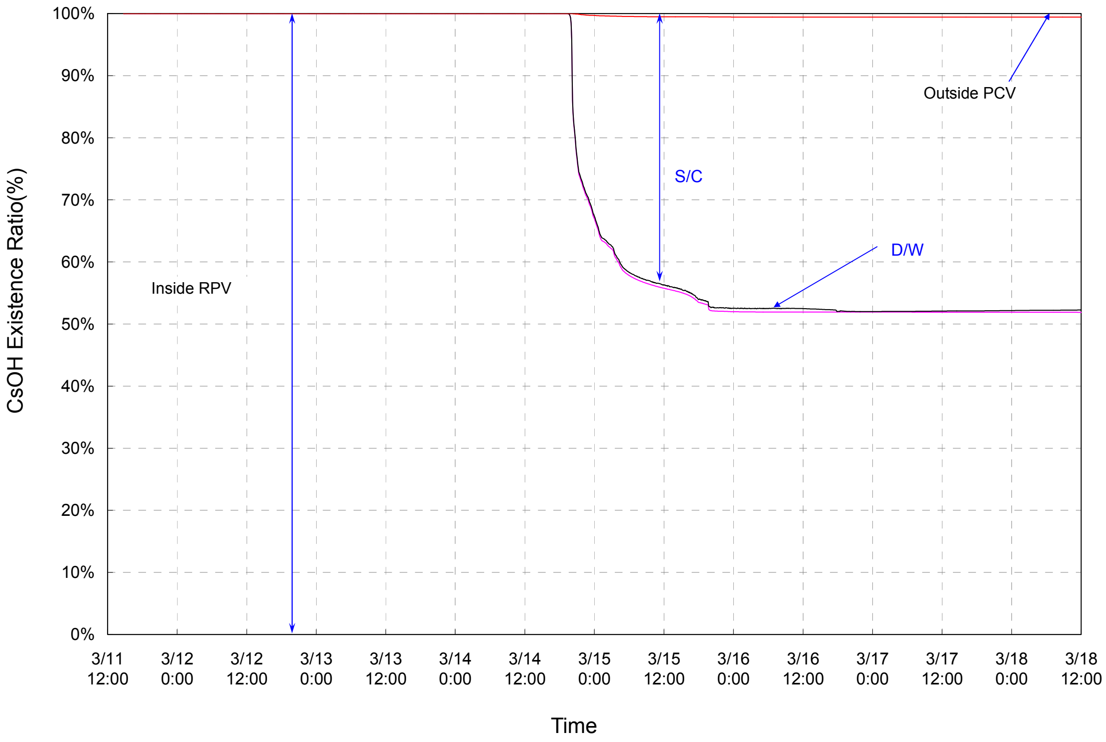
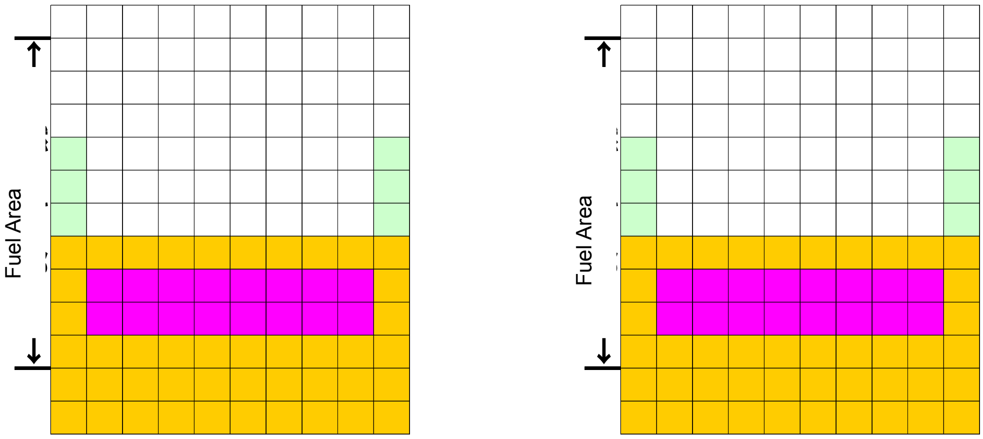
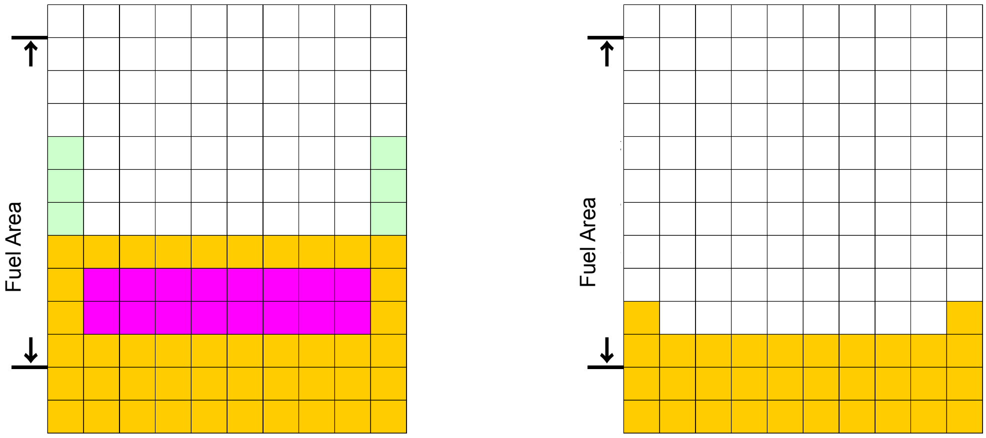


Figure3.2.2.8　Unit2 FP Existence Ratio(2/2)[Case2]



Approx. 87 hours after SCRAM　　Approx. 96 hours after SCRAM



Approx. 100 hours after SCRAM　　Approx. 109 hours after SCRAM

Model of Fuel Damage
- ☐：No Fuel（Slumped）
- ▨：Normal Fuel
- 🟩：Accumulation of Slumped Fuel
- 🟨：Accumulation of Melted Fuel
- 🟧：Flow Channel Blockage with Melted Fuel
- 🟪：Molten Core Pool

Figure3.2.2.9　Unit2 Core Status[Case2]

## 3.3 Unit 3 of Fukushima Daiichi Nuclear Power Station

### 3.3.1 Analysis condition

Principal conditions of analysis regarding Unit 3 of Fukushima Daiichi Nuclear Power Station are shown in the Table 3.3.1 and 3.3.2.

We implemented the analysis in two cases below.

① Cases of analysis

【Case 1】In order to accommodate to the measured figure of reactor water level, we presumed less the amount possible to maintain the reactor water level, not using the flow volume of discharge side of the fire pump.

【Case 2】Based on the premise that it is impossible to maintain the reactor water level in the fuel range, we presumed the injection amount to maintain slightly below the level of the fuel range, not the flow volume of discharge side of the fire pump.

**Table 3.3.1 Plant Conditions**

| Items | Conditions |
|---|---|
| Initial reactor output | 2381 MWt (rated power output) |
| Initial reactor pressure | 7.03MPa[abs] (normal operation pressure) |
| Initial reactor water level | Normal level |
| Open space volume of primary containment vessel | D/W open space : 4240m$^3$<br>S/C open space : 3160m$^3$ |
| Suppression pool water volume | 2980m$^3$ |

### Chart 3.3.2 Events

Explanatory notes ○：Records available △：Estimates based on records □：Assumption used on analysis

| Analysis Condition | | | | Classification | Notes | In case of ○：Referred part of the records<br>In case of △ or □：Estimated, presumed reasons etc. |
|---|---|---|---|---|---|---|
| No | Time and Date | | Analyzed Events | | | |
| 1 | March 11 | 2:46 pm | Earthquake occurred | ○ | ー | |
| 2 | | 2:47 pm | Reactor scram occurred | ○ | Report on May 16, 4. Operation daily, Handover diary of shift supervisor | |
| 3 | | 3:06 pm | RCIC activated manually | ○ | Report on May 16, 7. Operation records | |
| 4 | | 3:25 pm | RCIC tripped (L-8) | ○ | Same as above | |
| 5 | | 3:38 pm | Outage of all AC power occurred | ○ | Report on May 16, 4. Operation daily, Handover diary of shift supervisor | |
| 6 | | 4:03 pm | RCIC activated manually | ○ | Report on May 16, 7. Operation records | |
| 7 | March 12 | 11:36 am | RCIC tripped | ○ | Same as above | |
| 8 | | 0:35 pm | HPCI activated (L-2) | ○ | Same as above | |
| 9 | March 13 | 2:42 am | HPCI stopped | ○ | Same as above | |
| 10 | | Around 9:08 am | Started the pressure decrease of reactor pressure vessel by operating the safety relief valve | ○ | Same as above | |
| 11 | | 9:20 am | Regarding the primary containment vessel vent, pressure decrease was confirmed | ○ | The vent line constitution is completed by the operation of AO valve in the 7.Operation records in the report on May 16, however, we presumed the 9:20am as the start of the vent, since we confirmed the pressure decrease of primary containment vessel at this time. | |
| 12 | | 9:25 am | Started the injection of fresh water | ○ | Report on May 16, 7. Operation records ※1 | |
| 13 | | 11:17 am | Regarding the primary containment vessel vent, a closure of AO valve of vent line caused by the slip out of driving air pressure was confirmed | ○ | Report on May 16, 7. Operation records | |
| 14 | | 0:30 pm | Regarding the primary containment vessel vent, opening operation was | ○ | Same as above | |

| | | | | | |
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| | | | implemented | | |
| 15 | | 1:12 pm | Injection of water was changed from fresh water to sea water | ○ | Report on May 16, 7. Operation records ※1 |
| 16 | | 2:10 pm | Regarding the primary containment vessel vent, it is presumed that the vent valve is closed | △ | We presume the termination of the vent which started 0:30pm, March 13th at this time based on the increase of D/W pressure. It is described in the 7.Operation records in the report on May 16 that the closure of the valve is confirmed at 4:00pm, May 15. |
| 17 | March 14 | 1:10 am | Injection of water was halted in order to supply water to water source pit | ○ | Report on May16, 7. Operation records |
| 18 | | 3:20 am | The supply to the water source pit was finished and the injection of water restarted | ○ | Report on May16, 7. Operation records ※1 |
| 19 | | 5:20 am | Regarding the primary containment vessel vent, AO valve of suppression chamber side was opened. | ○ | Report on May16, 7. Operation records |
| 20 | | 0:00 pm | Regarding the primary containment vessel vent, it is presumed that the valve of suppression chamber side was closed. | △ | We presume the termination of the vent which started 5:30am, March 14 at this time based on the increase of D/W pressure. It is described in the 7.Operation records in the report on May 16 that the closure of the valve is confirmed at 4:00pm, May 15. |
| 21 | | 4:00 pm | Regarding the primary containment vessel vent, it is presumed that the valve of suppression chamber side was opened. | △ | We presume the vent at this time based on the decrease of D/W pressure. |
| 22 | | 9:04 pm | Regarding the primary containment vessel vent, it is presumed that the valve of suppression chamber side was closed. | △ | We presume the termination of the vent at this time based on the increase of D/W pressure. |
| 23 | March 15 | 4:05 pm | Regarding the primary containment vessel vent, the valve of suppression chamber side was opened. | ○ | Report on May16th, 7. Operation records |

| | | | | | |
|---|---|---|---|---|---|
| 24 | March 16 | 1:55 am | Regarding the primary containment vessel vent, the valve of suppression chamber side was opened. | △ | It is described in the 7.Operation records in the report on May 16 that the vent was implemented at this time, however, we presume that the vent was not implemented as the D/W pressure did not fluctuate. |
| 25 | March 17 | 9:00 pm | Regarding the primary containment vessel vent, closure of the valve of suppression chamber side was confirmed. | △ | It is described in the 7.Operation records in the report on May 16 that the closure of the valve was confirmed following the opening of the vent at 4:05pm March 15, however, we presume that the valve was not closed based on the transition of the D/W pressure. |
| 26 | | 9:30 pm | Regarding the primary containment vessel vent, the valve of suppression chamber side was opened. | △ | It is described in the 7.Operation records in the report on May 16 that the valve was opened, however, we presume that the valve was not opened based on the transition of the D/W pressure. |
| 27 | March 18 | 5:30 am | Regarding the primary containment vessel vent, closure of the valve of suppression chamber side was confirmed. | − | Though it is described in the report on May 16, it is out of the period for the analysis. |
| 28 | | Around 5:30 am | Regarding the primary containment vessel vent, the valve of suppression chamber side was opened. | − | Same as above |
| 29 | March 19 | 11:30 am | Regarding the primary containment vessel vent, closure of the valve of suppression chamber side was confirmed. | − | Same as above |
| 30 | March 20 | Around 11:25 am | Regarding the primary containment vessel vent, the valve of suppression chamber side was opened. | − | Same as above |

### 3.3.2.1 Analysis Result (Analysis Case 1)

Table 3.3.3 shows the result of analysis based on the condition shown in 3.3.1. And from Fig. 3.3.1.1 to Fig 3.3.1.13 show the result of analysis about the trend of reactor water level etc.

**Table 3.2.3 Summary of Analysis Result on Unit 3**

| Item | Analysis Result |
|---|---|
| Start of reactor core exposure | Approx. 40 hours after earthquake |
| Start of reactor core damages | Approx. 42 hours after earthquake |
| Start of reactor pressure vessel damages | (reactor pressure vessel damage did not occur in this analysis) |

The detail of analysis result is as follows.

The reactor water level gradually comes down after HPCI stop and the reactor core starts exposed, and the reactor core exposed perfectly by opening SRV and the reactor core damage starts (see Fig.3.3.1.1). Although the water injection starts, but in this analysis, because the water injection flow is assumed that it is commensurate with the reactor water level indicated by measurement equipment, so that the water injection flow is not enough and the water level is remained around a half level of the reactor core range. Therefore, the reactor core is damaged.

The reactor pressure is kept high around the pressure of SRV action until RCIC, HCPI stops. By SRV open after HCPI stop the reactor pressure decreases rapidly, after that go down to around atmosphere pressure (see Fig.3.3.1.2). In the analysis, RCIC and HPCI are assumed to be in operation continuously, but there exist a pressure decrease in the part while HPCI is in operation. For example, if the leak of steam is assumed out of the Primary containment vessel through the steam pipe of HPCI, the result is that the trend of pressure of reactor pressure vessel and Primary containment vessel is almost similar (see Fig.3.3.1.10 and Fig.3.3.1.11). However, currently it is not sure whether there is an actual path at the HPCI system or it is only a problem of measuring equipment.

Regarding the pressure of Primary containment vessel, because the steam produced in the reactor is discharged to S/C, the pressure of D/W and S/C continues increasing. And the pressure increases temporary by SRV open, but the pressure decreases by S/C vent. After that the pressure repeats increasing and decreasing (see Fig.3.3.1.4).

A big amount of hydrogen is produced when the reactor core is exposed and the temperature of clad start increasing. After 1 week of earthquake occurrence, the amount equal to the reaction of 70% of active clad is produced. In the analysis, almost amount of hydrogen is discharged out of PCV by S/C vent, but the amount of production assumed to be enough for causing explosion of the Reactor Building of Unit 3 (see Fig.3.3.1.6).

Regarding the discharge of FP, after reactor core damage, the noble gas is discharged from the reactor pressure vessel to S/C, and the result is that approximately 86% of noble gas is discharged by vent. For cesium iodide, the discharge rate is about 0.5% and almost exists in S/C (see Fig.3.3.1.7 and Fig.3.3.1.8).

Regarding the situation of reactor core, there partially exists a melted pool, but it remains in fuel range and does not lead to the reactor pressure vessel damage. The reason is that, the water injection by RCIC, HCPI in the early stage was implemented constantly, and the period after HPCI stop until start water injection is shorter than Unit 1 (see Fig.3.3.1.9).

Also, in this analysis, the water injection suspends 2 hours for the refill of water for the water source pit. We also implemented the analysis in case that the water injection goes continuously. As the result, the reactor water level remains a little higher in the early stage, but is not enough to fill up the fuel range, so that the reactor core is damaged (see Fig.3.3.1.12 and Fig.3.3.1.13).

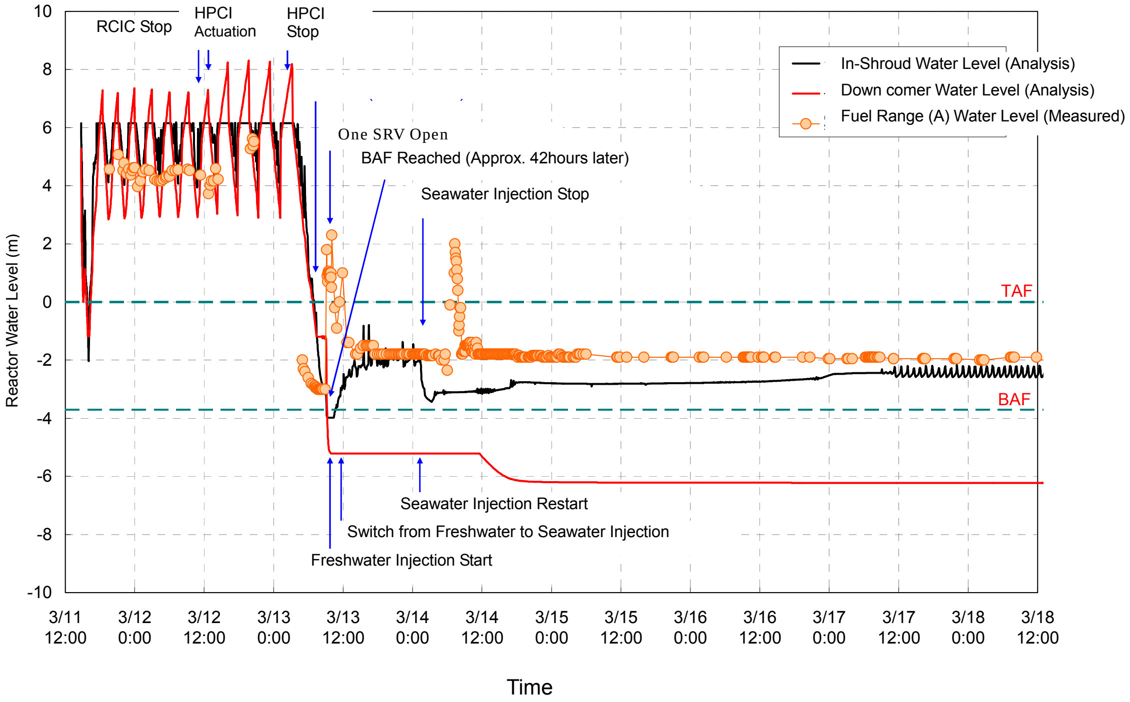


Figure3.3.1.1 Unit3 Reactor Water Level[Case1]

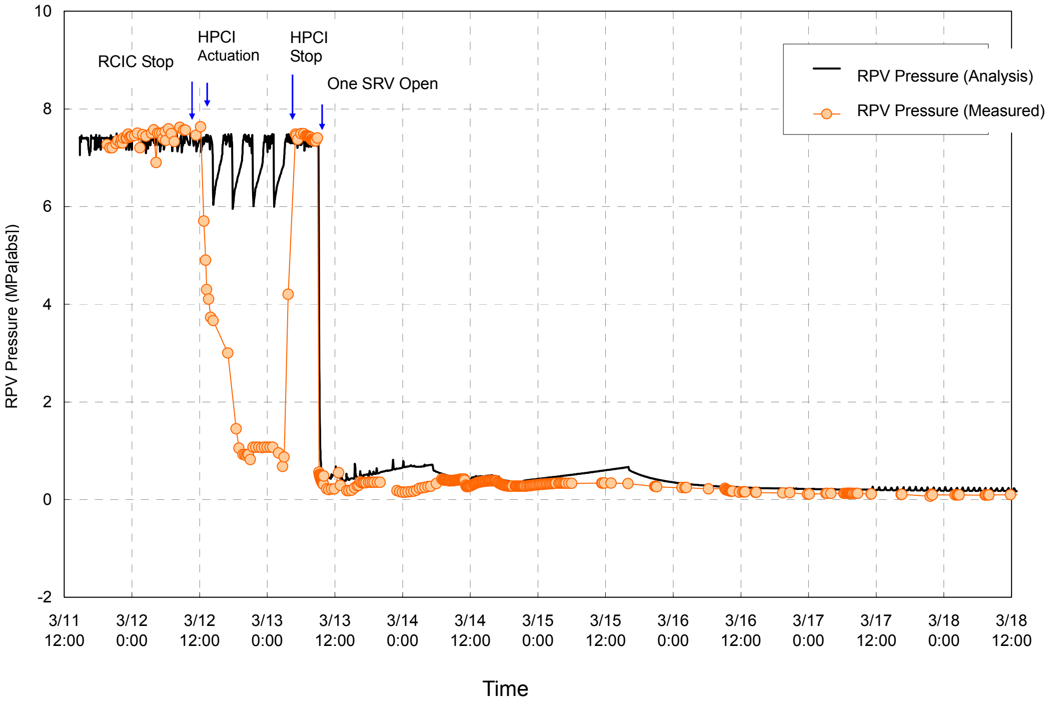


Figure3.3.1.2 Unit3 RPV Pressure[Case1]

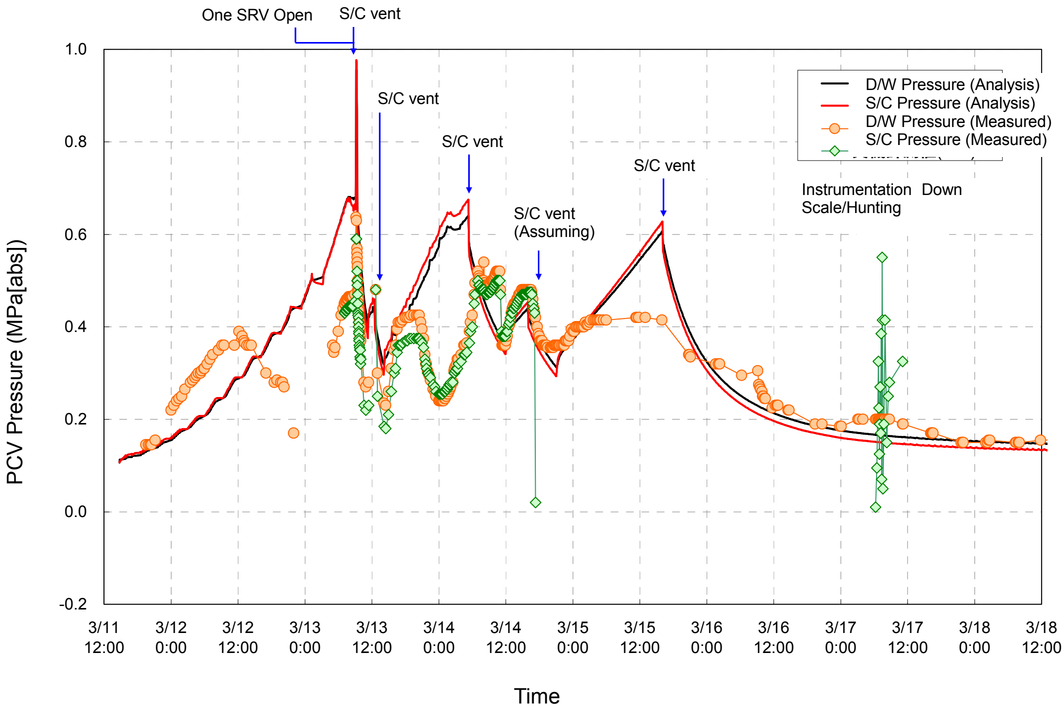


Figure3.3.1.3　Unit3 PCV Pressure[Case1]

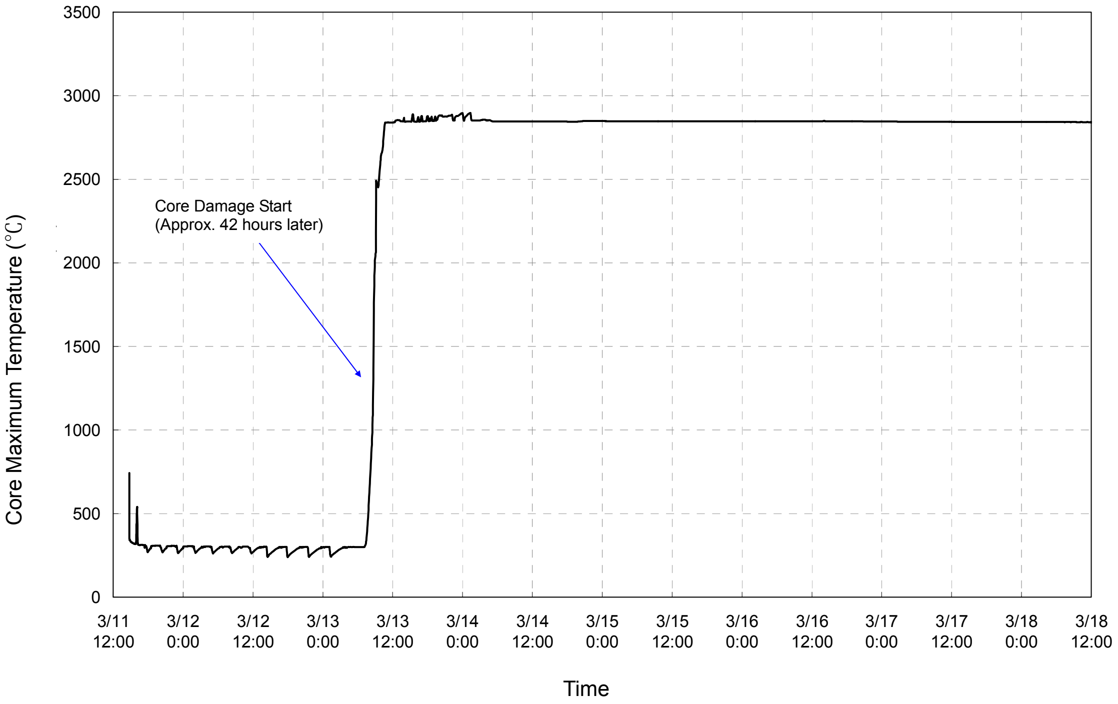


Figure3.3.1.4　Unit3 Core Temperature[Case1]

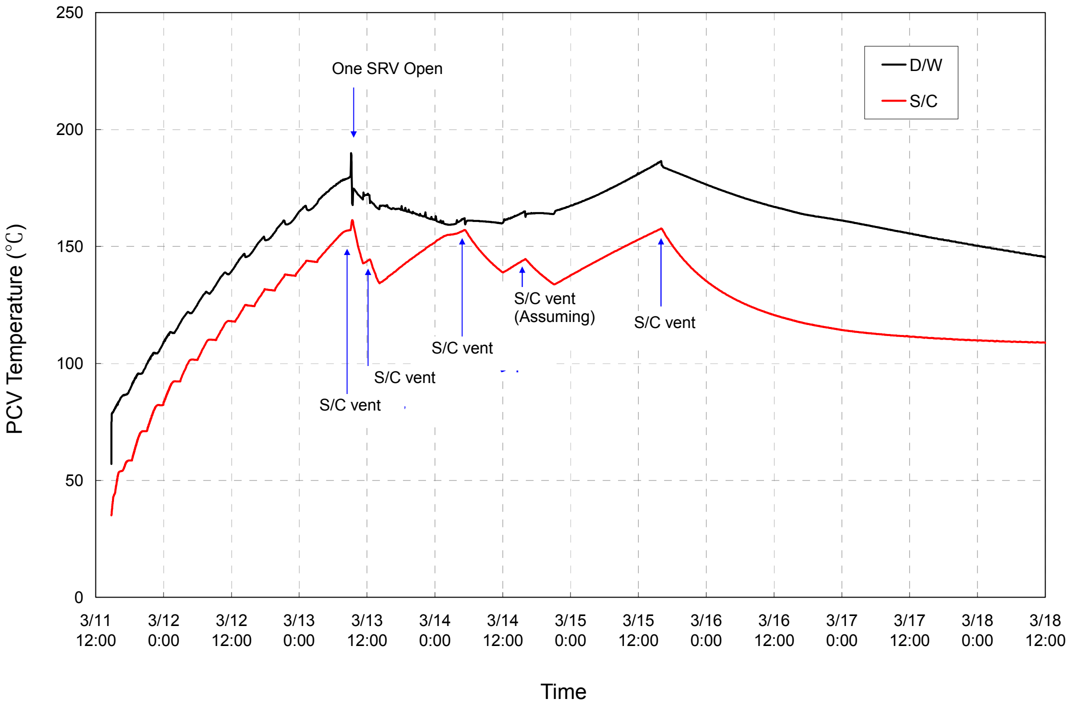


Figure3.2.1.5　　Unit3 PCV Temperature[Case1]

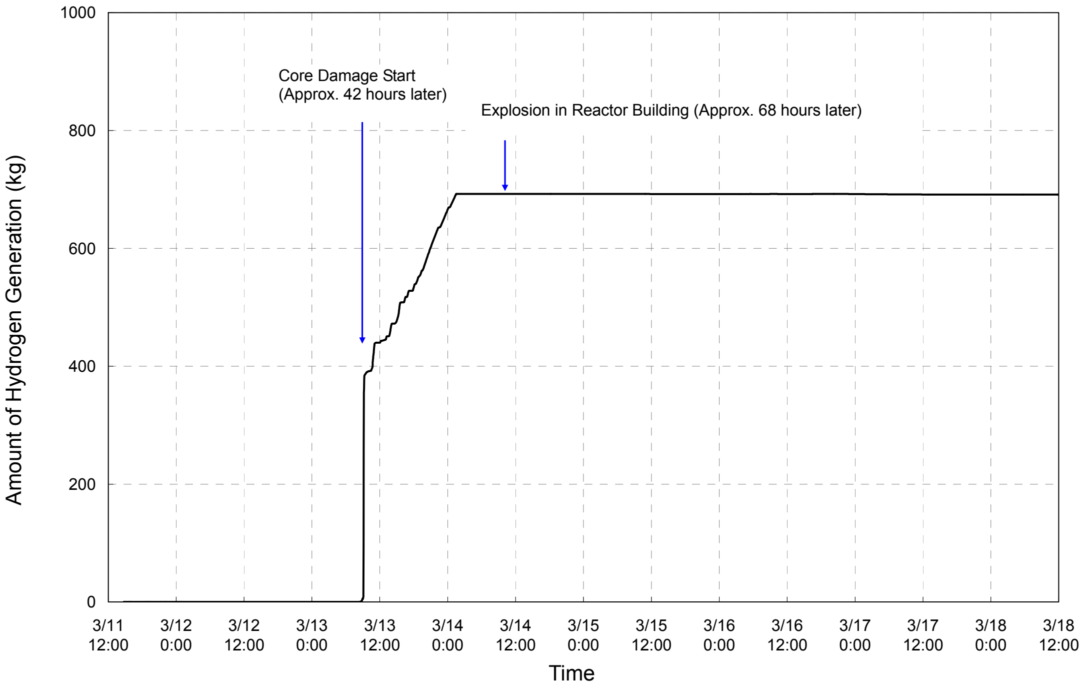


Figure3.3.1.6　　Unit3 Amount of Hydrogen Generation[Case1]

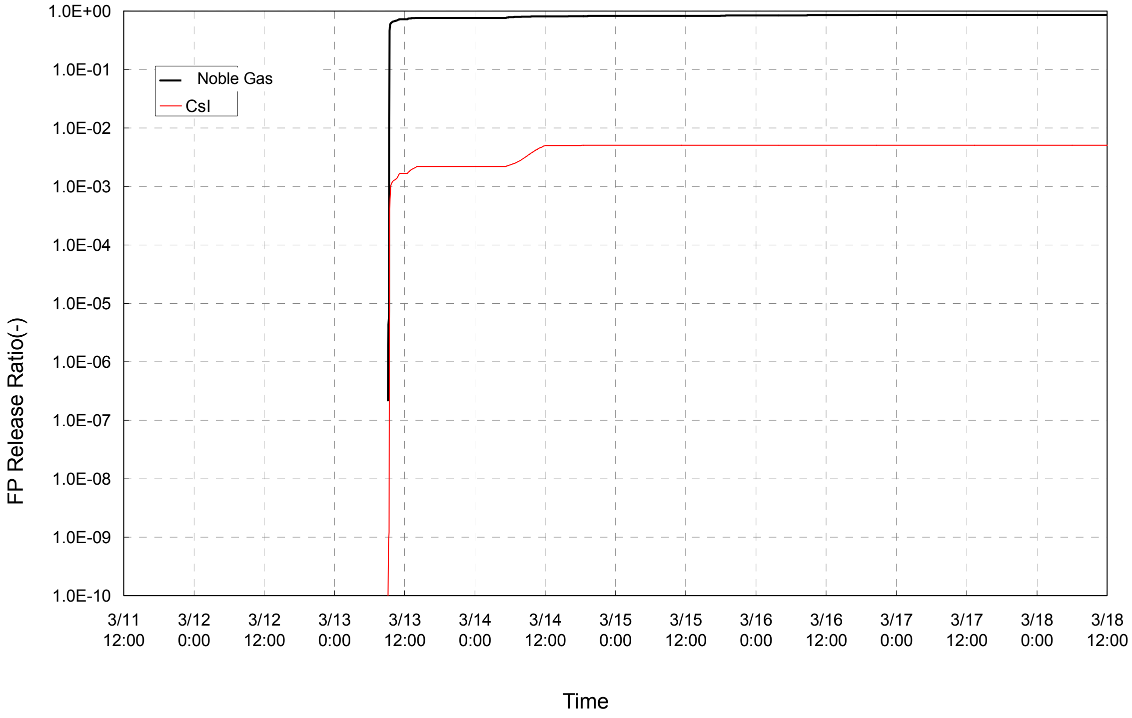


Figure3.3.1.7　　Unit3　FP Release Ratio[Case1]

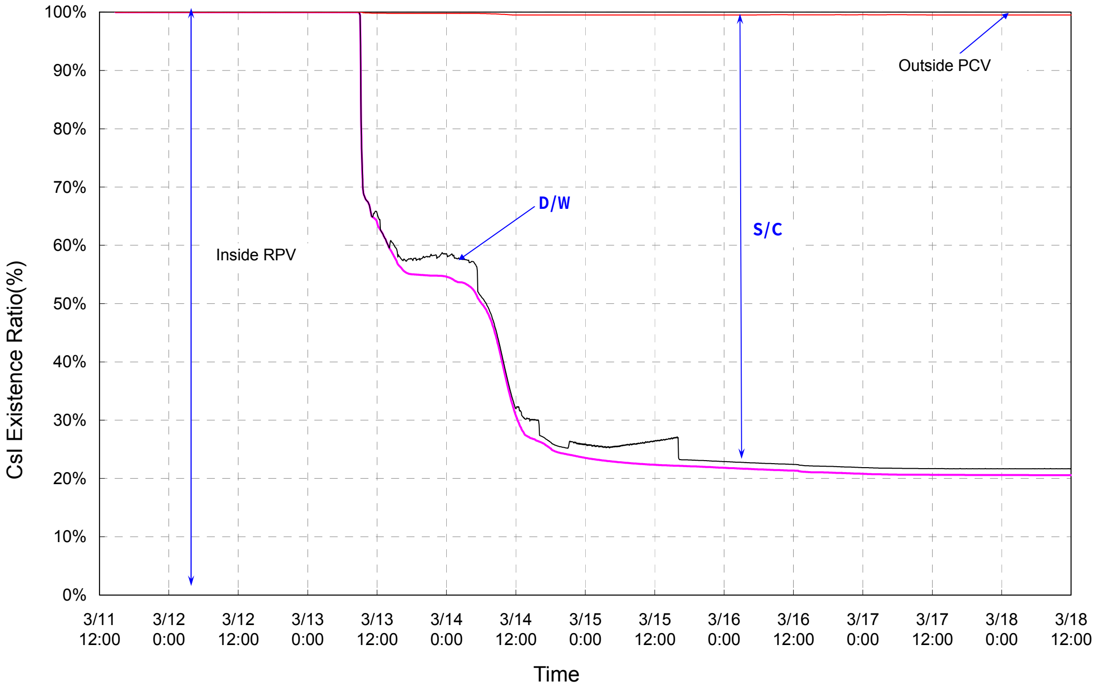


Figure3.3.1.8　　Unit3 FP Existence Ratio(1/2)[Case1]

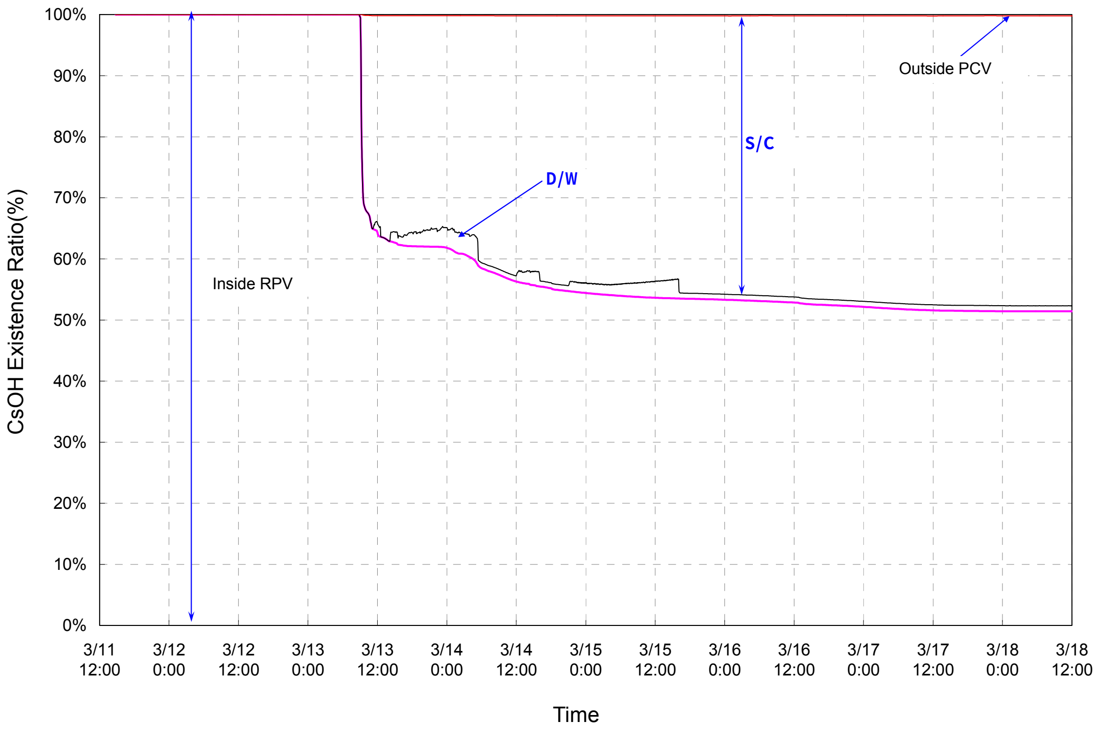
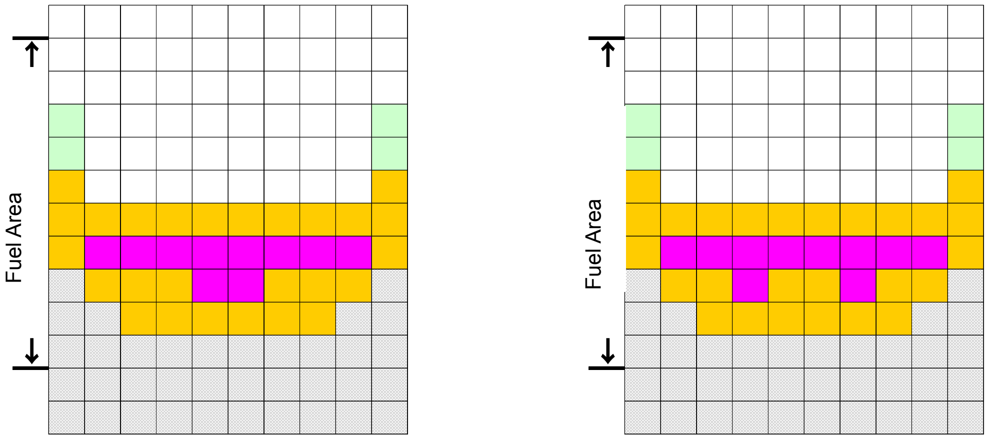
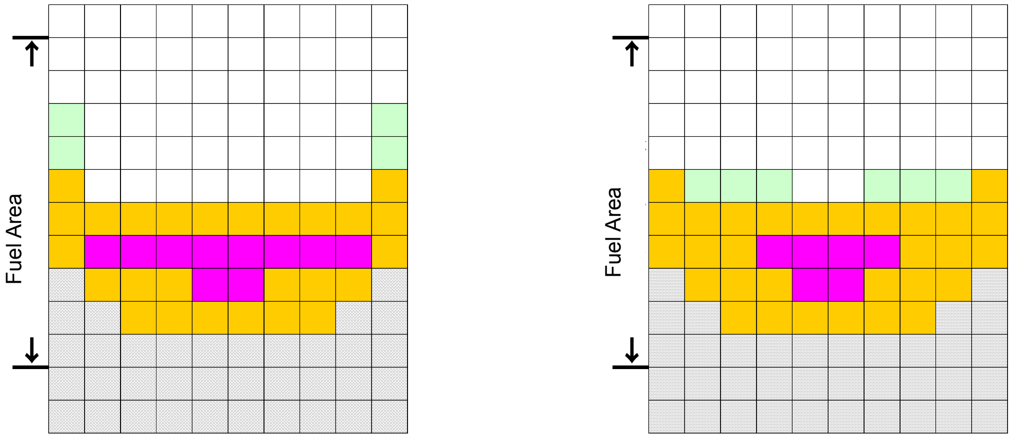


Figure3.3.1.8　　Unit3 FP Existence Ratio(2/2) [Case1]



Approx. 64 hours after SCRAM

Approx. 68 hours after SCRAM



Approx. 72 hours after SCRAM

Approx. 1 week after SCRAM

Model of Fuel Damage
☐：No Fuel（Slumped）
▨：Normal Fuel
🟩：Accumulation of Slumped Fuel
🟨：Accumulation of Melted Fuel

🟧：Flow Channel Blockage with Melted Fuel
🟪：Molten Core Pool

Figure3.3.1.9　Unit3 Core Status[Case1]

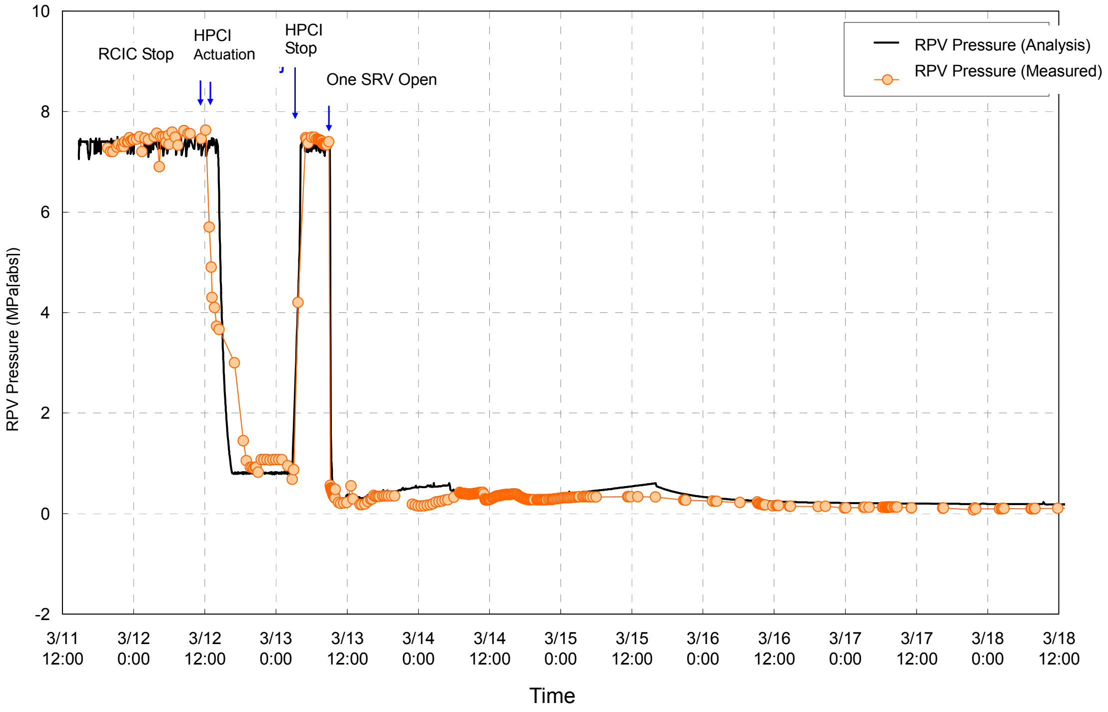


Figure3.3.1.10　Unit3 RPV Pressure[Case1]（Steam Leak）

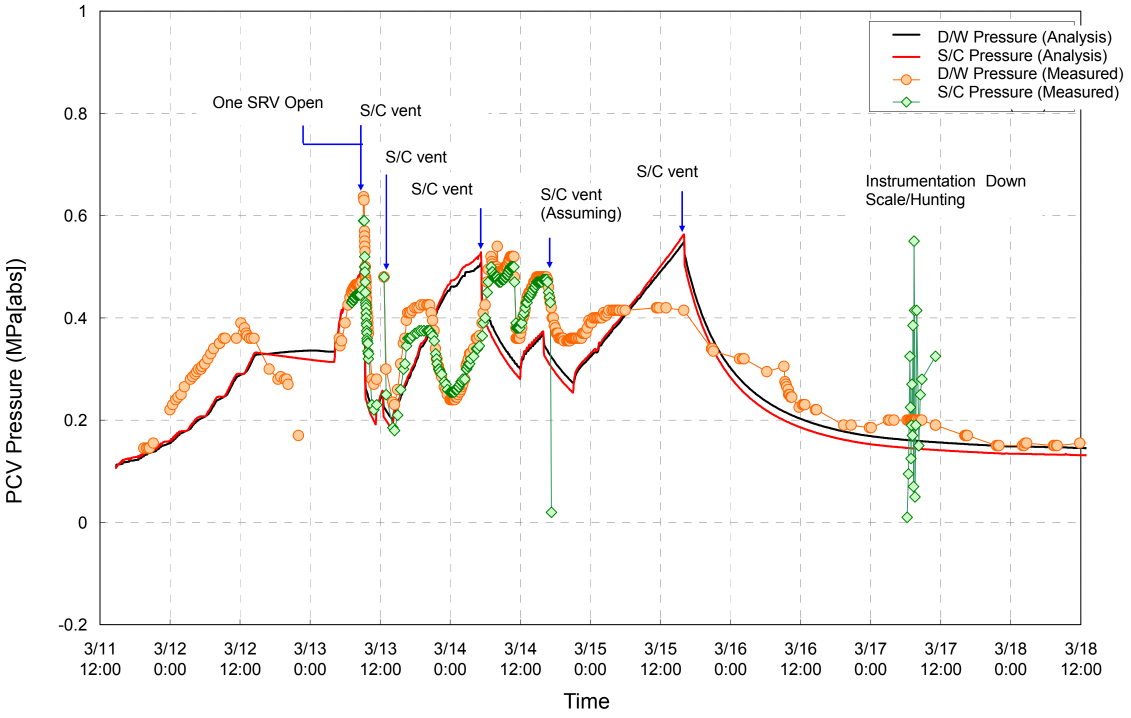


Figure3.3.1.11　Unit3 PCV Pressure[Case1]（Steam Leak）

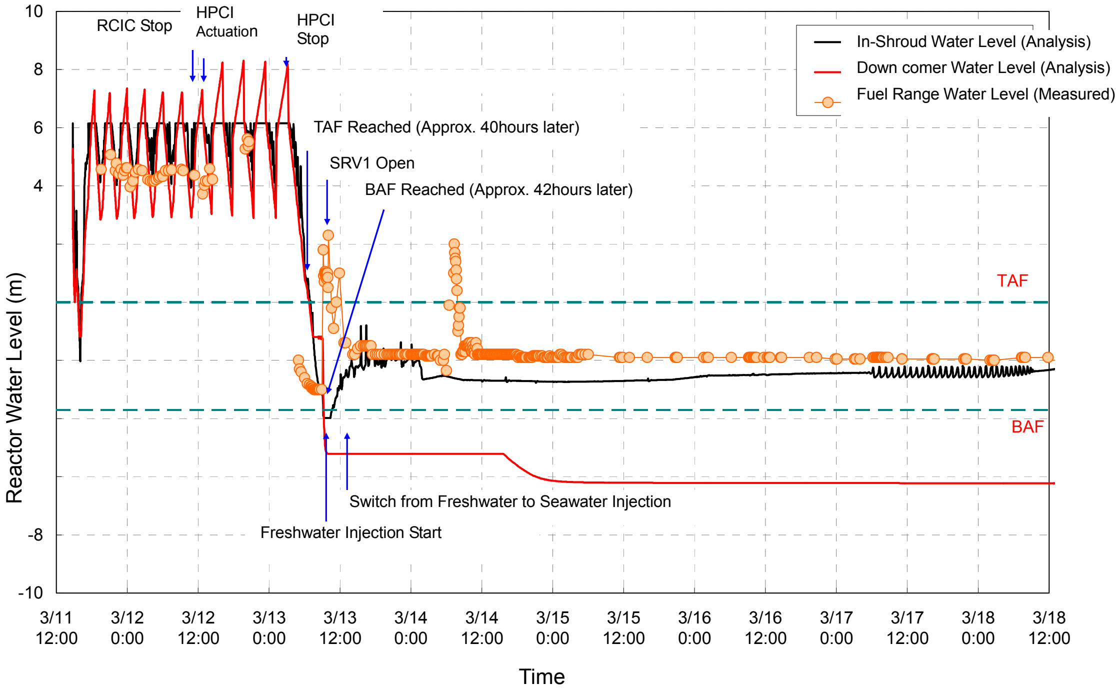


Figure3.3.1.12　Unit3 Reactor Water Level[Case1]（Continued Injection）

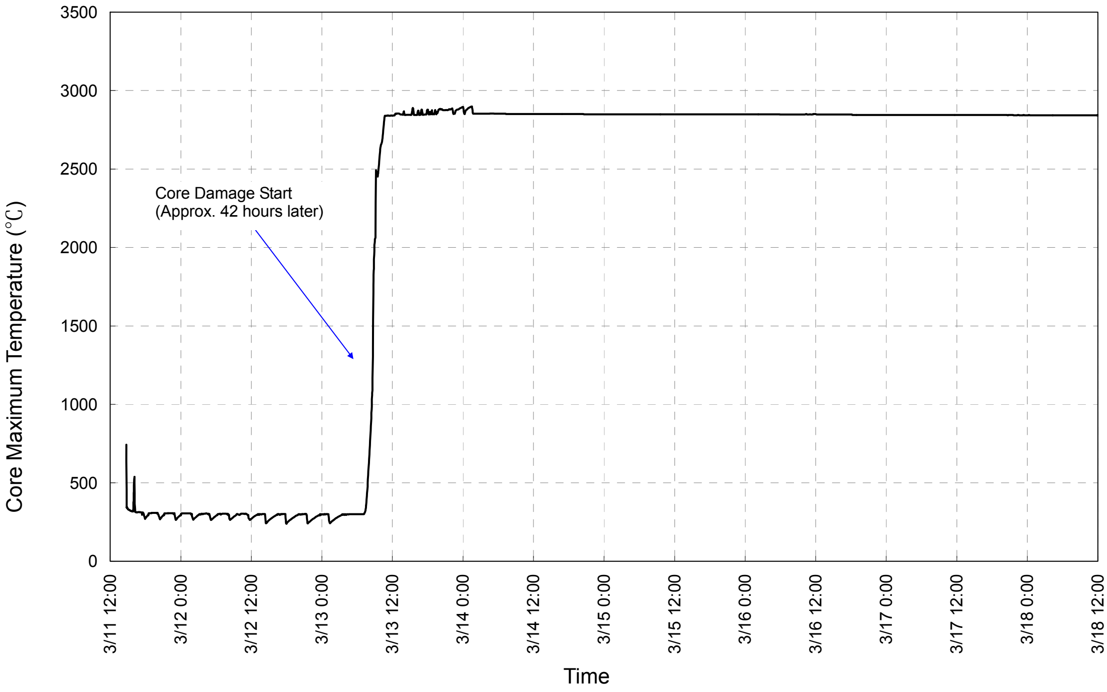


Figure3.3.1.13　Unit3 Core Temperature[Case1]（Continued Injection）

### 3.3.2.2 Analysis Result (Analysis Case 2)

Table 3.3.4 shows the result of analysis based on the condition shown in 3.3.1. And from Fig. 3.3.2.1 to Fig 3.3.2.9 show the result of analysis about the trend of reactor water level etc.

**Table 3.3.4　Summary of Analysis Result on Unit 3**

| Item | Analysis Result |
|---|---|
| Start of reactor core exposure | Approx. 40 hours after earthquake |
| Start of reactor core damages | Approx. 42 hours after earthquake |
| Start of reactor pressure vessel damages | Approx. 66 hours after earthquake |

The detail of analysis result is as follows.

The reactor water level gradually comes down after HPCI stop and the reactor core starts exposed, and the reactor core exposed perfectly by opening SRV and the reactor core damage starts (see Fig.3.3.2.1). Although the water injection starts, the assumed water injection flow is not enough so that the water level does not increase over the bottom of active fuel and as a result the reactor core is damaged more serious than case 1 (see Fig.3.3.2.1).

Regarding the reactor pressure, there is a temporary increase by the steam produced by the movement of reactor core to the lower plenum, but other behavior is almost same as the result of Case 1 (see Fig.3.3.2.2).

Regarding the pressure of Primary containment vessel, it is similar to the reactor pressure, there is a temporary increase by the steam produced by the movement of reactor core to the lower plenum, but other behavior is almost same as the result of Case 1 (see Fig.3.3.2.3).

Regarding reactor core temperature trend, after HPCI stop, the temperature increase with the decrease of reactor water level, and reach to the melting point of the pellet (see Fig.3.3.2.4).

A big amount of hydrogen is produced when the reactor core is exposed and the temperature of clad start increasing, the amount equal to the reaction of 59% of active clad is produced. In the analysis, almost amount of hydrogen is discharged out of PCV by S/C vent. The amount of production assumed to be enough for causing explosion of the Reactor Building of Unit 3 (see Fig.3.3.2.6).

Regarding the discharge of radioactive materials, after reactor core damage, the noble gas is discharged from the reactor pressure vessel to S/C, and the result is that almost full amount of noble gas is discharged by vent. For cesium iodide, the discharge rate is about

0.5% and almost exists in S/C (see Fig.3.3.2.7 and Fig.3.3.2.8).

The result says that, parts of the fuel remain in the reactor pressure vessel, but the reactor pressure vessel is damaged. As the water injection flow in the early stage is assumed smaller than Case 1, and then the result says the damage of reactor core is more serious (see Fig.3.3.2.9).

### 3.3.3 Evaluation Result

In Analysis Case 1, we have had an analysis result that the reactor core of Unit 3 stays within the fuel range, though a partial fuel-melting pool exists, and the reactor pressure vessel will not be damaged. In Analysis Case 2, we have had an analysis result that the reactor vessel has been damaged, though part of fuel stays within it.

In addition, as a result of calibration of water-level gauge of Unit 1, we have found that the water level in reactor pressure vessel is not within fuel ranges. We cannot deny the possibility that a similar event has occurred in Unit 3.

We think that most of fuel is cooled down in the reactor pressure vessel, because, according to plant parameters, temperatures of the steel of the reactor pressure vessel currently change around between approximately 100 degrees Celsius and approximately 200 degrees Celsius and correlate changes in amount of water spray in multiple measuring points and temperatures in some points are increasing in May (though we keep following up conditions while the rate of inflow to the reactor increased) and due to the increase in temperatures their heat source is estimated to come from the inside of reactor pressure vessel and the temperatures at the bottom of the reactor pressure vessel change around between approximately 100 degrees Celsius and approximately 170 degrees Celsius and correlate changes in temperatures in other parts of the reactor pressure vessel.

Hence, according to the analysis and plant parameters, we think that reactor cores have been significantly damaged, but moved below or dropped to the lower plenum from fixed position of fuel loading and most of it can be stably cooled down around there.

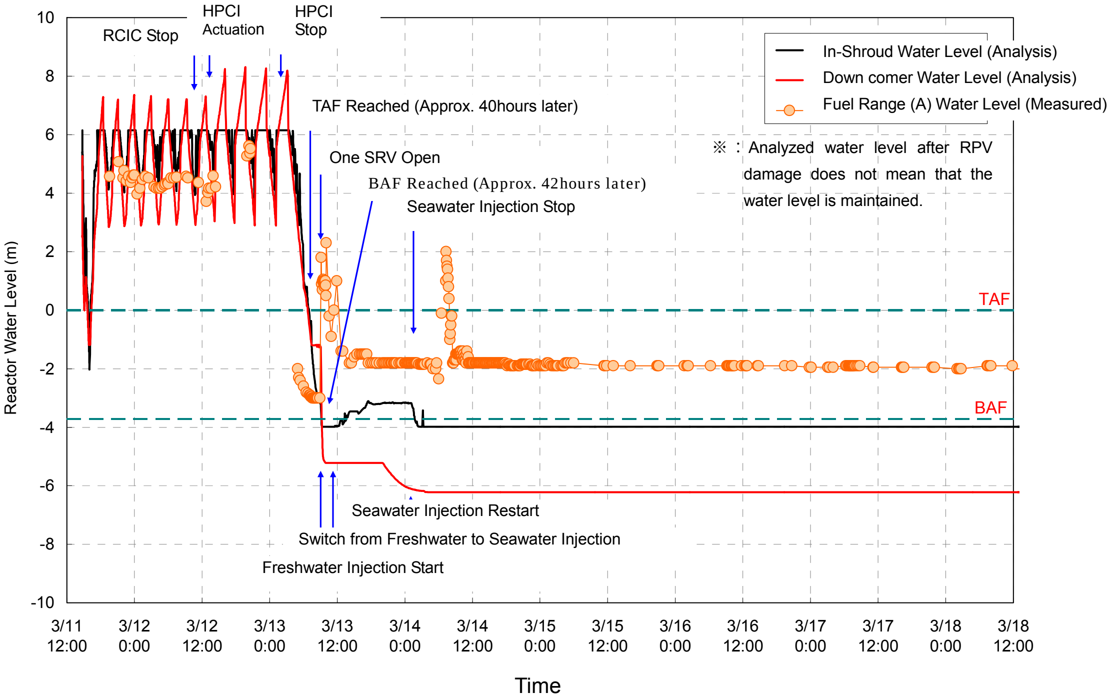


Figure3.3.2.1 Unit3 Reactor Water Level[Case2]

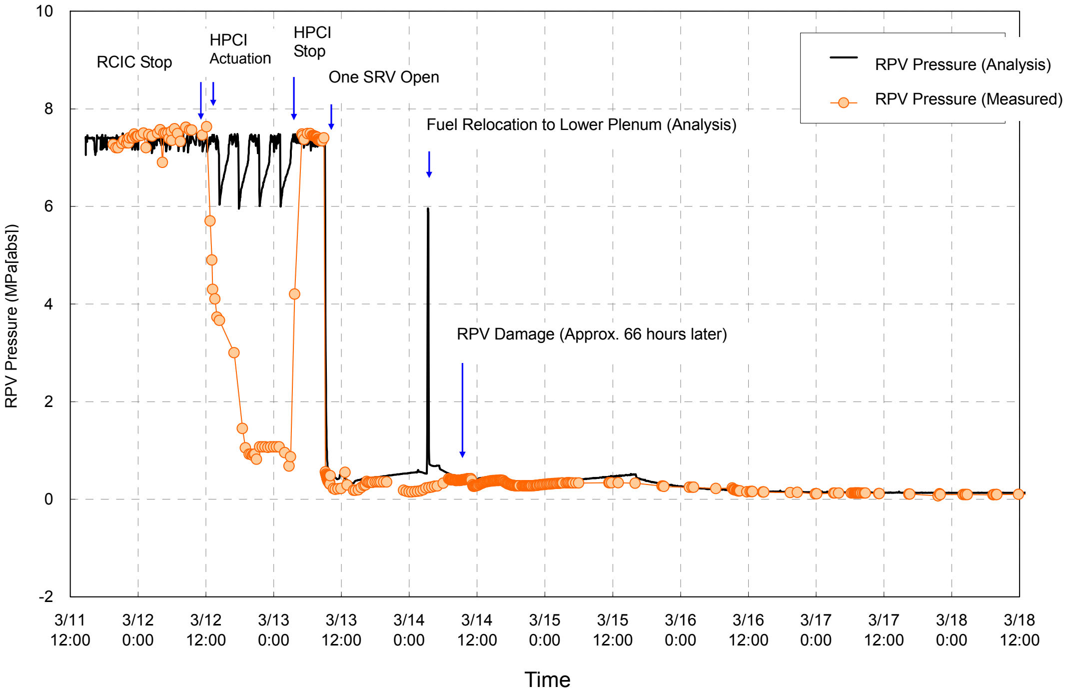


Figure3.3.2.2 Unit3 RPV Pressure[Case2]

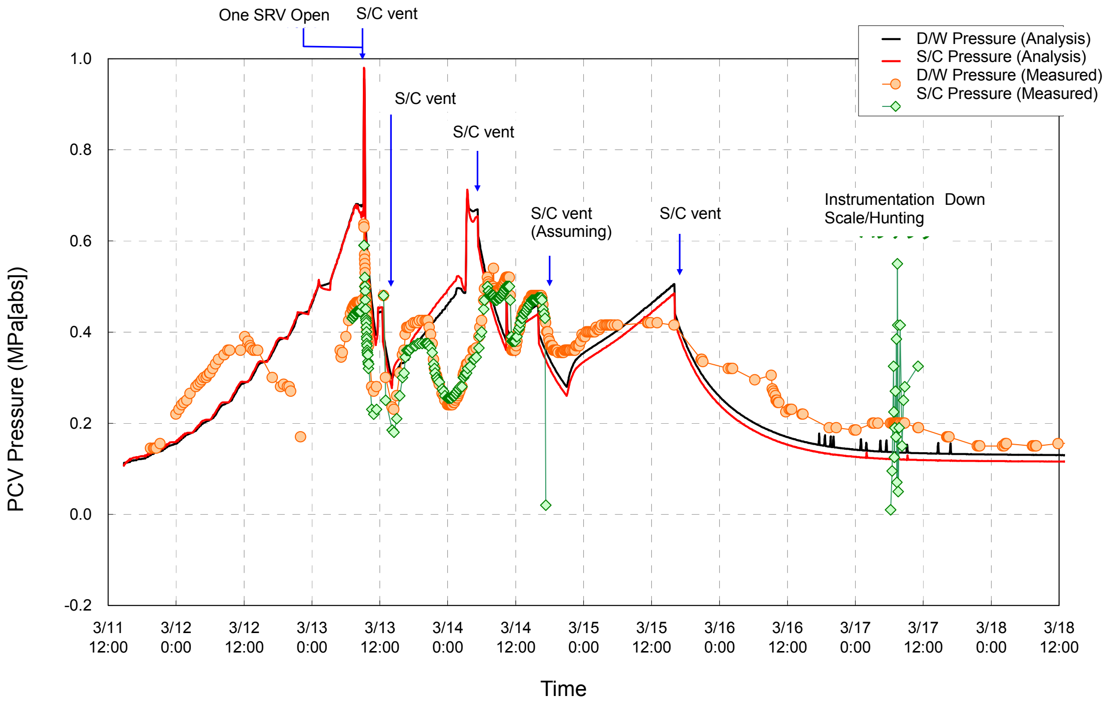


Figure3.3.2.3　Unit2 PCV Pressure[Case2]

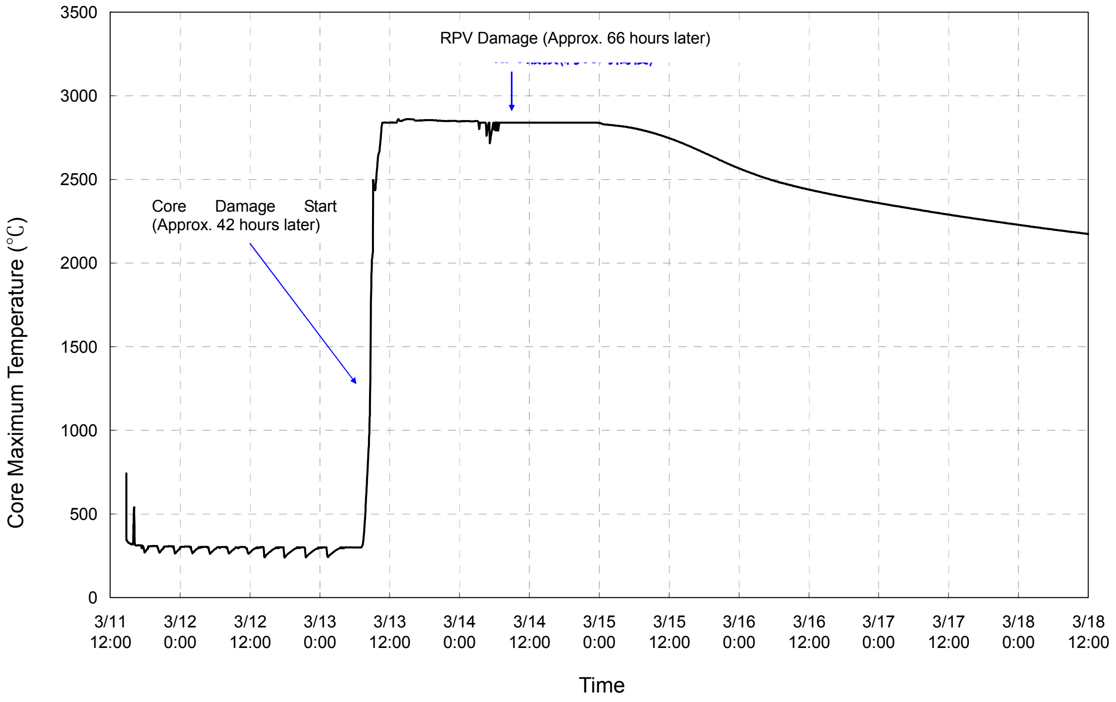


Figure3.3.2.4　Unit3 Core Temperature[Case2]

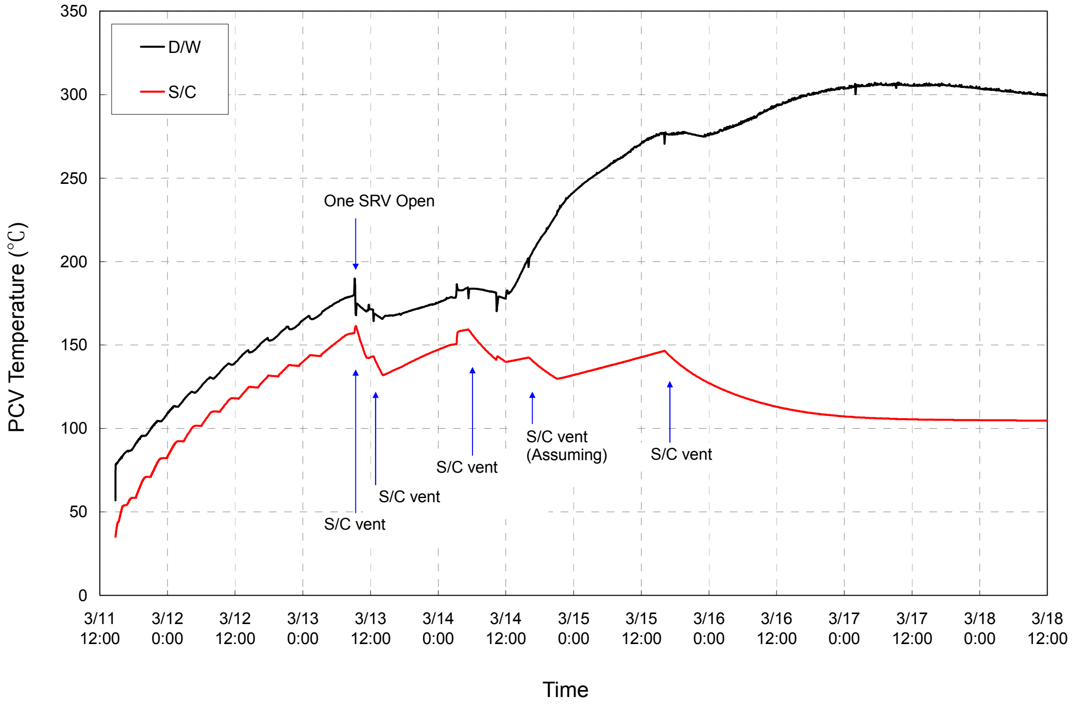


Figure3.3.2.5　Unit3 PCV Temperature[Case2]

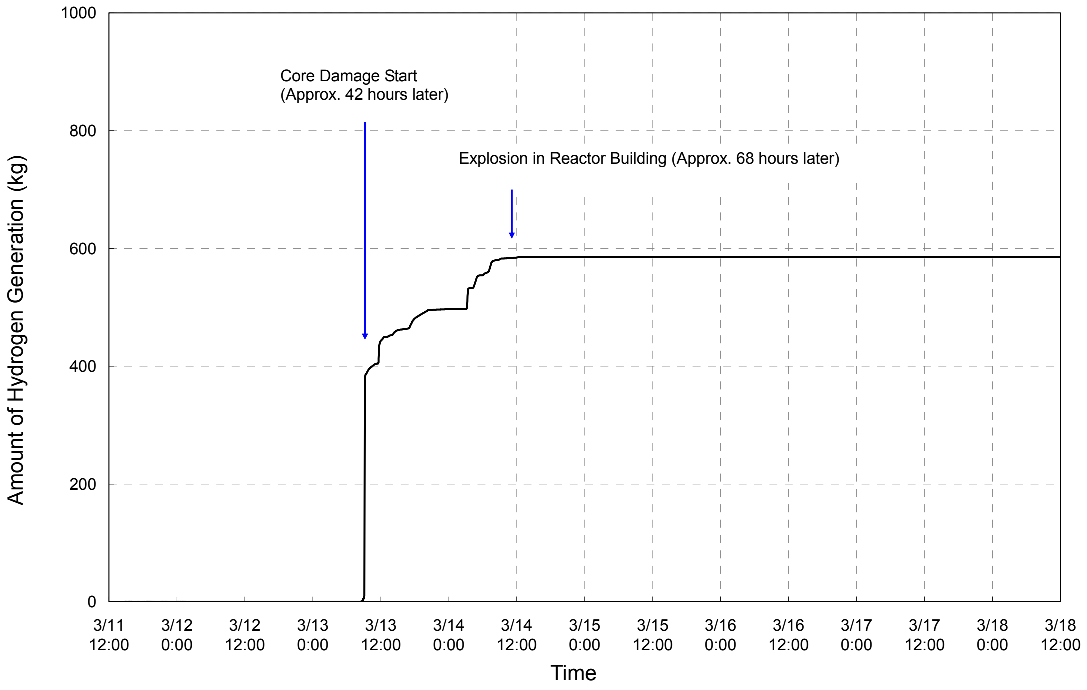


Figure3.3.2.6　Unit3 Amount of Hydrogen Generation[Case2]

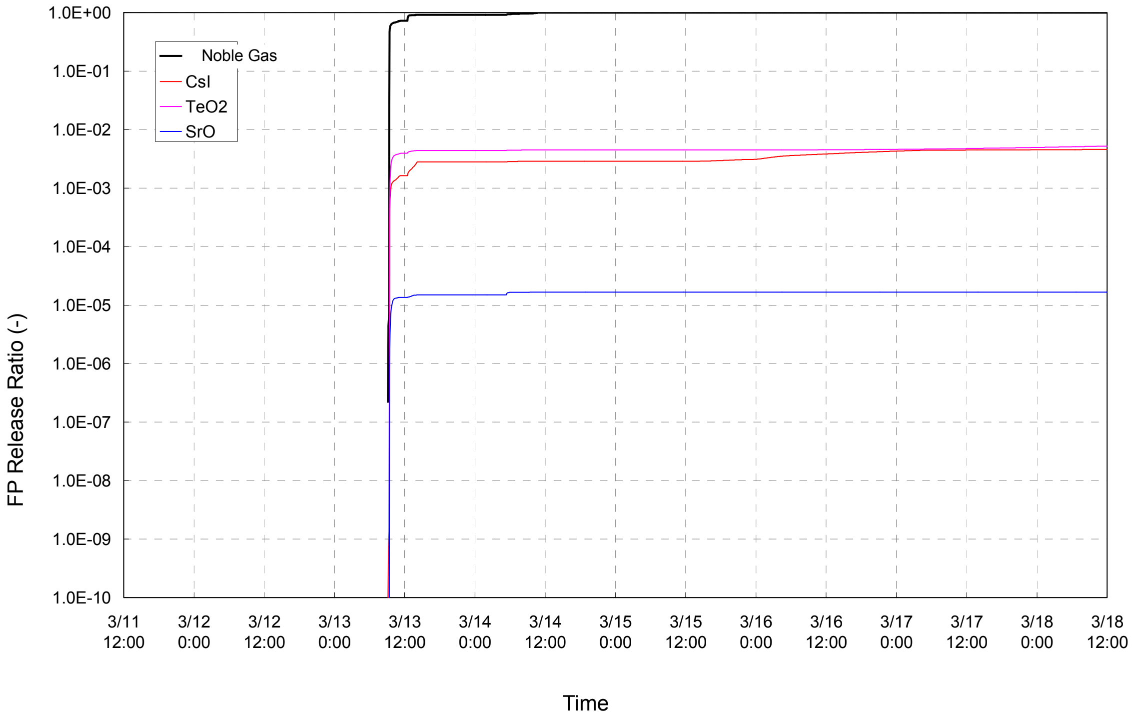


Figure3.3.2.7 Unit3 FP Release Ratio(1/3)[Case2]

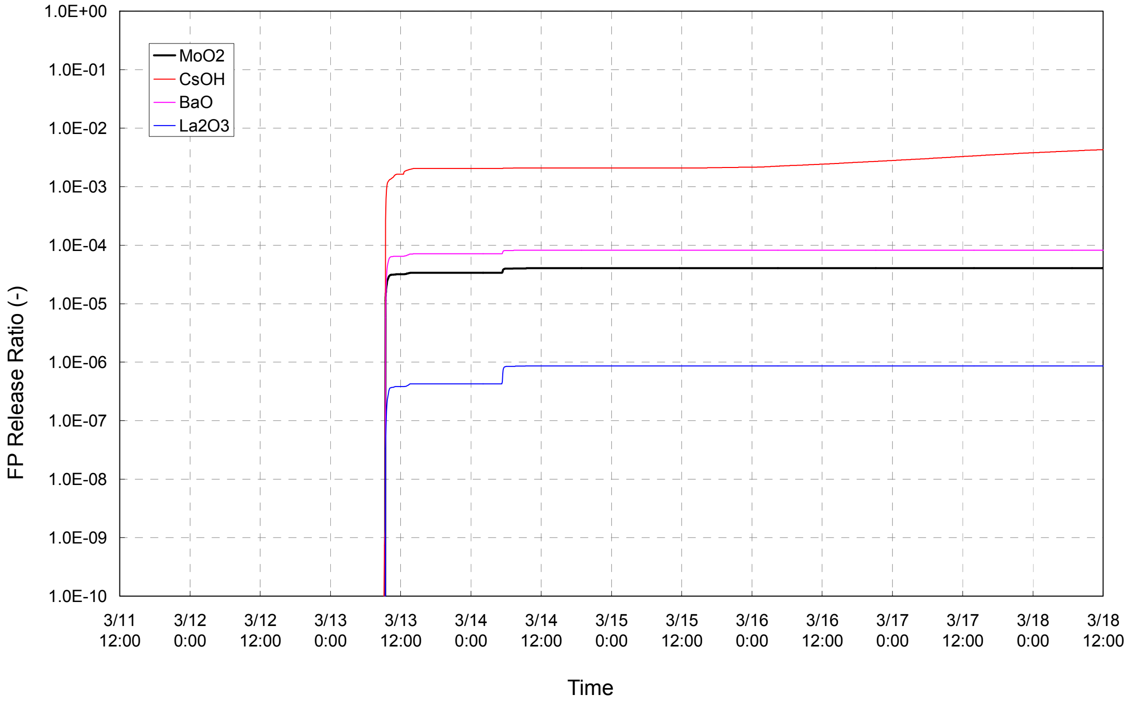


Figure3.3.2.7 Unit3 FP Release Ratio(2/3)[Case2]

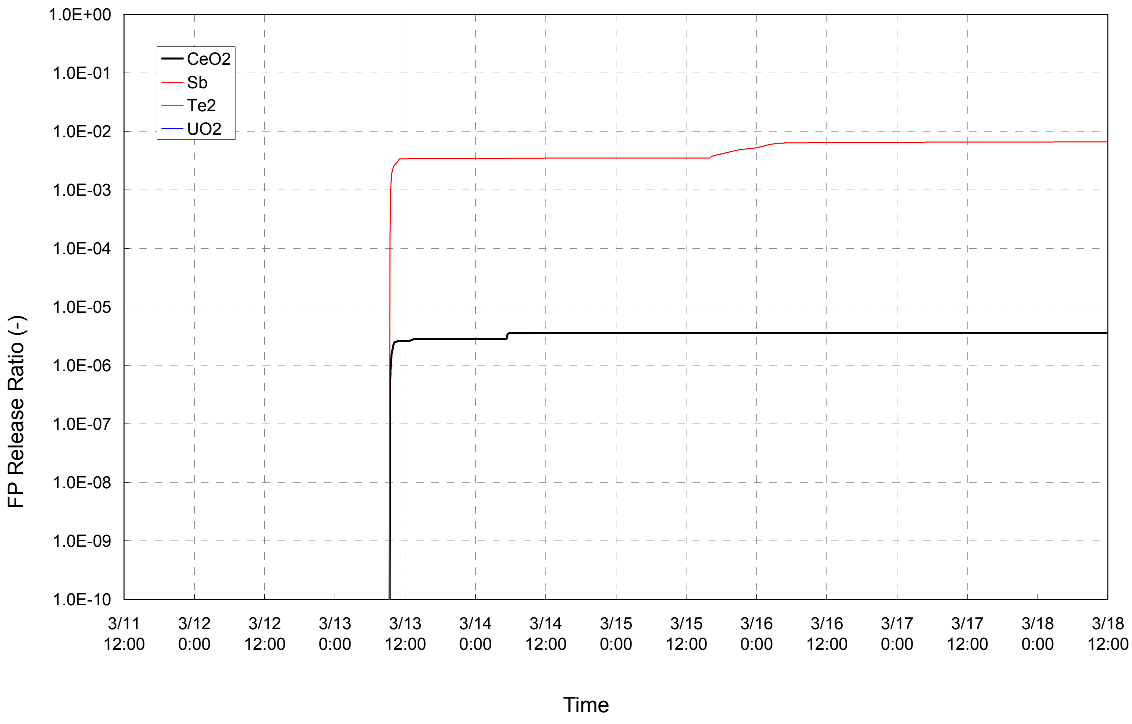


Figure3.3.2.7　Unit3 FP Release Ratio(3/3)[Case2]

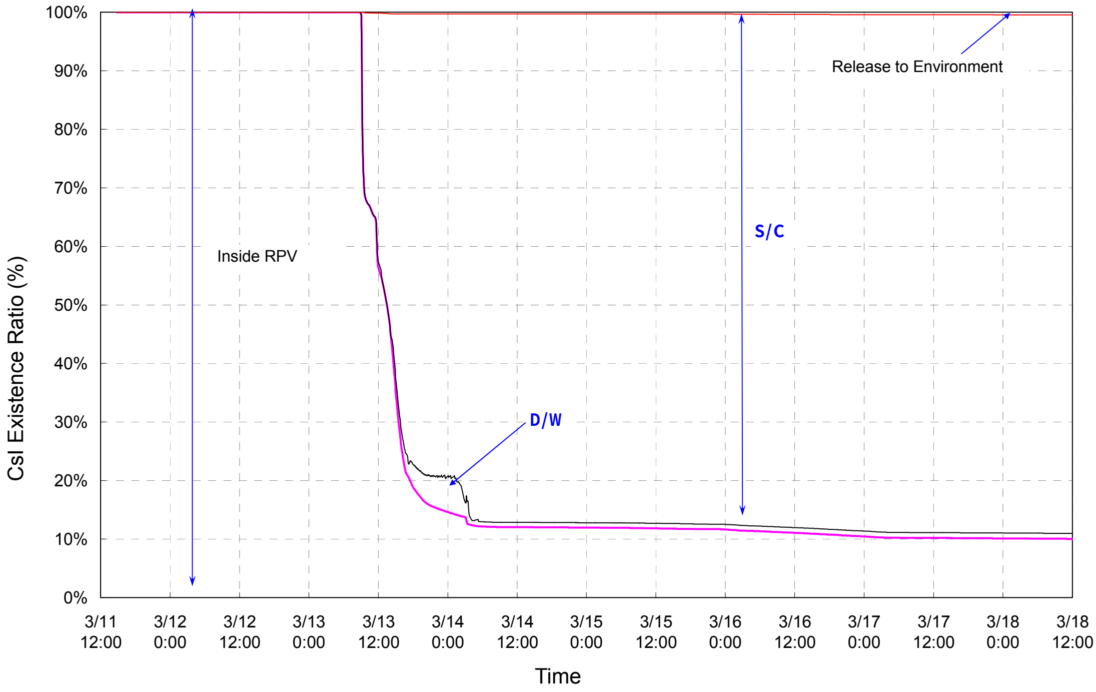


Figure3.3.2.8　Unit3 FP Existence Ratio(1/2)[Case2]

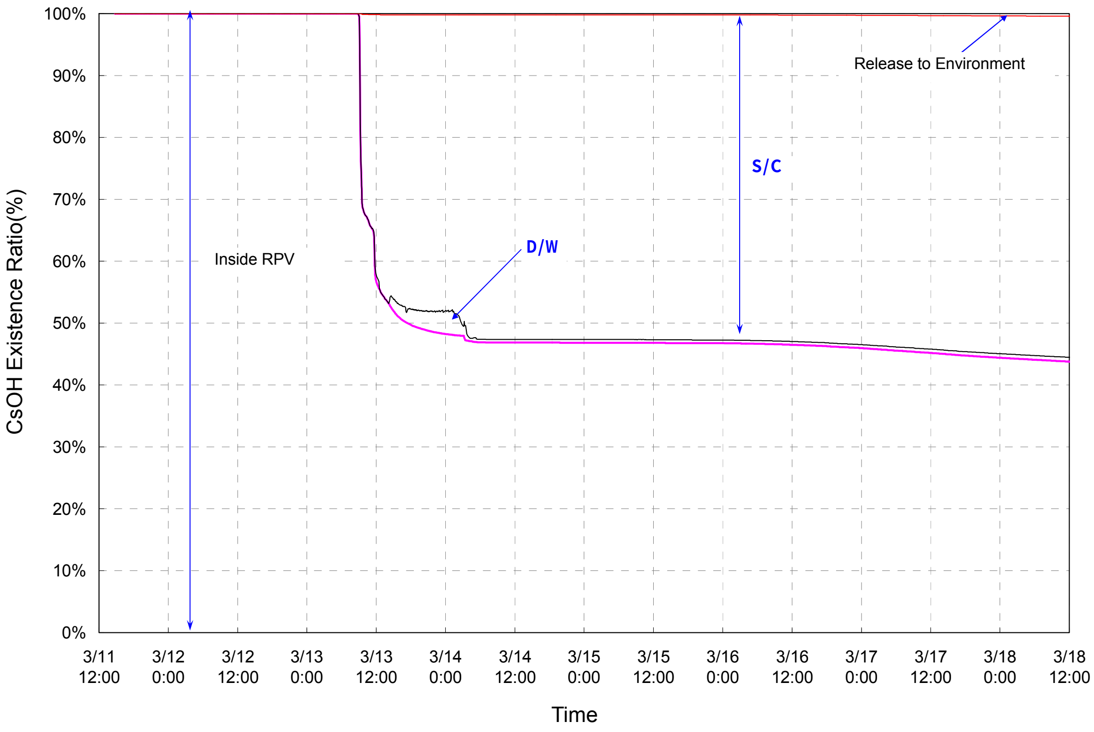
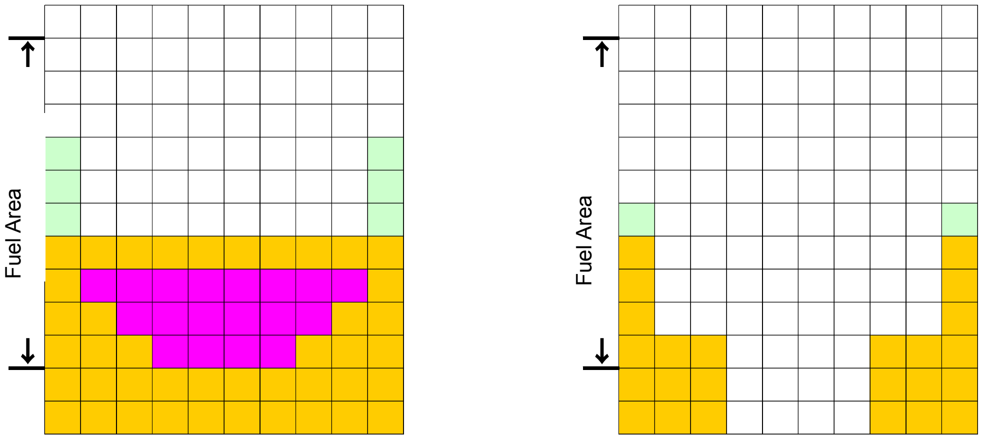
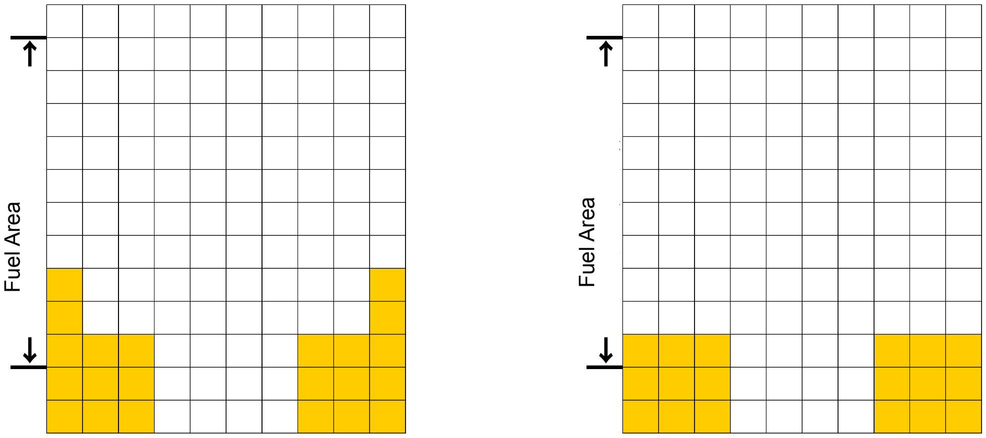


Figure3.3.2.8 Unit2 FP Existence Ratio(2/2)[Case2]



Approx. 58 hours after SCRAM　　Approx. 62 hours after SCRAM



Approx. 66 hours after SCRAM　　Approx. 96 hours after SCRAM

Model of Fuel Damage
⬜：No Fuel（Slumped）
▨：Normal Fuel
🟩：Accumulation of Slumped Fuel
🟨：Accumulation of Melted Fuel

🟧：Flow Channel Blockage with Melted Fuel
🟪：Molten Core Pool

Figure3.3.2.9　Unit3 Core Status[Case2]

Annex-2

# Fukushima Daiichi Nuclear Power Station
# Status of Facility Damage and Cause

Fukushima Daiichi Nuclear Power Station has sustained damage from the Tohoku-Chihou-Taiheiyo-Oki Earthquake that occurred on 2:46 pm, March 11, 2011. Since many restrictions exist in relation to entering the building, the status of the facility damage is still not completely understood at this moment in time. This time, in order to organize and utilize plant operational data, it has been summarized as the first step towards organizing the status of the facility damage as below.

This organized status of facility damage contains little and perfunctory information since it is based on the operational record and hearsay information from a small number of operators. In fact, the status of facility damages and its causes have been neither confirmed nor identified due to the immediate post-quake aftershocks, the tsunami warnings and hydrogen explosions etc. In order to supplement those points, not only must the status of facility damage be organized, but also robust information must be reported. This allows us to a limited degree to identify whether the damage is caused by the earthquake or tsunami and increase facility reinforcements. Damage includes the function losses of the facilities due to the damage done to the power source. The status of the regular use of facilities, the irregular use of cooling facilities as exhibit 1 and the damage of the main facilities are shown below.

＜Facility Damage, Operation Information＞

Unit １

Pure Water Storage Tank： Confirmed pure water leakage from flange（confirmed at 3:06 pm on March 11）

Diesel Driven Fire Pump: Operated after the earthquake

Unit ２

Electric Boiler： Nonradioactive steam leakage（confirmed at 3:20 pm on March 11： Place and degree are unknown）

Unit ３

Seawater Pump（SW pump（B））: Operated after the earthquake

Main Turbine Emergency Oil Pump: Operated after the earthquake

Diesel Driven Fire Pump: Operated after the earthquake

Unit ５

No damages were found based on the operator’s visual inspection during the course of the close range patrol.

Unit ６

Main Turbine, Variety of Oil Pump: Operated after the earthquake（MSOP、TGOP、EOP）

RFP-T Emergency Oil Pump: Operated after the earthquake

RCW Pump: Operated after the earthquake

No damages were found based on the operator’s visual inspection during the course of the close range patrol.

## 1F-1 Status of Emergency Core Cooling System(ECCS)

| | | | Place | Anti-Earthquake Class | When earthquake scram | From earthquake scrum to arrival of Tsunami | Since arrival of Tsunami | Remarks |
|---|---|---|---|---|---|---|---|---|
| Cooling Function | ECCS | CS(A) | R/B Basement Floor (OP.-1230) | A | ○ | ○<br>Note 1 | × | After Tsunami,both power and CCSW were lost. |
| | | CS(C) | R/B Basement Floor (OP.-1230) | A | ○ | ○<br>Note 1 | × | After Tsunami,both power and CCSW were lost. |
| | | CCS(A) | R/B Basement Floor (OP.-1230) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>After Tsunami, both power and CCSM were lost. |
| | | CCS(B) | R/B Basemnet Floor (OP.-1230) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>After Tsunami, both power and CCSM were lost. |
| | | CCSW(A) | Outdoors (OP.4000) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | CCSW(B) | Outdoors (OP.4000) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | CS(B) | R/B Basement Floor (OP.-1230) | A | ○ | ○<br>Note 1 | × | After Tsunami,both power and CCSW were lost. |
| | | CS(D) | R/B Basement Floor (OP.-1230) | A | ○ | ○<br>Note 1 | × | After Tsunami,both power and CCSW were lost. |
| | | CCS(C) | R/B Basement Floor (OP.-1230) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>After Tsunami,both power and CCSW were lost. |
| | | CCS(D) | R/B Basement Floor (OP.-1230) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>After Tsunami,both power and CCSW were lost. |
| | | CCSW(C) | Outdoors (OP.4000) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | CCSW(D) | Outdoors (OP.4000) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | HPCI | R/B Basement Floor (OP.-1230) | A | ○ | ○<br>Note 1 | × | After Tsunami,power was lost.(Oil pump) |
| | | IC(A) | R/B 4th Floor (OP.31000) | A | ○ | ◎ | – | Before Tsunami, confirmed to be operated automatically (Reactor Pressure was high).<br>After Tsunami, the status of valve was not confirmed due to power lost. |
| | | IC(B) | R/B 4th Floor (OP.31000) | A | ○ | ◎ | – | Before Tsunami, confirmed to be operated automatically (Reactor Pressure was high).<br>Ater Tsunami, the status of valve was not confirmed due to power lost. |
| | Water injection to Reactor | MUWC (back-up water injection) | T/B Basement Floor (OP.3200) | B | ◎ | ◎ | × | After the earthquake, power was lost. |
| | Pool Cooling | SFP Cooling (FPC) | R/B 3rd Floor (OP.25900) | B | ◎ | △ | × | After the earthquake, SW was lost. |
| | | SFP Cooling (SHC) | R/B 1st Floor (OP.10200) | A | ○ | ○ | × | After the earthquake, power and SW were lost. |
| Shutting Function | Vessel Facility | Reactor Building | | A | ◎ | ◎ | × | Until the earthquake scrum, a normal air conditionar was operated. After the scrum and before Tsunami,SGTS got operated and kept the pressure.<br>Afterwards, damaged from explosion. |
| | | Primary Containment Vessel (PCV) | | A | ○ | ○ | × | Before arrival of Tsunami,no possibility of damage in Primary Containment Vessel accoding to the pressure level. |

(Notes) ◎ : Opetrated ○ : Waiting △ : Stopped due to normal power stop × : Function lost or Out of waiting

Note 1:At Unit 5, which registered a large seismic scale at main shock of the earthquake, Residual Heat Removal System was used on Mar.19 after the earthquake. According to patrol by an operator, there was no large damage in each system and equipment. The peak acceleration of observation record at the basement of Reactor Building which the system and equipment were installed in was less than the acceleration to keep dynamic function of equipment*. Therefore, each function of the system is supposed to be ensured.

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## 1F-2 Status of Emergency Core Cooling System(ECCS)

|  |  |  | Place | Anti-Earthquake Class | When earthquake scram | From earthquake scrum to arrival of Tsunami | Since arrival of Tsunami | Remarks |
|---|---|---|---|---|---|---|---|---|
| Cooling Function | ECCS | **RHR**(A) | R/B Basement Floor (OP.-1030) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>After Tsunami, both power and RHRS A/C were lost. |
|  |  | **RHR**(B) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS A/C were lost. |
|  |  | **RHR**(C) | R/B Basement Floor (OP.-1030) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>After Tsunami, both power and RHRS A/C were lost. |
|  |  | **RHR**(D) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS A/C were lost. |
|  |  | **RHRS**(A) | Outdoors (OP.4000) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
|  |  | **RHRS**(B) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
|  |  | **RHRS**(C) | Outdoor (OP.4000) | A | ○ | ◎ | × | Before Tsumami, confirmed to be operated mannually(S/P cleaning).<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
|  |  | **RHRS**(D) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
|  |  | CS(A) | R/B Basement Floor (OP.-1000) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS A/C were lost. |
|  |  | CS(B) | R/B Basement Floor (OP.-1000) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS A/C were lost. |
|  |  | HPCI | R/B Basement Floor (OP.-2060) | A | ○ | ○<br>Note 1 | × | After Tsunami, power was lost(Sub-oil Pump). |
|  | Water injection to Reactor | **RCIC** | R/B Basement Floor (OP.-2060) | A | ○ | ◎ | ◎ | After earthquake and Tsunami,started mannualy. And then,high-pressure steam was lost. |
|  |  | MUWC (back-up water injection) | T/B Basement Floor (OP.1900) | B | ◎ | ◎ | × | After Tsunami, power was lost. |
|  | Pool Cooling | SFP Cooling (FPC) | R/B 3rd Floor (OP.26900) | B | ◎ | △ | × | After earthquake, power was lost.<br>After Tsunami, SW was lost. |
|  |  | SFP Cooling (RHR) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and SW were lost. |
| Shutting Function | Vessel Facility | Reactor Building |  | A | ○ | ○<br>Note 1 | × | Blowout Panel Open |
|  |  | Primary Containment Vessel (PCV) |  | A | ○ | ○ | × | Before arrival of Tsunami,no possibility of damage in Primary Containment Vessel accoding to the pressure level. |

(Notes) ◎：Opetrated ○：Waiting △：Stopped due to normal power stop ×：Function lost or Out of waiting

Note 1:At Unit 5, which registered a large seismic scale at main shock of the earthquake, Residual Heat Removal System was used on Mar.19 after the earthquake. According to patrol by an operator, there was no large damage in each system and equipment. The peak acceleration of observation record at the basement of Reactor Building which the system and equipment were installed in was less than the acceleration to keep dynamic function of equipment*. Therefore, each function of the system is supposed to be ensured.

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## 1F-3 Status of Emergency Core Cooling System(ECCS)

| | | | Place | Anti-Earthquake Class | When earthquake scram | From earthquake scrum to arrival of Tsunami | Since arrival of Tsunami | Remarks |
|---|---|---|---|---|---|---|---|---|
| Cooling Function | ECCS | **RHR**(A) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS A/C were lost. |
| | | **RHR**(B) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS B/D were lost. |
| | | **RHR**(C) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS A/C were lost. |
| | | **RHR**(D) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS B/D were lost. |
| | | **RHRS**(A) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | **RHRS**(B) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | **RHRS**(C) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | **RHRS**(D) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | CS(A) | R/B Basement Floor (OP.-1000) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS A/C were lost. |
| | | CS(B) | R/B Basement Floor (OP.-1000) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS B/D were lost. |
| | | HPCI | R/B Basement Floor (OP.-2060) | A | ○ | ○ | ◎ | After Tsunami, when water level decreased, After earthquake and Tsunami,started automatically. And then,high-pressure steam was lost. |
| | Water injection to Reactor | **RCIC** | R/B Basement Floor (OP.-2060) | A | ○ | ○ | ◎ | After Tsunami, started. And then, tripped and couldn't restart. |
| | | MUWC (back-up water injection) | R/B Basement Floor (OP.2420) | B | ◎ | ◎ | × | After Tsunami, power was lost. |
| | Pool Cooling | SFP Cooling (FPC) | R/B 3rd Floor (OP.26900) | B | ◎ | △ | × | After earthquake, power was lost. After Tsunami, SW was lost. |
| | | SFP Cooling (RHR) | R/B Basement Floor (OP.-1030) | A | ○ | ○<br>Note 1 | × | After Tsunami, power and SW were lost. |
| Shutting Function | Vessel Facility | Reactor Building | | A | ○ | ○<br>Note 1 | × | Damaged from the explosion. |
| | | Primary Containment Vessel (PCV) | | A | ○ | ○ | × | Before arrival of Tsunami,no possibility of damage in Primary Containment Vessel accoding to the pressure level. |

(Notes) ◎：Opetrated　○：Waiting　△：Stopped due to normal power stop　×：Function lost or Out of waiting

Note 1:At Unit 5, which registered a large seismic scale at main shock of the earthquake, Residual Heat Removal System was used on Mar.19 after the earthquake. According to patrol by an operator, there was no large damage in each system and equipment. The peak acceleration of observation record at the basement of Reactor Building which the system and equipment were installed in was less than the acceleration to keep dynamic function of equipment*. Therefore, each function of the system is supposed to be ensured.

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## 1F-4 Status of Emergency Core Cooling System(ECCS)

| | | | Place | Anti-Earthquake Class | When earthquake scram | From earthquake scrum to arrival of Tsunami | Since arrival of Tsunami | Remarks |
|---|---|---|---|---|---|---|---|---|
| Cooling Function | ECCS | **RHR**(A) | R/B Basement Floor (O.P-1110) | A | － | － | － | |
| | | **RHR**(B) | R/B Basement Floor (O.P-1110) | A | ○ | ○<br>Note 1 | × | After Tsunami, both power and RHRS B/D were lost. |
| | | **RHR**(C) | R/B Basement Floor (O.P-1110) | A | － | － | － | |
| | | **RHR**(D) | R/B Basement Floor (O.P-1110) | A | ◎<br>(SFP Cooling) | ○<br>Note 1 | × | After earthquake, stopped due to blackout.(Note 2)<br>After Tsunami, both power and RHRS B/D were lost. |
| | | **RHRS**(A) | Outdoors (OP.4000) | A | － | － | － | |
| | | **RHRS**(B) | Outdoors (OP.4000) | A | ◎<br>(SFP Cooling) | ○<br>Note 1 | × | After earthquake, stopped due to blackout.(Note 2)<br>After Tsunami, both power and RHRS B/D were lost. |
| | | **RHRS**(C) | Outdoors (OP.4000) | A | － | － | × | |
| | | **RHRS**(D) | Outdoors (OP.4000) | A | ◎<br>(SFP Cooling) | ○<br>Note 1 | × | After earthquake, stopped due to blackout.(Note 2)<br>After Tsunami, both power and RHRS B/D were lost. |
| | | CS(A) | R/B Basement Floor (O.P-1110) | A | － | － | － | |
| | | CS(B) | R/B Basement Floor (O.P-1110) | A | － | － | － | |
| | | HPCI | R/B Basement Floor (O.P-2060) | A | － | － | － | |
| | Water injection to Reactor | **RCIC** | R/B Basement Floor (O.P-2060) | A | － | － | － | |
| | | MUWC (back-up water injection) | T/B Basement Floor (OP.1900) | B | ◎ | ◎ | × | After Tsunami, power was lost. |
| | Pool Cooling | SFP Cooling (FPC) | R/B 3rd Floor (OP.26900) | B | ◎ | △ | × | One was under inspection. The other was on operation before earthquake.<br>After earthquake, normally powered-off. |
| | | SFP Cooling (RHP) | R/B Basement Floor (O.P-1110) | A | ◎ | ○<br>Note 1 | × | After earthquake, stopped due to blackout.(Note 2)<br>After Tsunami, both power and RHRS B/D were lost. |
| Shutting Function | Vessel Facility | Reactor Building | | A | ○ | ○<br>Note 1 | × | Damaged from the explosion. |
| | | Primary Containment Vessel (PCV) | | A | － | － | － | Due to periodic check, all fuel were rejected and MSIV was closed. And Well was full of water. |

(Notes) ◎：Opetrated ○：Waiting △：Stopped due to normal power stop ×：Function lost or Out of waiting
－：Stopped due to periodic check(No demand of function)

Note 1:At Unit 5, which registered a large seismic scale at main shock of the earthquake, Residual Heat Removal System was used on Mar.19 after the earthquake. According to patrol by an operator, there was no large damage in each system and equipment. The peak acceleration of observation record at the basement of Reactor Building which the system and equipment were installed in was less than the acceleration to keep dynamic function of equipment*. Therefore, each function of the system is supposed to be ensured.
*JEAC4601-2008

Note 2:The reason that Residual Heat Removal System Pump powered from Diesel Generator was not restarted before arrival of Tsunami is that the status of the Pump was stable and not supposed to damage fuel cooling system early, based on confirmation that water level of spent fuel pool was full (around the level of overflow) and a water temperature was around 27℃ before the earthquake.

## 1F-5 Status of Emergency Core Cooling System(ECCS)

| | | | Place | Anti-Earthquake Class | When earthquake scram | From earthquake scrum to arrival of Tsunami | Since arrival of Tsunami | Remarks |
|---|---|---|---|---|---|---|---|---|
| Cooling Function | ECCS | **R H R**(A) | R/B Basement Floor (OP.940) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, both power and RHRS A/C were lost. |
| | | **R H R**(B) | R/B Basement Floor (OP.940) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, both power and RHRS B/D were lost. |
| | | **R H R**(C) | R/B Basement Floor (OP.940) | A | ○ | ○ | ◎ | After Tsunami, both power and RHRS A/C were lost. Temporary underwater pump got installed and operated from Mar.19 when power restored.<br>* Operated in SHC and Emergency thermal load mode by turns. |
| | | **R H R**(D) | R/B Basement Floor (OP.940) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, both power and RHRS B/D were lost. |
| | | **R H R S**(A) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | **R H R S**(B) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | **R H R S**(C) | Outdoors (OP.4000) | A | ○ | ○ | ◎ | After Tsunami, when water level decreased, After earthquake and Tsunami,started automatically. And then,high-pressure steam was lost.On Mar.18, temporary underwater pump was installed, and powered from temporary power panel.(One equipment per RHRS A/C) |
| | | **R H R S**(D) | Outdoors (OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | CS(A) | R/B Basement Floor (OP.940) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, both power and RHRS A/C were lost. |
| | | CS(B) | R/B Basement Floor (OP.940) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, both power and RHRS B/D were lost. |
| | | HPCI | R/B Basement Floor (OP.940) | A | − | − | − | Under suspension due to periodic check |
| | Water injection to Reactor | **R C I C** | R/B Basement Floor (OP.940) | A | − | − | − | Under suspension due to periodic check |
| | | MUWC (back-up water injection) | T/B Basement Floor (OP.4900) | B | ◎ | ◎ | ◎ | After earthquake, started. After Tsunami, power was lost. |
| | Pool Cooling | SFP Cooling (FPC) | R/B 3rd Floor (OP.32700) | B | ◎ | △ | ○ | After earthquake, normally powered-off. After Tsunami, SW was lost. |
| | | SFP Cooling (RHR) | R/B Basement Floor (OP.940) | A | ○ | ○ | ◎ | After Tsunami, both power and RHRS A/C were lost. Temporaty underwater pump was installed and was operated from Mar.19 when power restored. * Operated in SHC and Emergency thermal load mode by turns. |
| Shutting Function | Vessel Facility | Reactor Building | | A | ○ | ○<br>Note 1 | × | After Tsunami,on Mar. 18,made an air-hole on the roof.（Anti-hydrogen staying: preventive mentenance） |
| | | Primary Containment Vessel (PCV) | | A | ○ | ○ | ○ | No possibility of damage in Primary Containment Vessel accoding to the pressure level. |

(Notes) ◎：Opetrated　○：Waiting　△：Stopped due to normal power stop　×：Function lost or Out of waiting
－：Stopped due to periodic check(No demand of function)

Note 1:At Unit 5, which registered a large seismic scale at main shock of the earthquake, Residual Heat Removal System was used on Mar.19 after the earthquake. According to patrol by an operator, there was no large damage in each system and equipment. The peak acceleration of observation record at the basement of Reactor Building which the system and equipment were installed in was less than the acceleration to keep dynamic function of equipment*. Therefore, each function of the system is supposed to be ensured.

*JEAC4601-2008

## 1F-6 Status of Emergency Core Cooling System(ECCS)

| | | | Place | Anti-Earthquake Class | When earthquake scram | From earthquake scrum to arrival of Tsunami | Since arrival of Tsunami | Remarks |
|---|---|---|---|---|---|---|---|---|
| Cooling Function | ECCS | **R H R**(A) | R/B<br>Basement<br>2nd Floor<br>(OP.1000) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, RHRS A/C was lost. |
| | | **R H R**(B) | R/B<br>Basement<br>2nd Floor<br>(OP.1000) | A | ◎<br>(SHC operation) | ○ | ◎ | When earthquake happened, stopped due to blackout.(Note 2)<br>After Tsunami, RHRS B/D was lost.<br>Temporaty underwater pump was installed on Mar.18 and operated from Mar.19(power restoration) * Operated in SHC and Emergency thermal load mode by turns. |
| | | **R H R**(C) | R/B<br>Basement<br>2nd Floor<br>(OP.1000) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, RHRS B/D was lost.Temporaty underwater pump was installed on Mar.18 and was powered |
| | | **R H R S**(A) | Outdoors<br>(OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | **R H R S**(B) | Outdoors<br>(OP.4000) | A | ◎<br>(SHC operation) | ○ | ◎ | When earthquake happened, stopped due to blackout.(Note 2)<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost.<br>Temporaty underwater pump was installed on Mar.18 and was powered from temporary power panel.(2 per RHRS B/D) |
| | | **R H R S**(C) | Outdoors<br>(OP.4000) | A | ○ | ○<br>Note 1 | × | When Tsunami came, the main equipment got drenched with sea water ,and power was lost. |
| | | **R H R S**(D) | Outdoors<br>(OP.4000) | A | ◎<br>(SHC operation) | ○ | ◎ | When earthquake happened, stopped due to blackout.(Note 2)<br>When Tsunami came, the main equipment got drenched with sea water ,and power was lost.<br>Temporaty underwater pump was installed on Mar.18 and was powered from temporary power panel.(2 per RHRS B/D) |
| | | **L P C S** | R/B<br>Basement<br>2nd Floor<br>(OP.1000) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, RHRS A/C was lost. |
| | | **H P C S** | R/B<br>Basement<br>2nd Floor<br>(OP.1000) | A | ○ | ○<br>Note 1 | ○ | After Tsunami, DG（H）SW was lost. |
| | Water injection to Reactor | **R C I C** | R/B<br>Basement<br>2nd Floor<br>(OP.1000) | A | ー | ー | ー | Under suspension due to periodic check |
| | | MUWC<br>(back-up water injection) | T/B<br>Basement<br>Floor<br>(OP.3400) | B | ◎ | ◎ | ◎ | As for B-System, D/G B-System was operated powered by D-System. |
| | Pool Cooling | SFP Cooling<br>(FPC) | R/B 4th Floor<br>(OP.34000) | B | ◎ | △ | ○ | After earthquake, normally powered-off. After Tsunami, SW was lost. |
| | | SFP Cooling<br>(RHR) | R/B<br>Basement<br>2nd Floor<br>(OP.1000) | A | ○ | ○<br>Note 1 | × | Temporaty underwater pump was installed on Mar.18 and was powered from temporary power panel. * Operated in SHC and Emergency thermal load mode by turns. |
| Shutting Function | Vessel Facility | Reactor Building | | A | ○ | ○<br>Note 1 | × | After Tsunami,on Mar. 18,made an air-hole on the roof.（Anti-hydrogen staying: preventive mentenance） |
| | | Primary Containment Vessel (PCV) | | A | ○ | ○ | ○ | No possibility of damage in Primary Containment Vessel accoding to the pressure level. |
| Other equipment | | | | | | | | |

(Notes) ◎：Opetrated ○：Waiting ×：Function lost or Out of waiting ー：Stopped due to periodic check(No demand of function)

Note 1:At Unit 5, which registered a large seismic scale at main shock of the earthquake, Residual Heat Removal System was used on Mar.19 after the earthquake. According to patrol by an operator, there was no large damage in each system and equipment. The peak acceleration of observation record at the basement of Reactor Building which the system and equipment were installed in was less than the acceleration to keep dynamic function of equipment*. Therefore, each function of the system is supposed to be ensured.
*JEAC4601-2008

Note 2:The reason that Residual Heat Removal System Pump powered from Diesel Generator was not restarted before arrival of Tsunami is that the status of the Pump was stable and not supposed to damage fuel cooling system early, based on confirmation that water level of spent fuel pool was full (around the level of overflow) and a water temperature was around 27℃ before the earthquake.

# REFERENCE

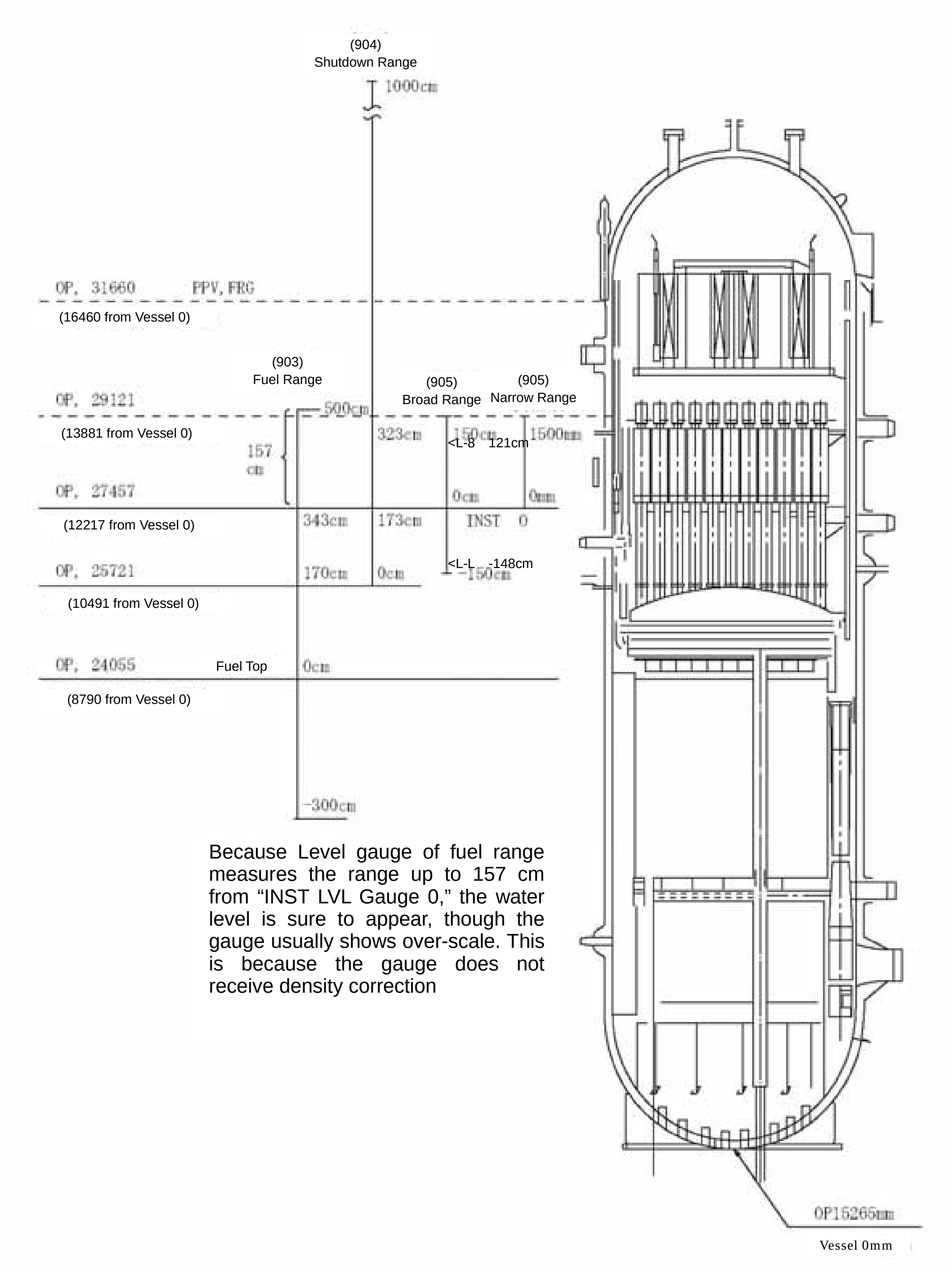
(1) Gross Range of Reactor’s Water Level Gauge

- Fukushima Daiichi Unit 1
- Fukushima Daiichi Unit 2
- Fukushima Daiichi Unit 3
- Fukushima Daiichi Unit 4
- Fukushima Daiichi Unit 5
- Fukushima Daiichi Unit 6

(2) Emergency steam condenser (Schematic diagram)

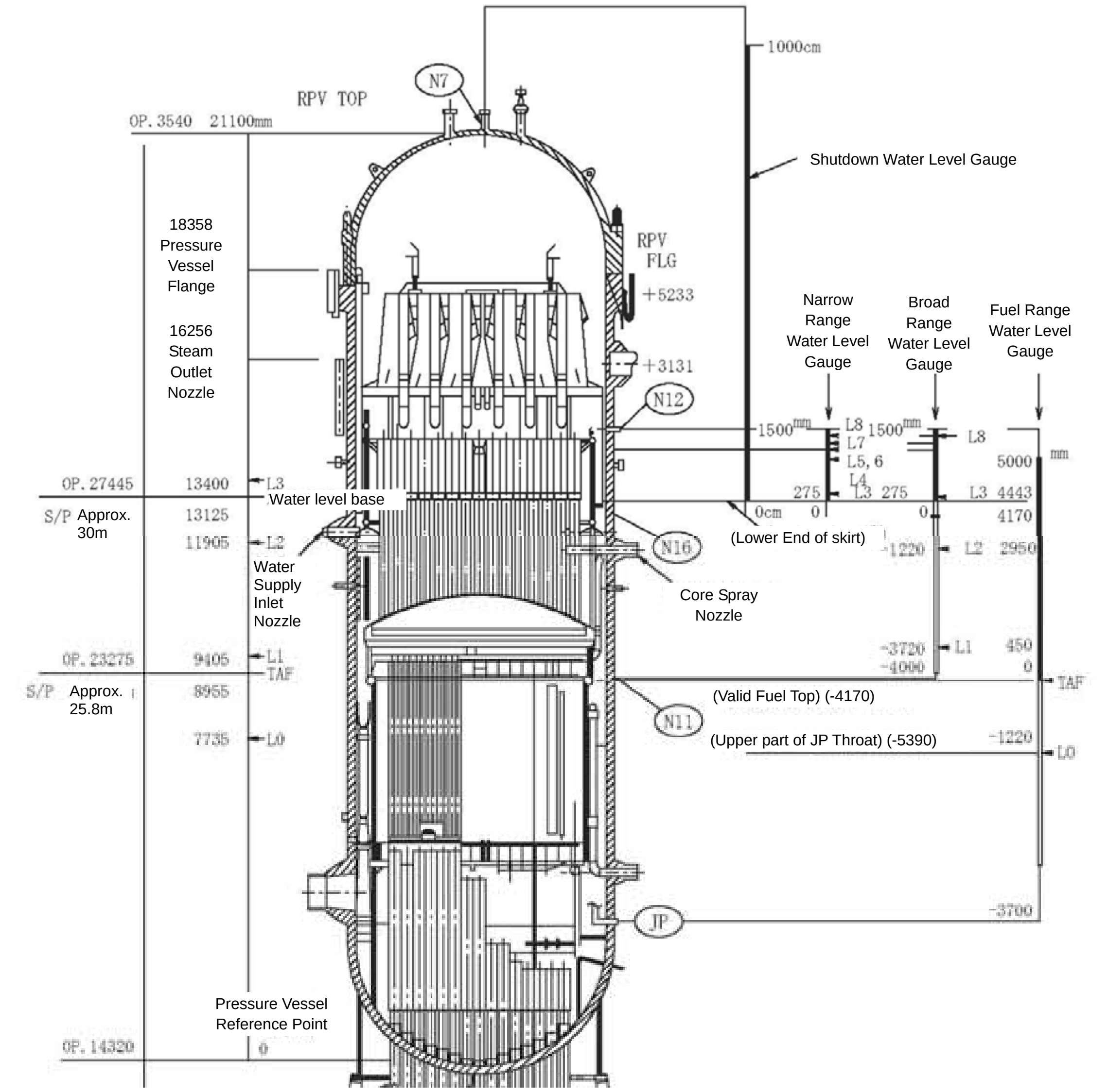
(3) Maximum Acceleration Recorded on the Lowest Basement of Reactor Building at Tohoku-Chihou-Taiheiyo-Oki Earthquake

(4) [Overview] Findings of Tsunami Survey at Fukushima Daiichi Nuclear Power Station

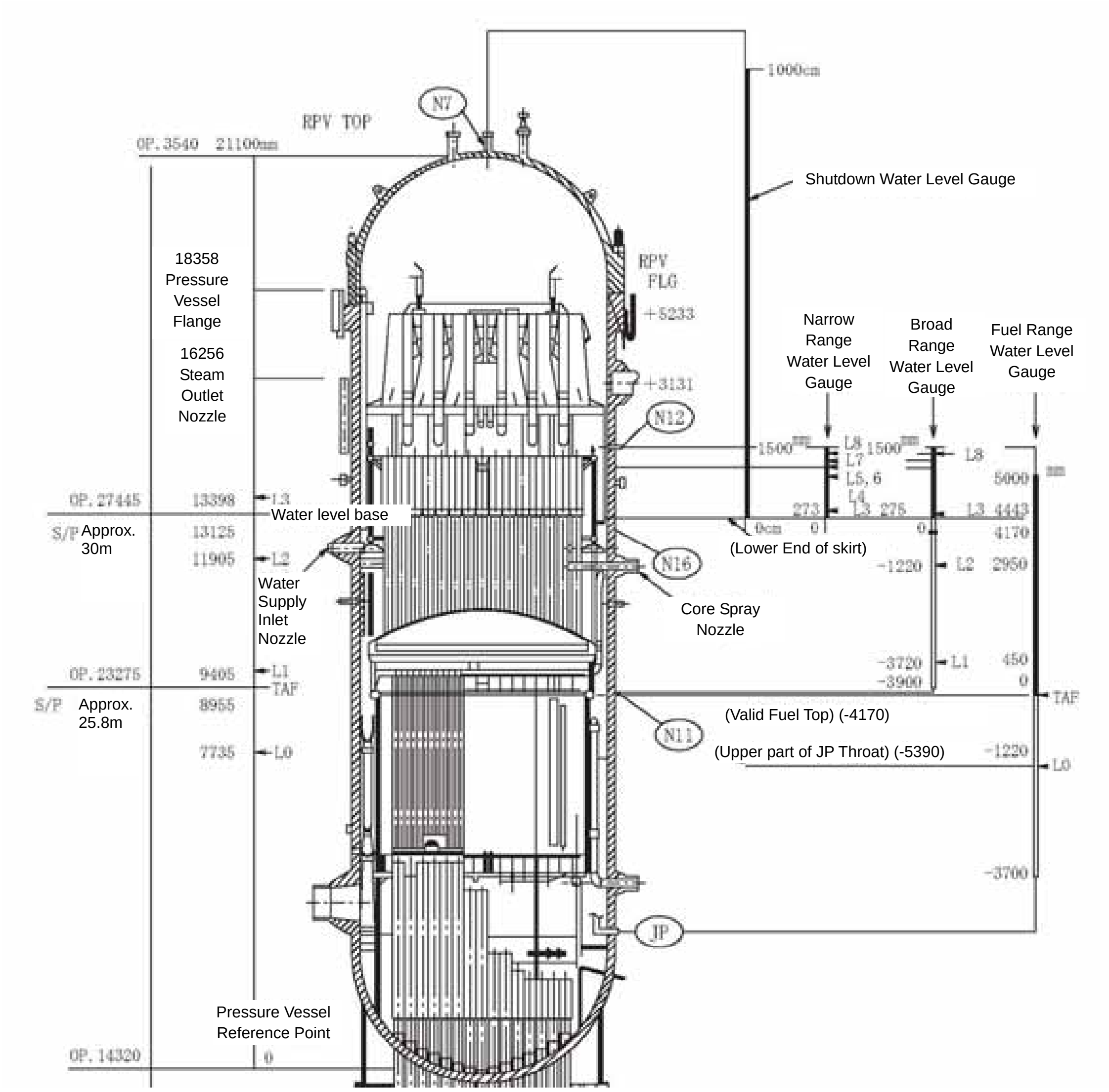


Because Level gauge of fuel range measures the range up to 157 cm from “INST LVL Gauge 0,” the water level is sure to appear, though the gauge usually shows over-scale. This is because the gauge does not receive density correction

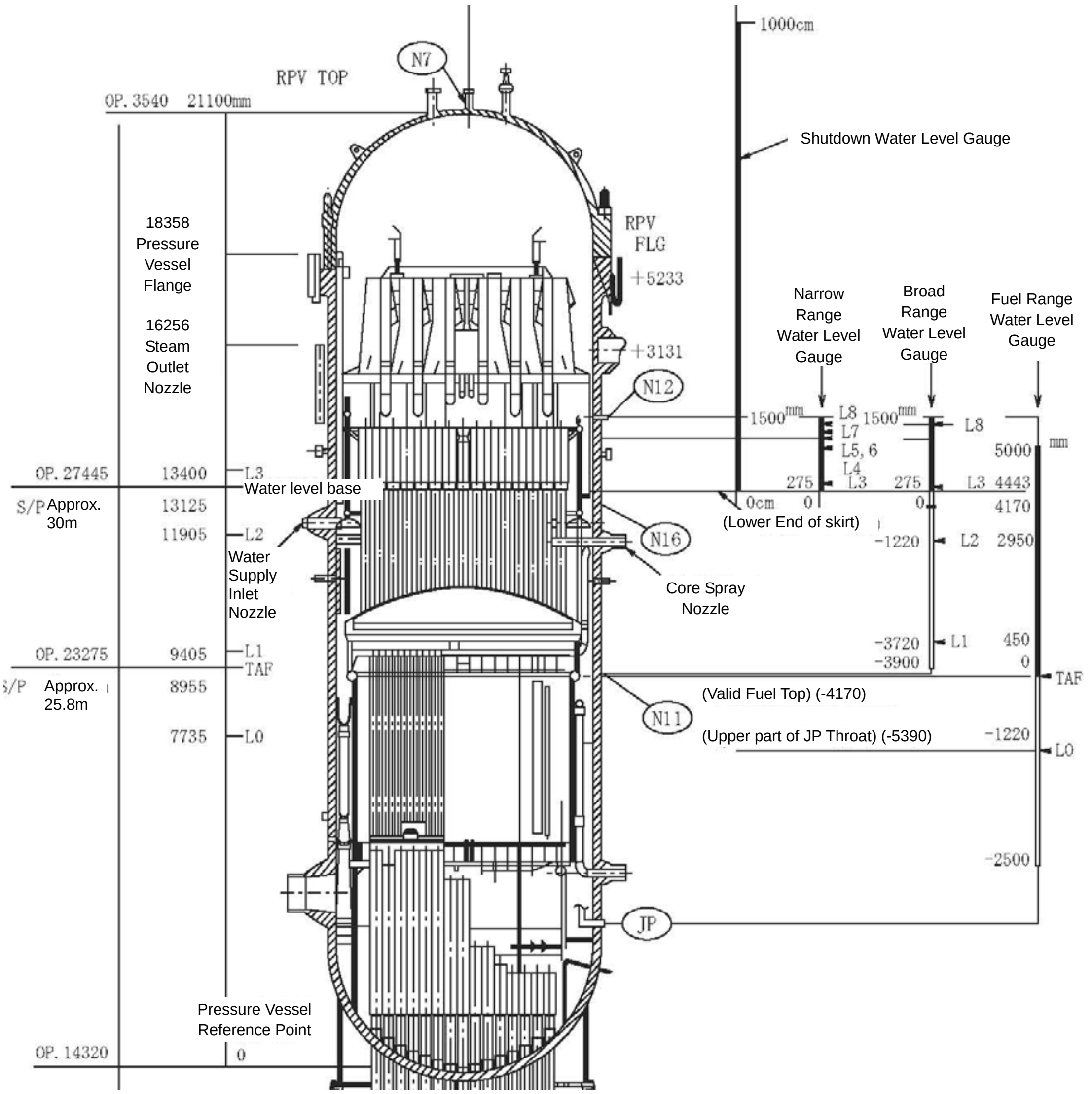
Gross Range of Reactor’s Water Level Gauge
(Fukushima Daiichi Unit 1)



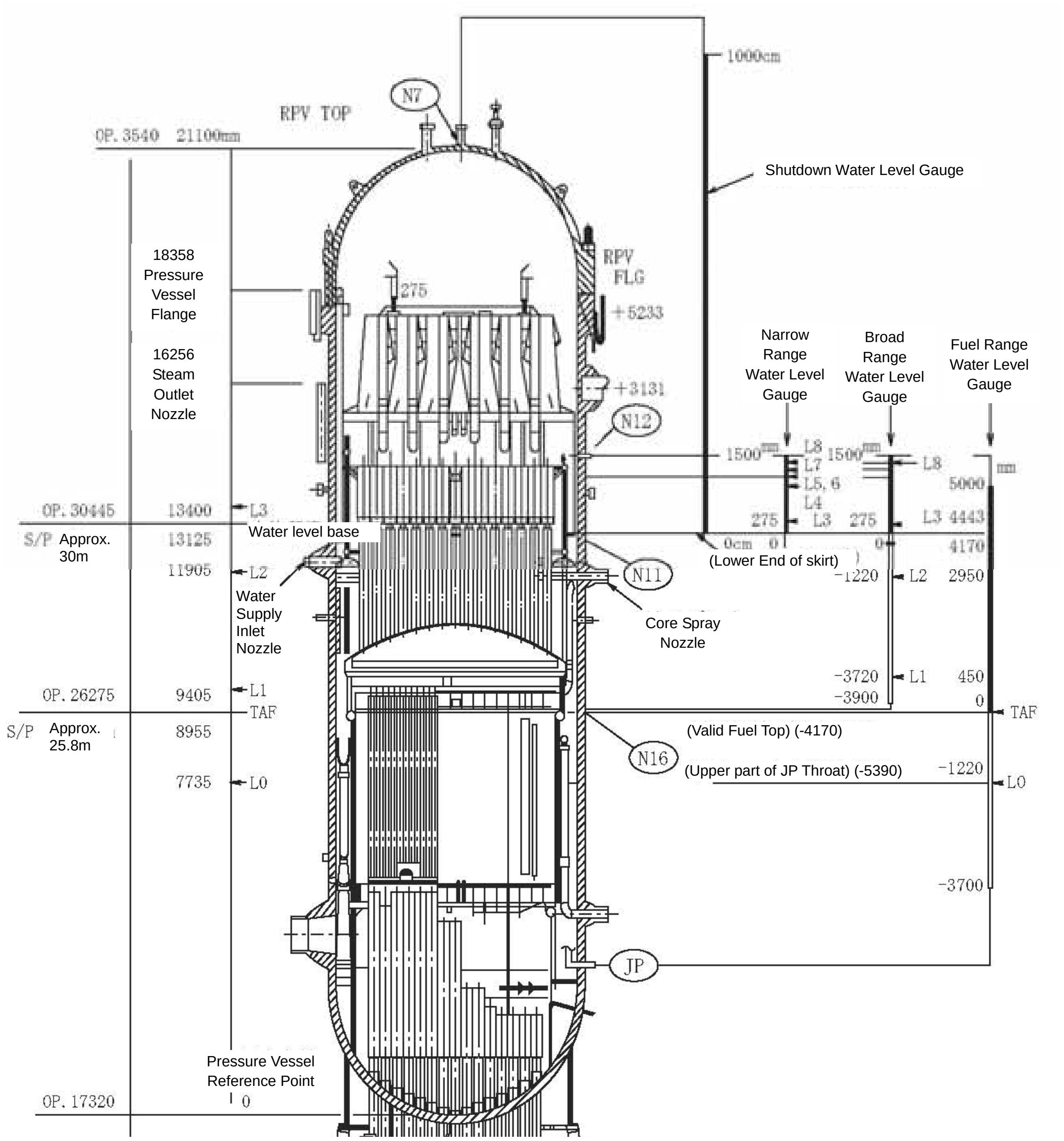
Gross Range of Reactor’s Water Level Gauge
(Fukushima Daiichi Unit 2)



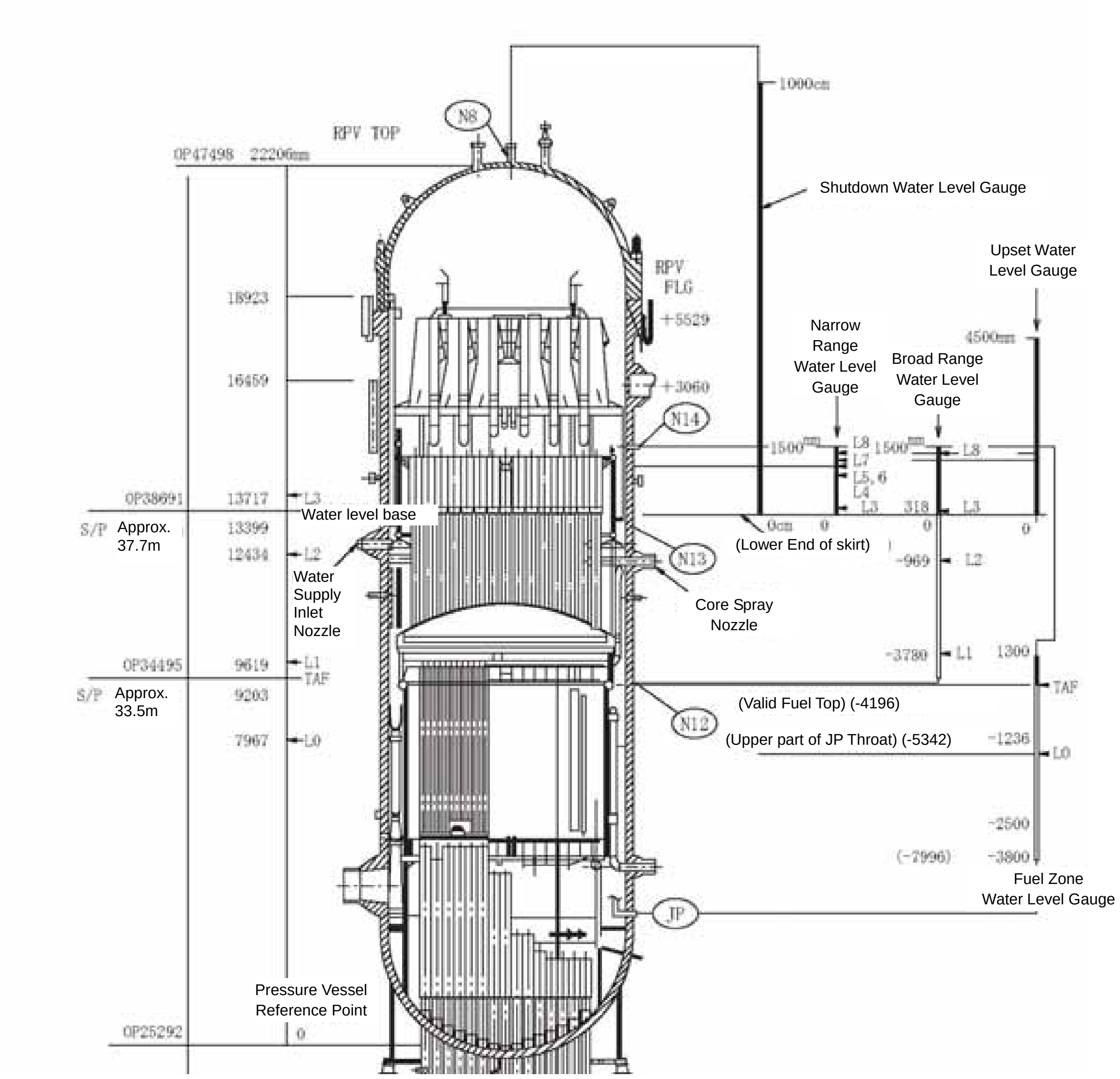
Gross Range of Reactor's Water Level Gauge
(Fukushima Daiichi Unit 3)



Gross Range of Reactor’s Water Level Gauge
(Fukushima Daiichi Unit 4)

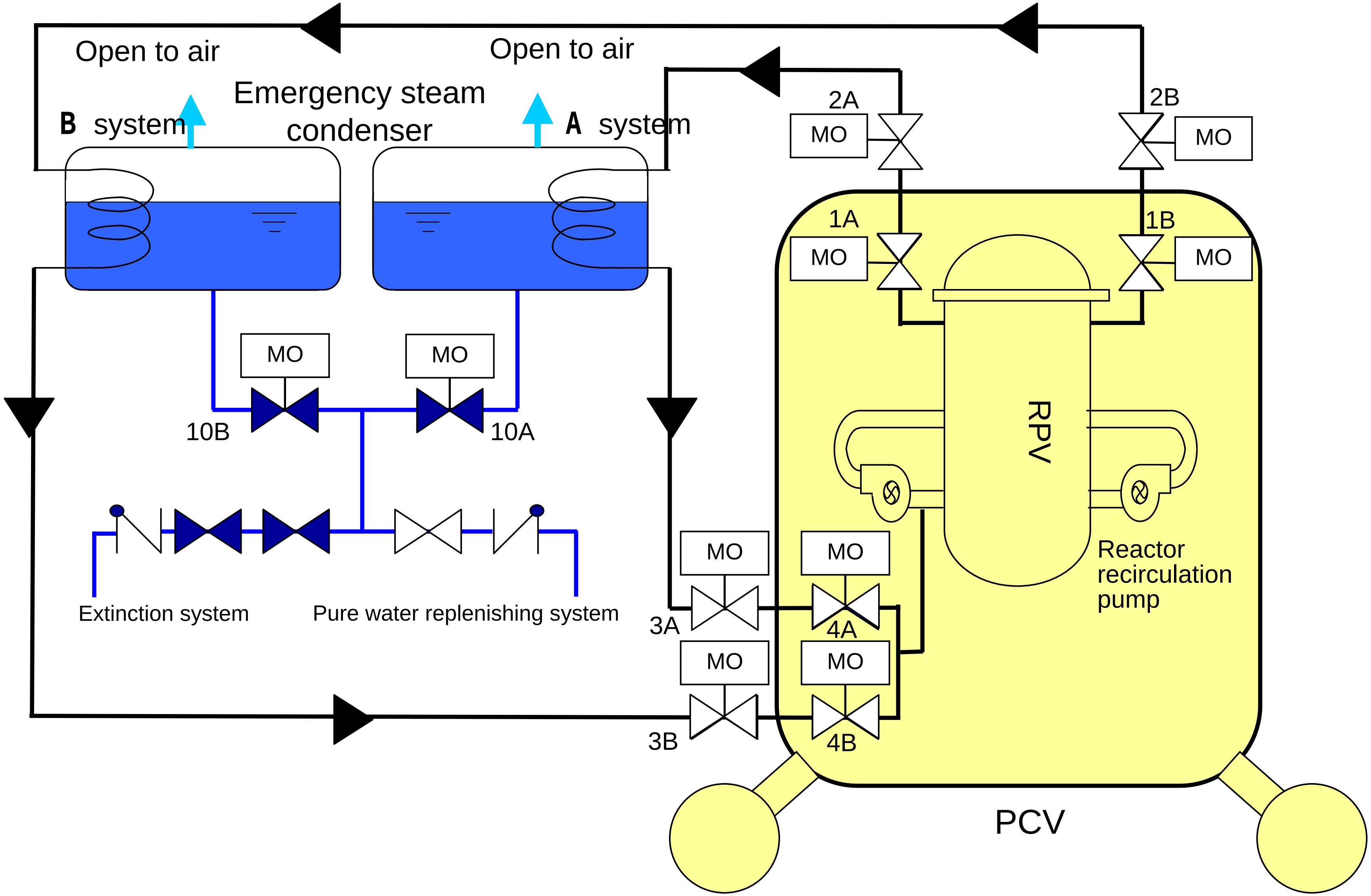


Gross Range of Reactor’s Water Level Gauge
(Fukushima Daiichi Unit 5)



Gross Range of Reactor’s Water Level Gauge
(Fukushima Daiichi Unit 6)

Reference－7



Emergency steam condenser (Schematic diagram)

Reference-2

Reference-3

## Maximum Acceleration Recorded on the Lowest Basement of Reactor Building at　Tohoku-Chihou-Taiheiyo-Oki Earthquake

| Point of observation（Lowest basement of Reactor Building） | | Record of observation（tentative※1） | | | Maximum response acceleration to basic earthquake ground motion :SS（gal） | | |
|---|---|---|---|---|---|---|---|
| | | Maximum acceleration（gal） | | | | | |
| | | S-N direction | E-W direction | Up-Down direction | S-N direction | E-W direction | Up-Down direction |
| Fukushima Daiichi NPS | Unit 1 | 460※2 | 447※2 | 258※2 | 487 | 489 | 412 |
| | Unit 2 | 348※2 | 550※2 | 302※2 | 441 | 438 | 420 |
| | Unit 3 | 322※2 | 507※2 | 231※2 | 449 | 441 | 429 |
| | Unit 4 | 281※2 | 319※2 | 200※2 | 447 | 445 | 422 |
| | Unit 5 | 311※2 | 548※2 | 256※2 | 452 | 452 | 427 |
| | Unit 6 | 298※2 | 444※2 | 244 | 445 | 448 | 415 |

※１：These records are tentative and subject to change by further consideration

※２：It took 130 to 150 for to start recording and finish it.

【Note】Scram setting value of each unit (A reactor will automatically shutdown once it exceeded its scram setting value）

| | Scram setting value（gal） | | | | |
|---|---|---|---|---|---|
| | Unit | Horizontal direction | Where to install | Up-Down direction | Where to install |
| Fukushima Daiichi | Units 1 to 5 | 135 | B1F | 100 | B1F |
| | Unit 6 | | B2F | | B2F |

# 【Overview】Findings of Tsunami Survey at Fukushima Daiichi Nuclear Power Station (1/3)

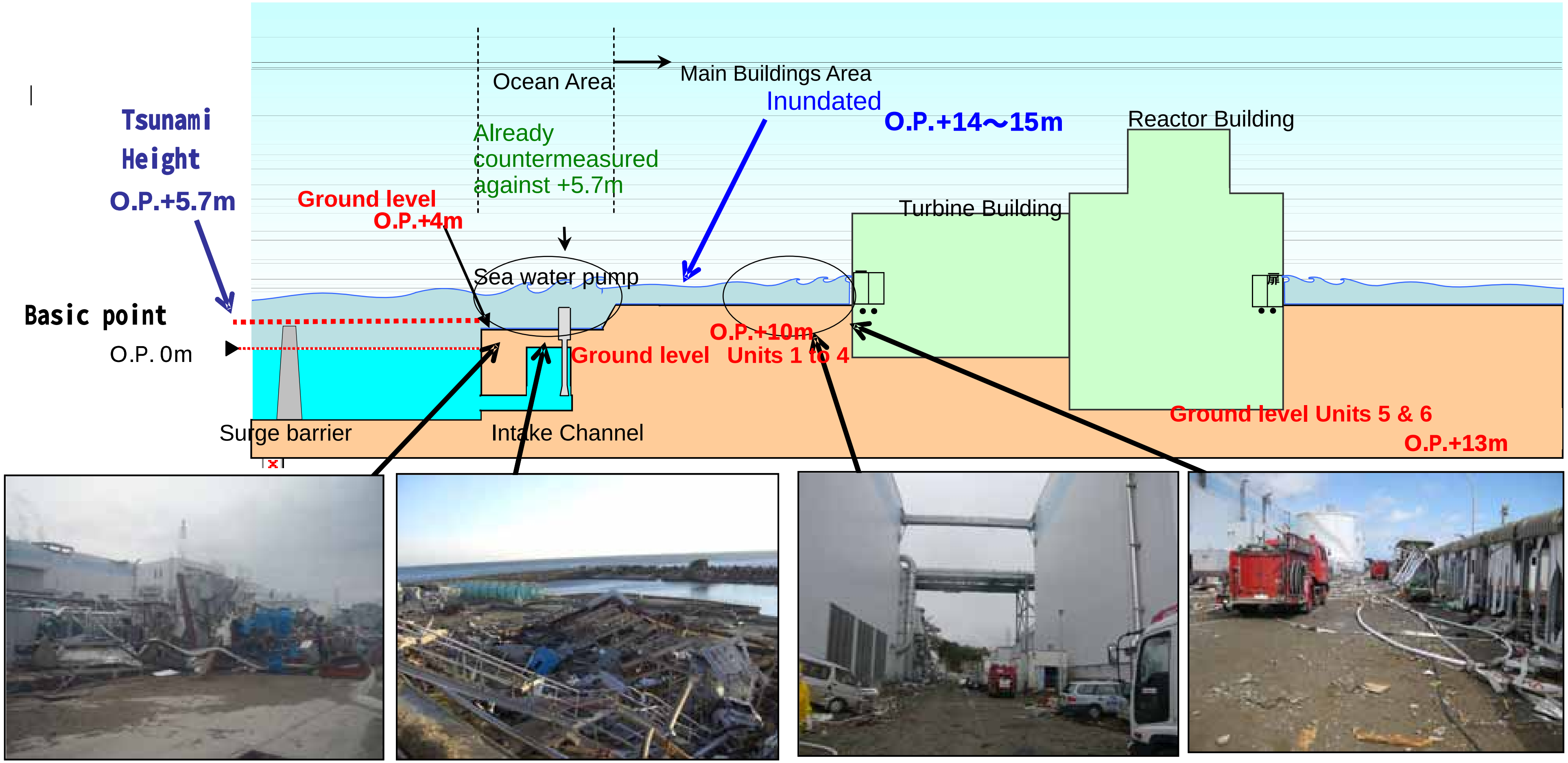
We surveyed the tsunami of Tohoku-Chihou-Taiheiyo-Oki Earthquake that hit Fukushima Daiichi Nuclear Power Station on March 11, 2011. Out of consideration of the impact caused by the crustal movement, the height and area of its inundation are as follows:

(1) Inundation Height：The trace left shows that the height of inundation was O.P.+14 to 15 meters that covered almost all the area facing the ocean.

(2) Inundation Area：The tsunami submerged almost all the area facing the ocean (O.P.+4meters) and the area oPointf the main buildings.

(3) Tsunami Height： The trace left shows that the height of the tsunami reached O.P+14.5 meters.

Reference-9

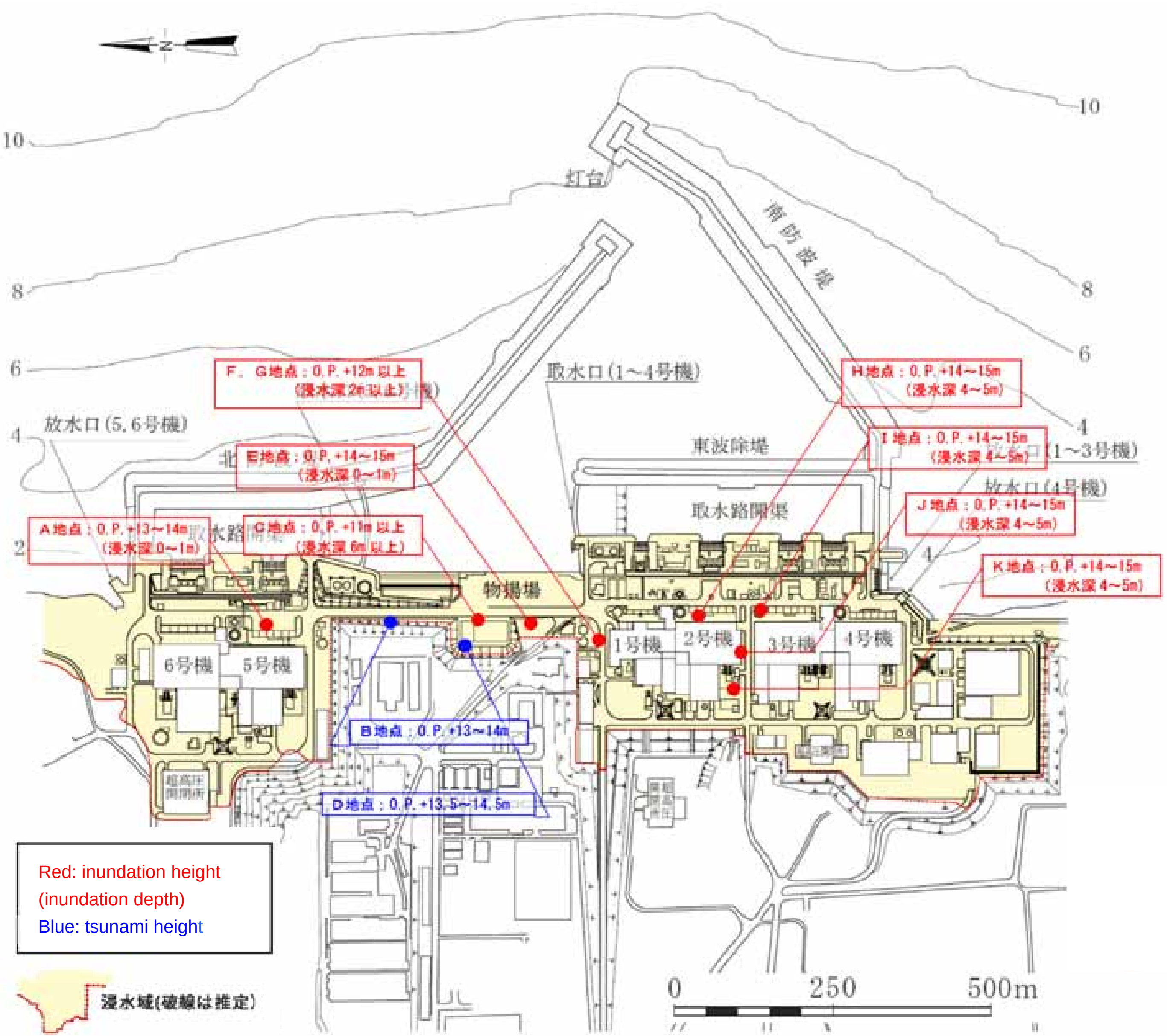


Reference-4

**Tsunami that hit Fukushima Daiichi Nuclear Power Station (Diagram)**

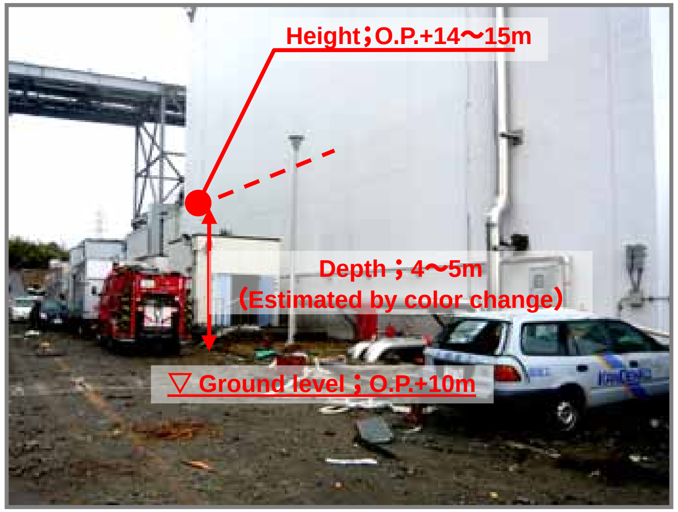
Reference-10

# 【Overview】Findings of Tsunami Survey at Fukushima Daiichi Nuclear Power Station (2/3)

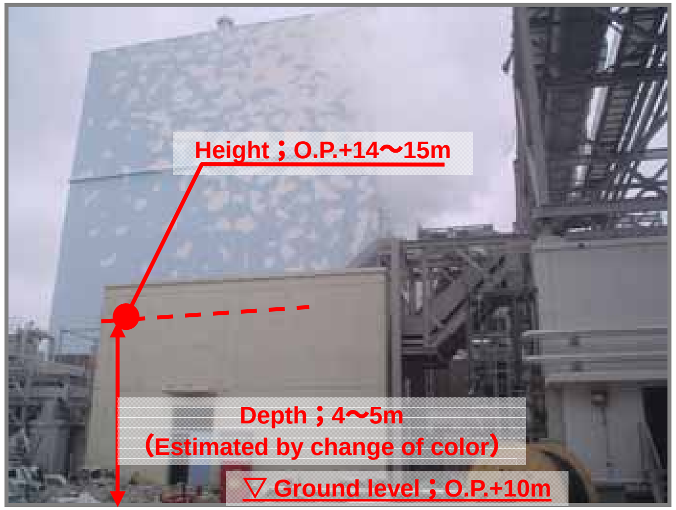


Red: inundation height
(inundation depth)
Blue: tsunami height

Height of Inundation and tsunami, area of inundation at Fukushima Daiichi Nuclear Power Station



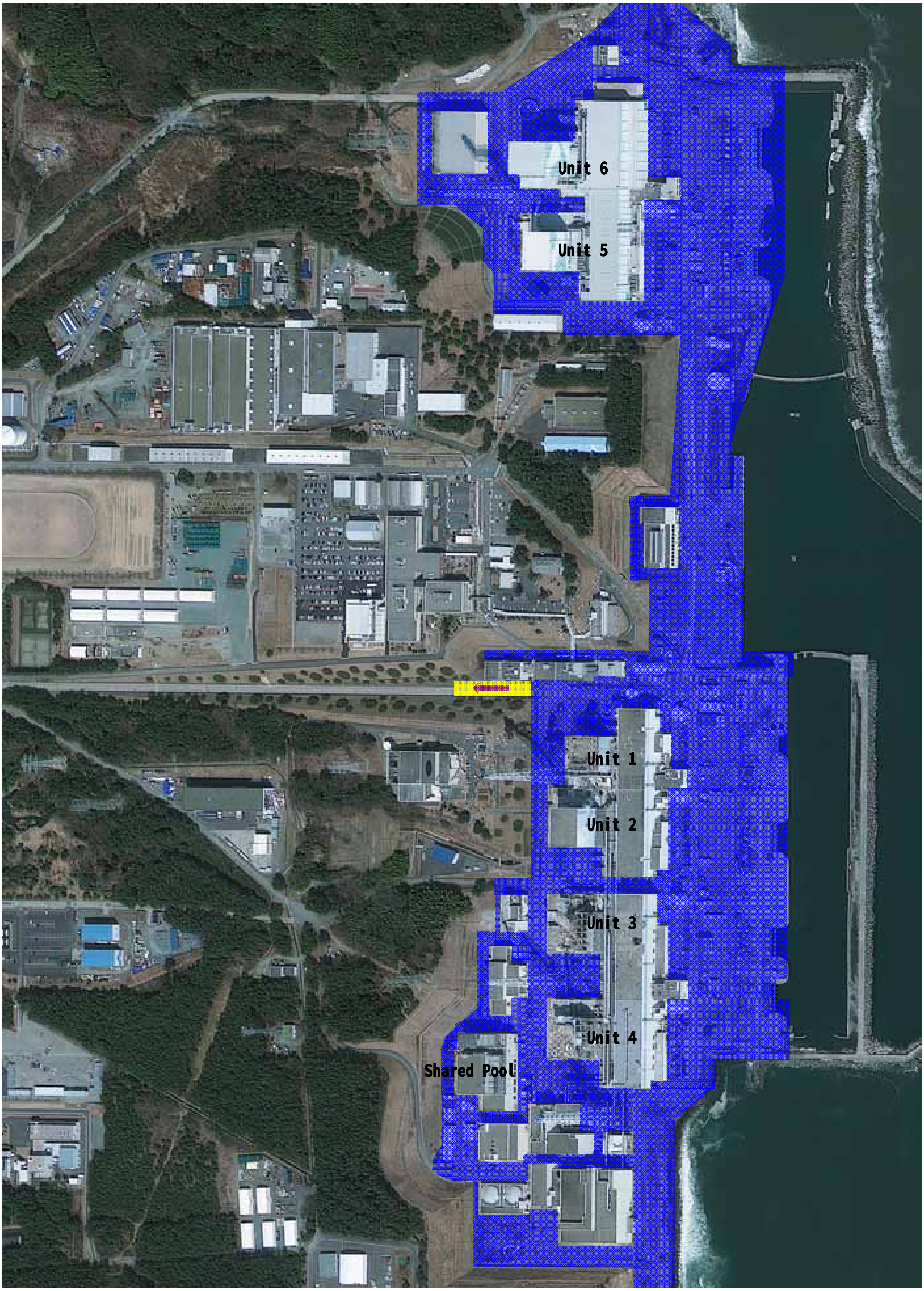
Height of inundation（J）



Height of inundation（K）

# 【Overview】Findings of Tsunami Survey at Fukushima Daiichi Nuclear Power Station (3/3)

## Inundation by the tsunami



⒞ GeoEye

Fukushima Daiichi Nuclear Power Station, 10:04am on March 29, 2011, pictured by GeoEye-1