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Presentation Material

Ceaseless Quest for Safety Improvement after TEPCO Fukushima Daiichi Accidents

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1.

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After the accident, reports were issued by not only Japanese Institution but also international/foreign organizations such as:

- IAEA
- INPO
- WANO
- USNRC
- IRSN ・・・・・・etc.

Fundamental understanding of the accident has been agreeably established.

2.

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After 10-years from the accident, improvement of accessibility to reactor buildings and previous high-radiation areas enables for the NRAJ to obtain new and detailed information.

3.

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The second-phase of accident investigation/analysis of Fukushima Daiichi started from September 2019.

- Field-research inside/around RBs
- Video/Data analysis
- Annual reports
- Database open to international-world (in preparation)
- International cooperation program

・Report of 1st-phase investigation/analysis URL：
・2020 annual report URL：

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4. Topics from the view point of safety

4-1 Peculiar contamination pattern by Cs^{137}

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- Specific contamination pattern in hardened vent lines of unit 1/2.
- Very high contamination at the bottom of the stack in unit 1/2.
- High concentration of Cs^{137} under the Shield Plugs.

Fig 4-1. Contamination Level of Vent Lines

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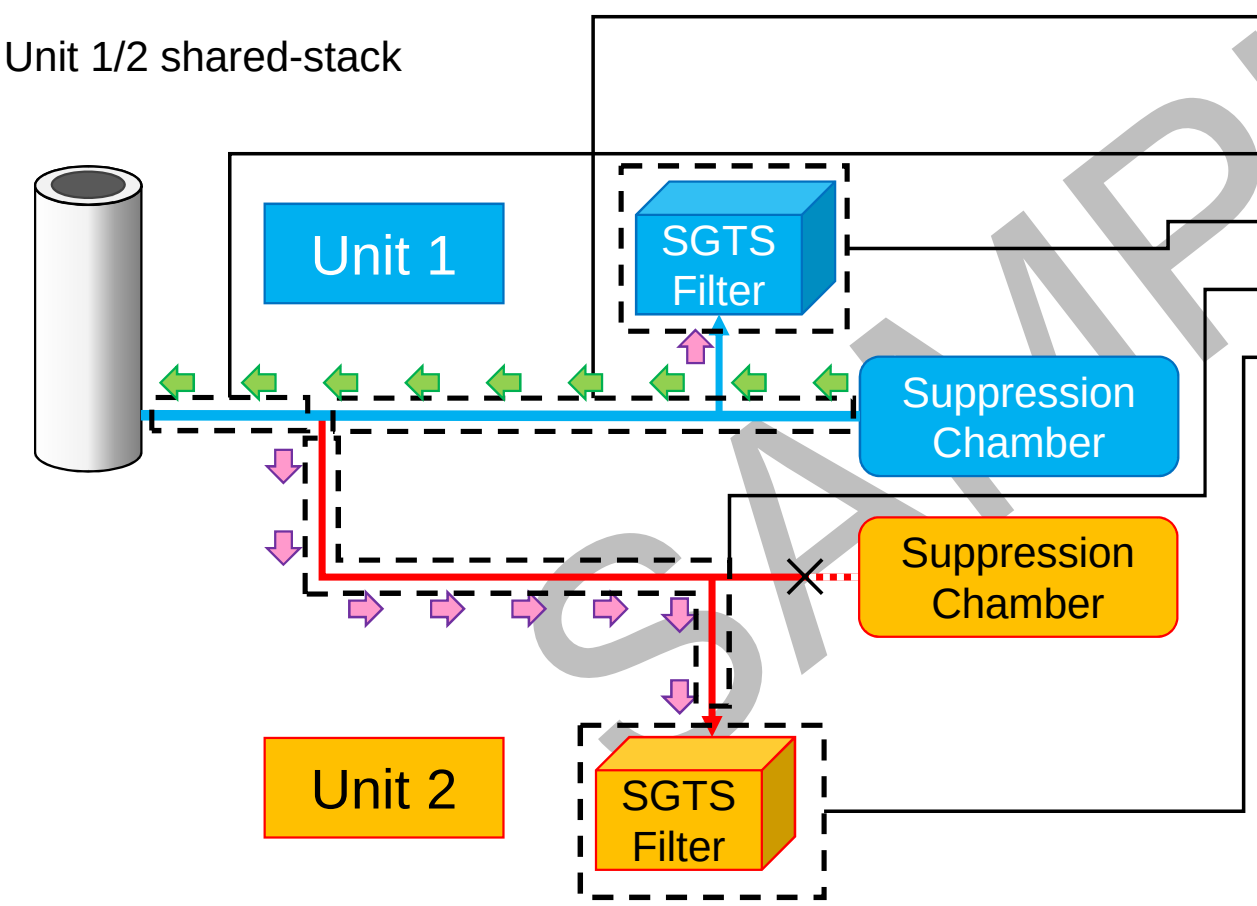


Contamination Level	Flow zone
0.11 TBq	Main Vent Flow
⇒ Relatively Low Contamination	
3.54 TBq	Reverse Flow
≧ 10TBq	Filter Zone
18.3 TBq	Reverse Flow
2 TBq	Filter Zone
⇒ High Contamination	

- Vented gas flow
- Vented gas reverse flow
- Unit1 SGTS pipe line
- Unit2 SGTS pipe line

Fig 4-2. Unit 1/2 Shared-Stack

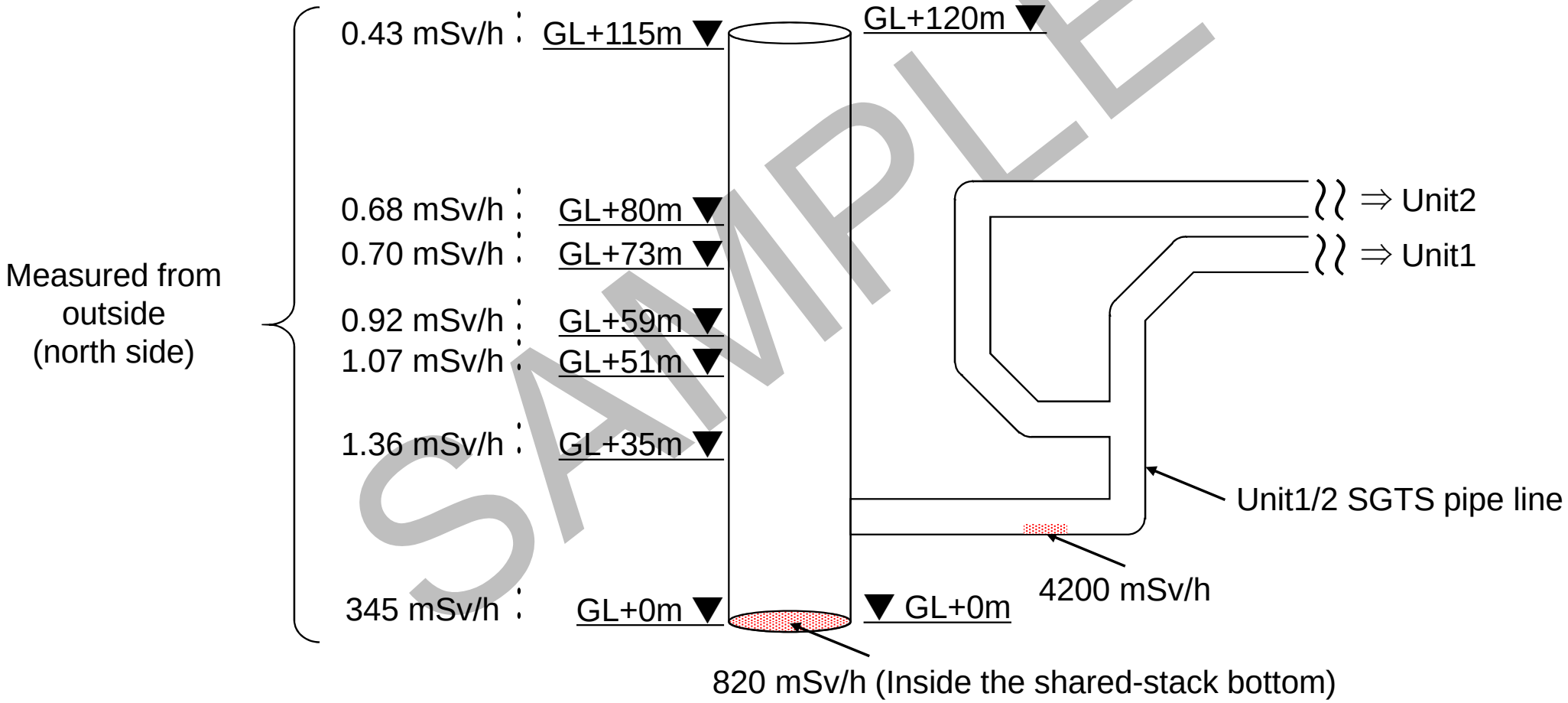
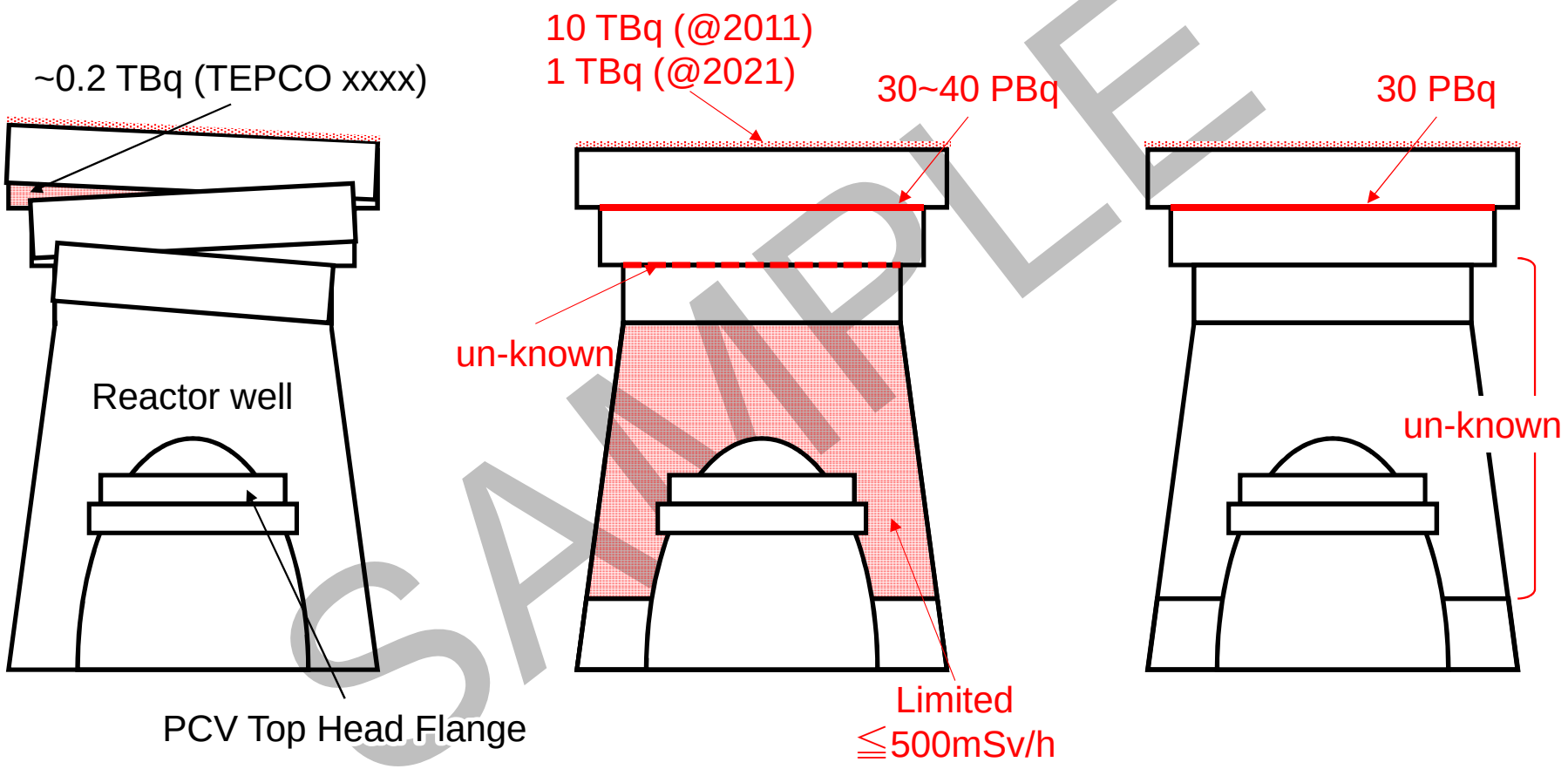


Fig 4-3. Contamination of Shield Plugs



➢ These information can be a clue for understanding the Cs^{137} transfer/release mechanism.

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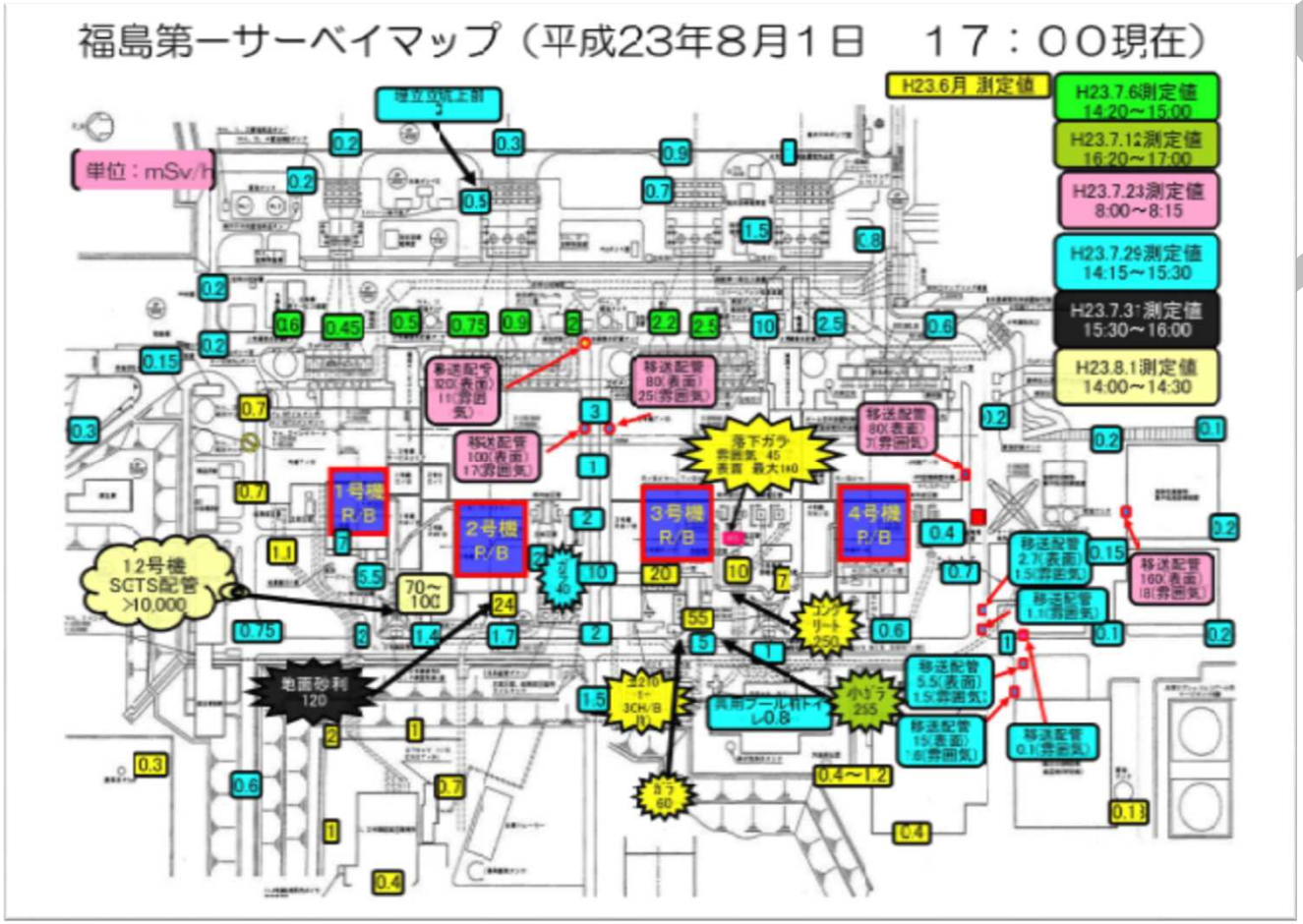
- The knowledge may lead to
  - explanation of the relatively small amount of Cs^{137} release to the environment (around 15-20 PBq).
  - explication of the cause(s) of high radiation field (~10Sv/h in 2011 August) observed near the Unit1/2 shared stack bottom.
  - efficient approach to suppress the Cs^{137} release to the environment

- NRAJ plans to Re-evaluate the benefit of the hardened vent system. (BWRs in Japan still have hardened vent system. Filtered-Venting System is installed) (P)

The high radiation level was one of the major obstacle soon after the accidents.



Survey Map（2011.8.1）

東京電力ホールディングス株式会社
HP（建屋周辺サーベイマップ）より抜粋

4-2 Interlocks

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- Successful venting of Unit3 was triggered by unexpected operation of ADS due to the activation of automatic-start-logic (TEPCO 2017)
- SRVs of Unit2 could not close under SBO condition even after the reactor pressure dropped lower than re-set level. (NRA 2021)
- One of the reasons for prolonged operation of RCIC in Unit2 is possibly loss of interlock function due to DC-loss.
- Some facilities could not restart (even for a short time) due to interlocks.

Interlocks/logics are designed for normal/near normal conditions

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Under Severe Accident Conditions, they might not be appropriate.

Once the accident proceeds and the control of the facilities is lost, the most important action is to restore the control. (P)

NRAJ plans to discuss in the near future about the change of priority with the progress of the severe accident in addition to the necessity of regulatory requirements for manual over-ride function to specific facilities/installation at extreme conditions. (P)

4-3 Hydrogen Explosions

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- At Unit1 and Unit3, venting activities were taken after hydrogen leaked from PCV to reactor buildings.
- 3rd floor of Unit3 was severely damaged. (NRA 2021)
- Close investigation of Unit4 indicated that hydrogen explosion occurred not only on the operation floor (5th floor), but also in CRD exchange room on 3rd floor. (NRA 2021)
- Unit4's reactor building was damaged by hydrogen explosion around 40 hours after the final hydrogen supply from the Unit3. (NRA 2021)
- Investigation inside the Unit2 reactor building shows that the path(s) from reactor well to SGTS ducts existed. (TEPCO xxxx)

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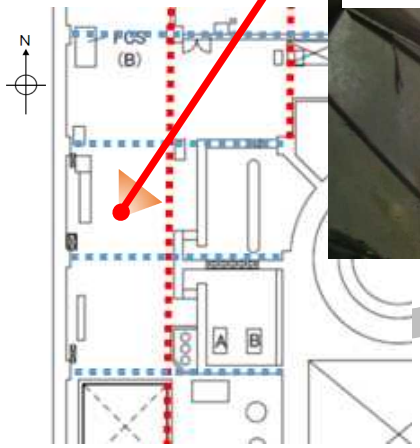
NRAJ observed that some beams of the 3rd floor ceiling broke.
NRAJ considers this indicates that some explosions occurred in the 4th floor.

Unit3 R/B 3rd floor

(P)



Main beam
Sub beam

3rd floor

Photo by NRAJ
2020/9/18

(P)

Unit 4 R/B 3rd floor (North side) CRD repair room

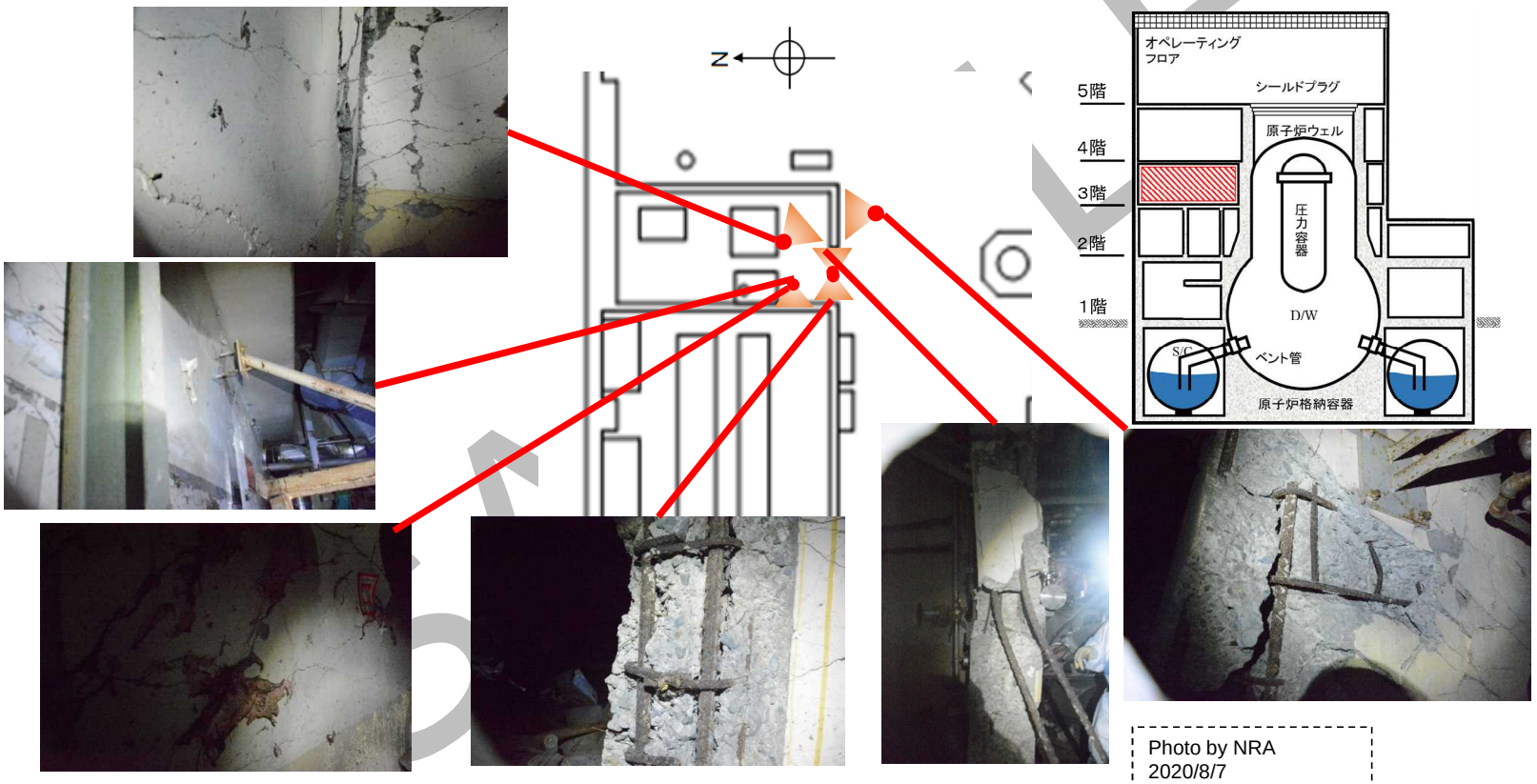


Photo by NRA
2020/8/7

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After the 1F accident, various improvement was implemented. However, it is not certain that the possibility of Hydrogen leakage/Hydrogen explosion is eliminated in all area.

If not:

⇒Constraints to Severe Accident management?

- personnel
- electricity resupply

⇒More active measures to reduce the possibility of Hydrogen-leakage/Hydrogen explosion?

NRAJ begins to discuss on these issues. (P)

Topics 5.

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Investigation/analysis of detailed situation of the 1F facilities leads to:

- More precise understanding of related phenomena
- Improvement of regulation
- Safer decommissioning
- Reasonable waste management

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Ceaseless Quest for Safety Improvement!!

Appendix

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