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Integrated Coping Strategies for Beyond-Design-Basis External Events

Jaewhan Kim and Kwang-II Ahn

KAERI



Korea Atomic Energy
Research Institute

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Damage Conditions by the Earthquake and Tsunami at the Fukushima Daiichi

- Loss of Off-site Power (by the Earthquake)
- Loss of On-site Power
- Loss of Batteries
- Loss of Seawater Intake (Loss of Access to Ultimate Heat Sink)

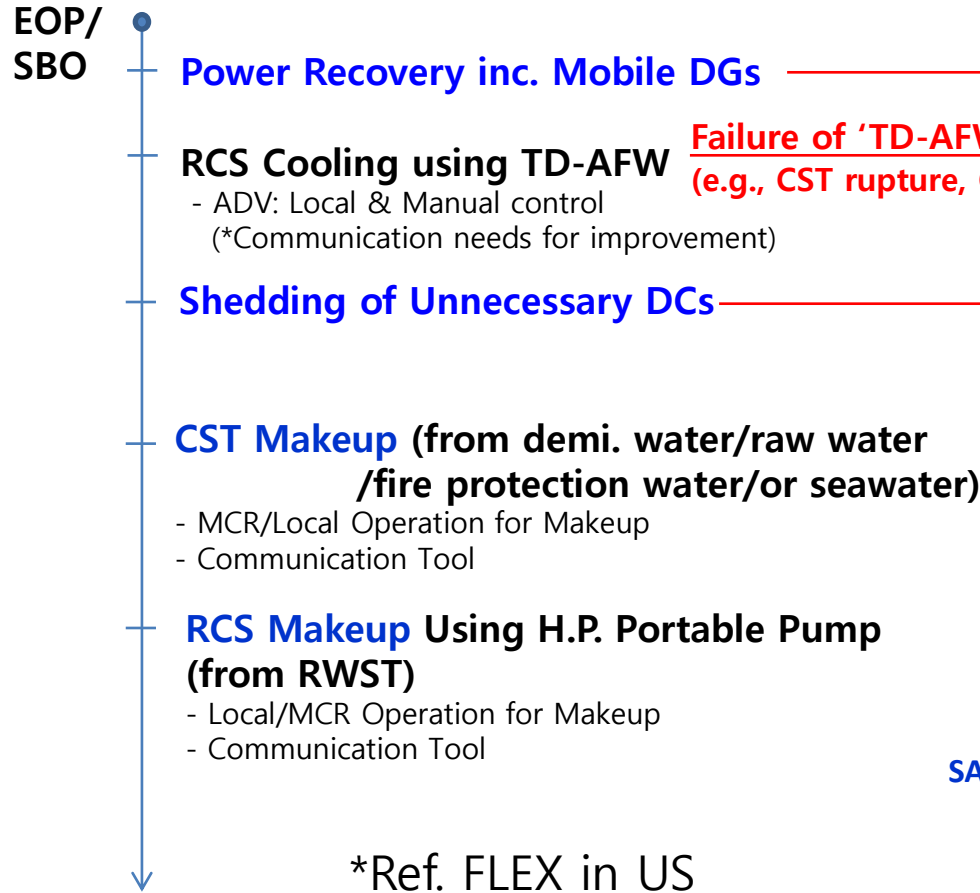


- Loss of Core Cooling
- Core Uncovery, Fuel Melt, Hydrogen Generation
- Hydrogen Explosion
- Vessel/Containment Failure
- Release of Fission Products

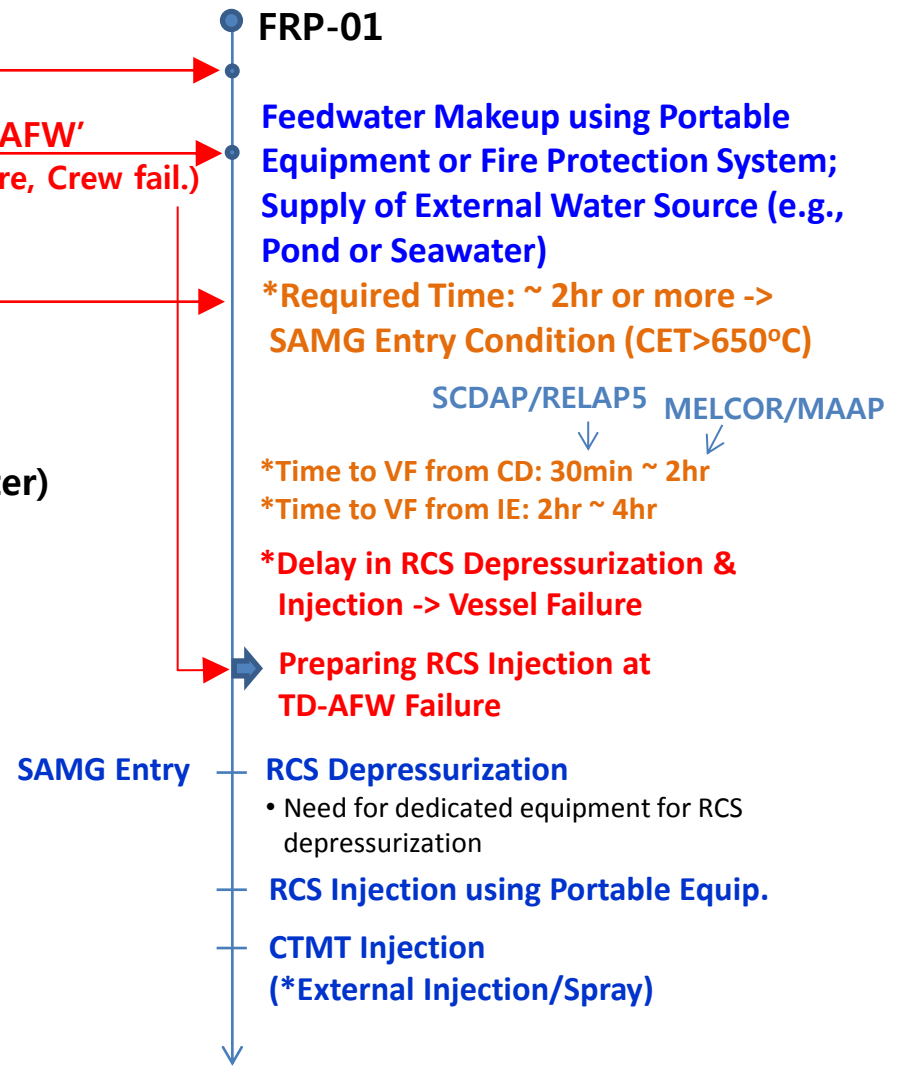


iROCS' Coping Strategy for Damage Condition ① and ②

* Coping Strategy for Condition ①



* Coping Strategy for Condition ②



'Available Time vs. Required Time' under Early Failure of TD-AFW

Available Time from Accident Analysis Codes for SBO under TD-AFW Failure

	SCDAP/ RELAP5	MELCOR	MAAP5
Rx Trip	0	0	0
Core Uncovery	6,580 sec (1.8 hr)	6,556 sec (1.8 hr)	6,870 sec (1.9 hr)
Rx Vessel Failure	8,570 sec (2.3 hr)	15,237 sec (4.2 hr)	13,300 sec (3.6 hr)
Time from CU to RVF	0.5 hr	2.4 hr	1.7 hr

Required Time to Deploy Portable Equipment:

- 2hr or more (depends on degree of plant damage)



Failure to maintain Reactor Vessel Integrity, If RCS Depressurization and Injection Strategy is to be Initiated after SAMG Entry Condition is met

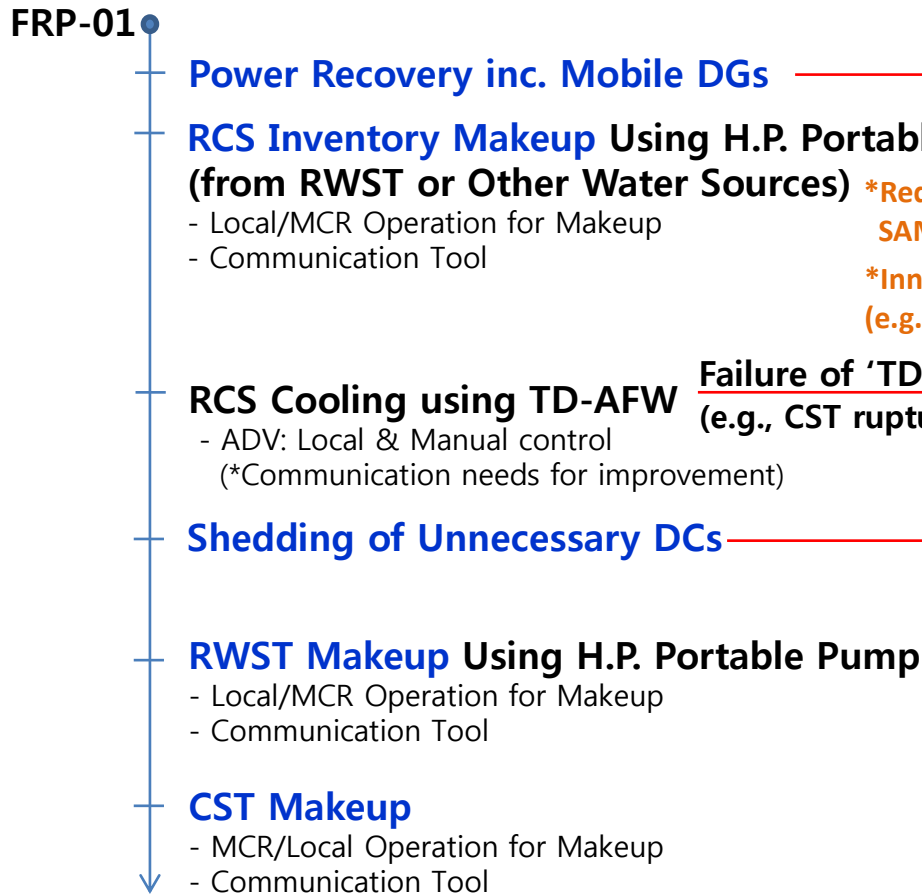
**Ref. SAMG Entry Condition
(CET > 650°C)**



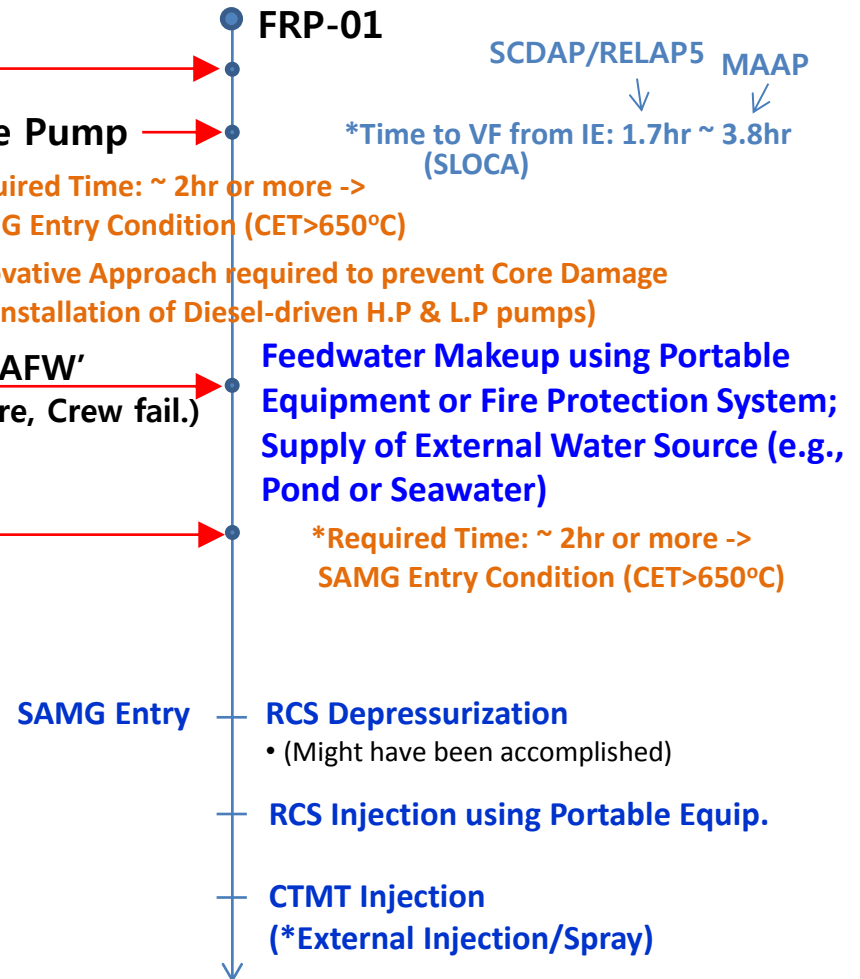
iROCS' Coping Strategy for Damage Condition ③ and ④



* Coping Strategy for Condition ③



* Coping Strategy for Condition ④

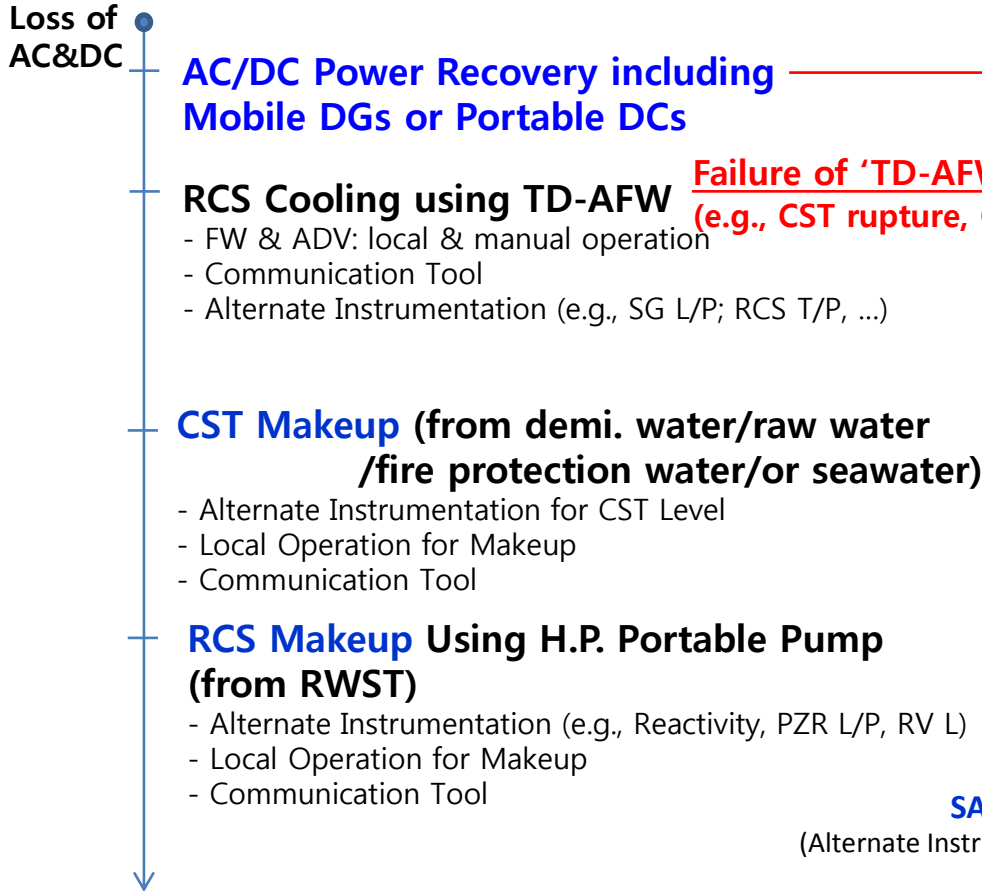


*Required Time: ~ 2hr or more -> SAMG Entry Condition (CET>650°C)
 *Innovative Approach required to prevent Core Damage (e.g. Installation of Diesel-driven H.P & L.P pumps)

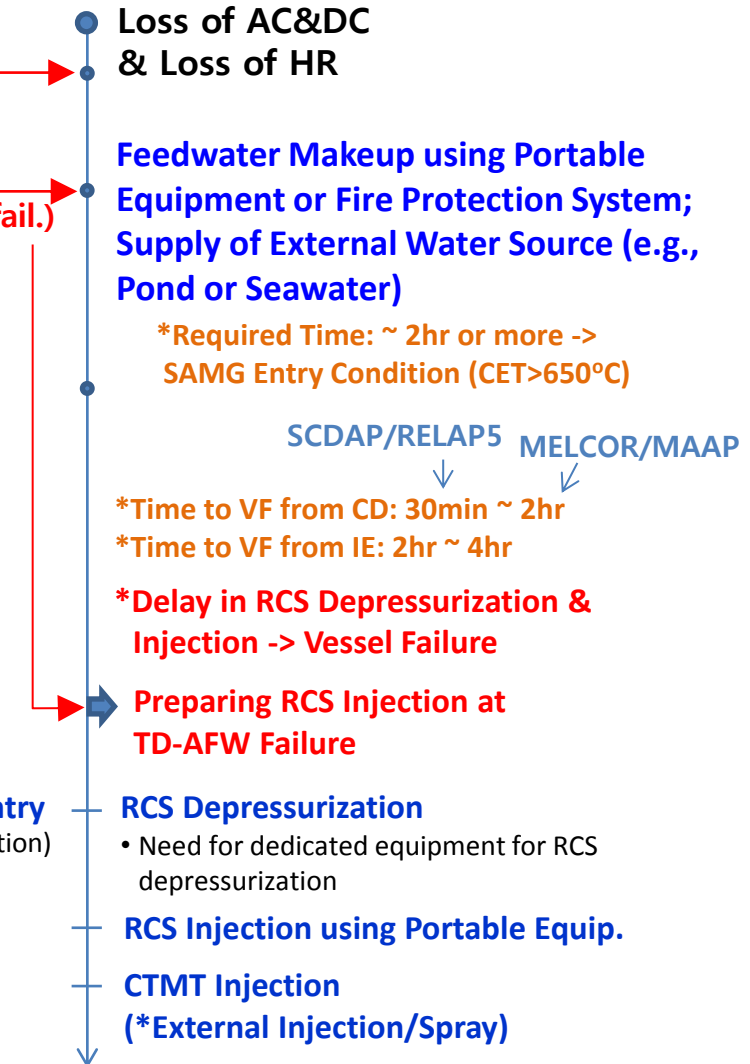
Failure of 'TD-AFW'
 (e.g., CST rupture, Crew fail.)

iROCS' Coping Strategy for Damage Condition ①' and ②'

* Coping Strategy for Condition ①'



* Coping Strategy for Condition ②'



Concluding Remarks

- **iROCS: integrated, RObust Coping Strategies**
 - Possible Plant Damage Conditions
 - Integrative Use of EOP and SAMG
 - Robust Strategies Required
- Verification and Validation of **iROCS** will be further pursued.