Source Term Evaluation System Build for Ulchin 5&6 Units

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1. Introduction

AtomCARE in KINS is the system for the decision making at the emergency status of nuclear power plants. AtomCARE has the functions of receiving the safety parameters from nuclear power plants, evaluation of source terms, and estimation of dose rate. Recently the source term estimation program was developed for Ulchin 5&6 units. It can calculate the amount of source terms based on the parameters from Ulchin 5&6 units at the emergency status. While exiting estimation programs for other nuclear power plants are using SOR code, new developed program calculates leakage after it decides leakage mechanism based on containment failure mode. (Fig. 1)

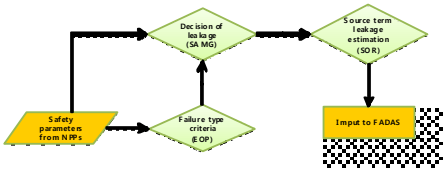


Fig. 1 Calculation flow chart of STES for Ulchin 5&6

2. Methods

The source term estimation system of Ulchin 5&6 units is using SOR method like programs for other power plants and leakage logics are complemented by using leakage mechanism based on SAMG of Ulchin 5&6. Ulchin 5&6 units have 10 detailed leakage mechanism according to the 4 containment failure types (Table 1).

Radiological material leakage logics are activated from the parameters from SIDS (Safety Information Display System) of AtomCARE. Table 2 shows 2 leakage mechanism logics at the mode of early containment failure. One is isolation failure of containment that radiational leakage is decided when reactor is down and isolation valve is open and at least the one value of radiation monitors is over the criteria.

Cont't failure type	failure/leakage mechanism
early Cont't failure	isolation failure of cont't
	direct cont't heating
	hydrogen explosion
late Cont't failure	cont't overpressure
	hydrogen burning
	cont't penetration failure due to high temperature
Bottom Melt Through	melting core - concrete interaction
bypass of cont't	isolation failure ISLOCA
	isolation failure SGTR
	S/G tube Creep Rupture

Table 1 containment failure types

The radiational leakage of direct containment heating is decided on the conditions: reactor is shutdown, RCS pressure is over the criteria and containment pressure is over the criteria.

Table 3 shows the screens of logics of the parameters, the order and results of calculation. 10 types of accident have each tabs. Input parameter show the failure of containment. Finally, the calculated results are used as input to FADAS which estimates environment dose rate.

3. Conclusion

Source Term Evaluation System (STES) for

type	parameter	variable	set point value	Logic		decision criteria
cont't isolation failure	Rx. trip	RxTrip	1: down, 0: operation		AND	reactor trip
	isolation valve position	CF6LG1	0: open, 1: close			valve open
	radiation monitor	CVAirG	32.2 Bq/cc	OR		> stat. value
		CVAirI	0.0082 Bq/cc			> stat. value
		CVAirP	0.000237 Bq/cc			> stat. value
direct cont't heating	Rx. trip	RxTrip	1:down, 0:operation	AND		rector trip
	RCS press	PZRPr	29.2 kg/㎠(a)			> stat. value
	cont. press	CVPrWr	133.6 cmH_2O(G)			> stat. value

Table 2 two leakage mechanism logics

Ulchin 5&6 units evaluates the source terms by using the knowledge of the severe accident types based on SAMG and SOR code of NUREG-1150. This system uses the systematic logics based accident types and it is the different point from existing STES programs. After 2011, AtomCARE will receive more 10 times parameters than now. Then, based on the many parameters, more accurate source term evaluation would be possible.

REFERENCE

[1] United States Nuclear Regulatory Commission, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants", NUREG-1150, 1991
[2] United States Atomic Energy Commission, “Siting Criteria”, TID-14844 USAEC Report, 1959

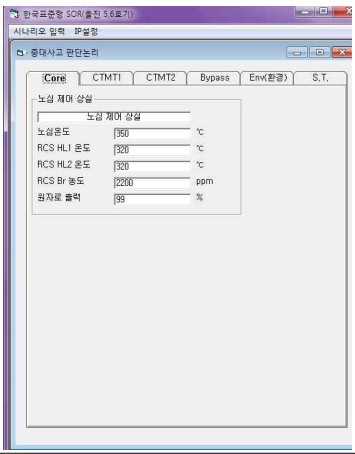
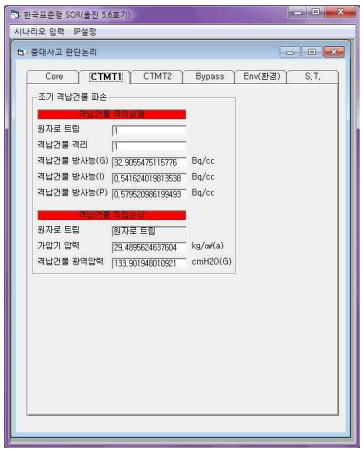
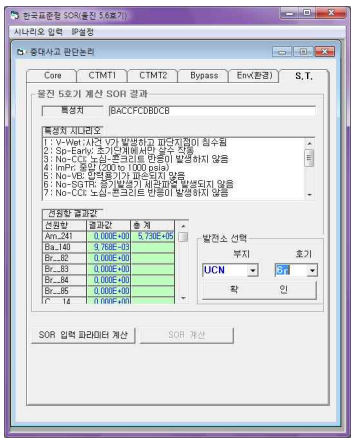
criteria input based on accident type	source term leakage	SOR features & source term estimation
		

Table 3 the screens of logics of the parameters