

3/4

가

**Establishment and Evaluation of Reactor Transient Analyzing System
for Kori Unit 3/4**

150

가

Non-LOCA LOCA

RETRAN-3D MARS

3/4

RETRAN-3D

가

Abstract

The best-estimate(B-E) thermal-hydraulic programs, such as RETRAN, MARS and RELAP etc, are used only by a few experts due to the complexity involved in input preparation including control logic required for a realistic plant transient analysis. Korea Atomic Energy Research Institute has established "Reactor Transient Analyzing System (RTAS)" for the purpose of easy use of B-E codes and effective EOP analysis without an additional control input for manual operation. RTAS, with features of an interactive manual control function and a plant mimic window, has a capability to simulate Emergency Operating Procedure (EOP) for Loss-of-Coolant Accident (LOCA) and Non-LOCA transients using MARS and RETRAN, respectively. In this study, the generation of input and Steam Generator Tube Rupture (SGTR) simulation for Kori-3/4 units based on EOP have been performed to evaluate the capability of RTAS and it is found that the-state-of-art simulation for SGTR is possible in an effective manner, with the basic input of RTAS.

1.

가

RETRAN-3D
(Reactor Transient Analyzing System)

MARS

1. RETRAN-3D MARS

2. 가

editor

3.
window

가 가 visual & interactive control

가

가

가

MARS
NSSS
RETRAN

Non-LOCA

가

1/2

가

3/4

2.

RETRAN-3D

가

RETRAN-3D

RETRAN-3D

2.1 RETRAN-3D

3/4 Westinghouse 3 loop (NSSS)

BOP

, 가 ,

, , , , 가 , , ,

6

, 가

4가

1

8

2

10

. 1

2

(Inlet/Outlet Plenum)

(Tube

Sheet)

1, 2, 3

(Crossover Leg)

가

가

가

interfacial heat transfer

coefficient 0

가

가 가

, , , , , , 2 8

U-tube

1

Dome

(Bubble Rise Model)

가

RETRAN-3D Fill Junction

가 가

Point Kinetics Model

U-tube

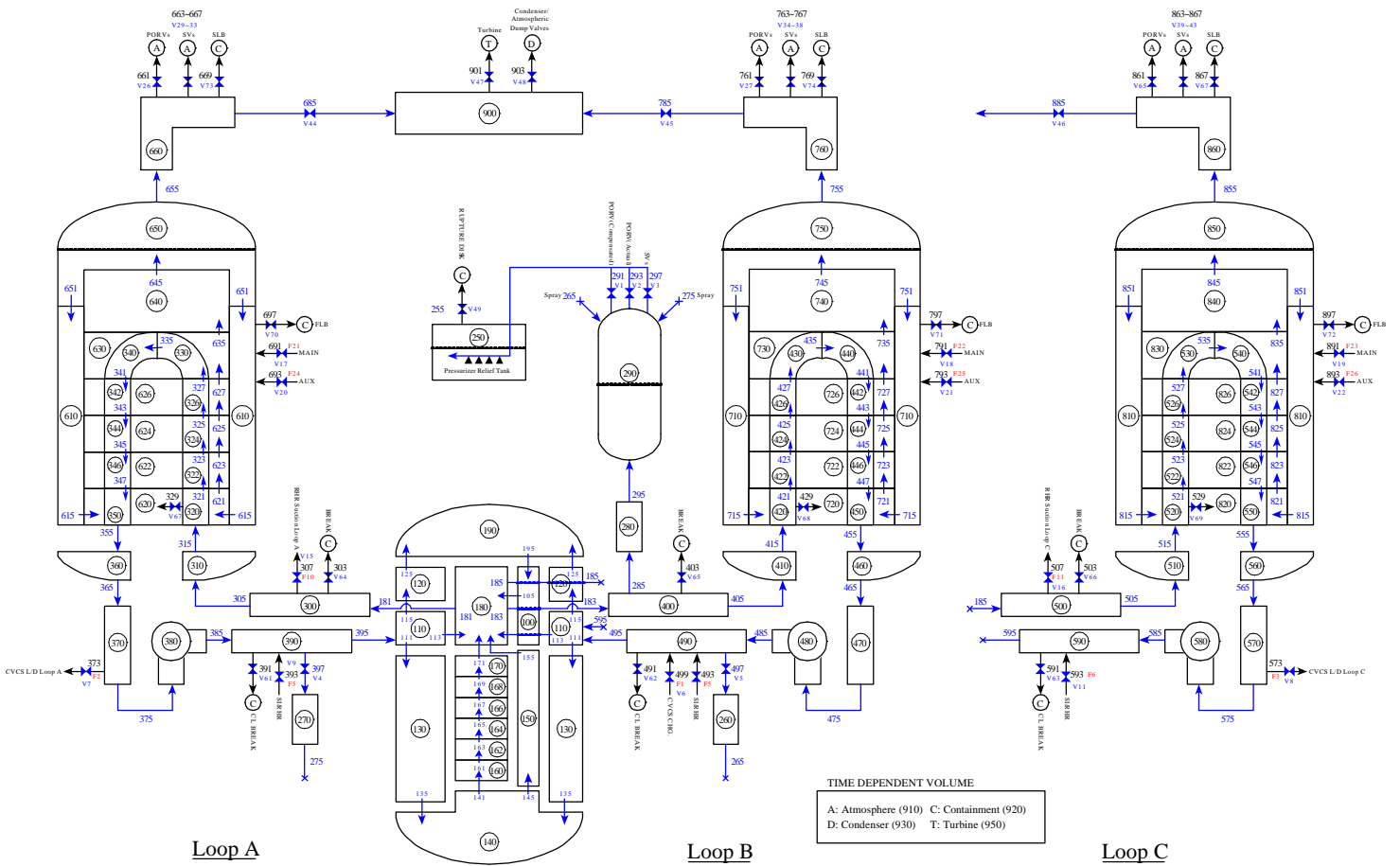
1, 2

(Heat Capacity)

25

가

2



1. 3/4

nodalization

2.2 RETRAN-3D

가 , 가 , ,
Runback .
“ 3/4 ”, “Control Block Diagram”,
"Functional Diagram", “ ” “ 5,6 ”

, Permissive/Control Interlock,

가 .
, 가

가 가

가

b) , c) 1/3 - , d) a) ,
2/3 - 가
5 / .
RETRAN-3D [1]

3.

3/4 ‘S/G ’ (flow chart)

2

3가

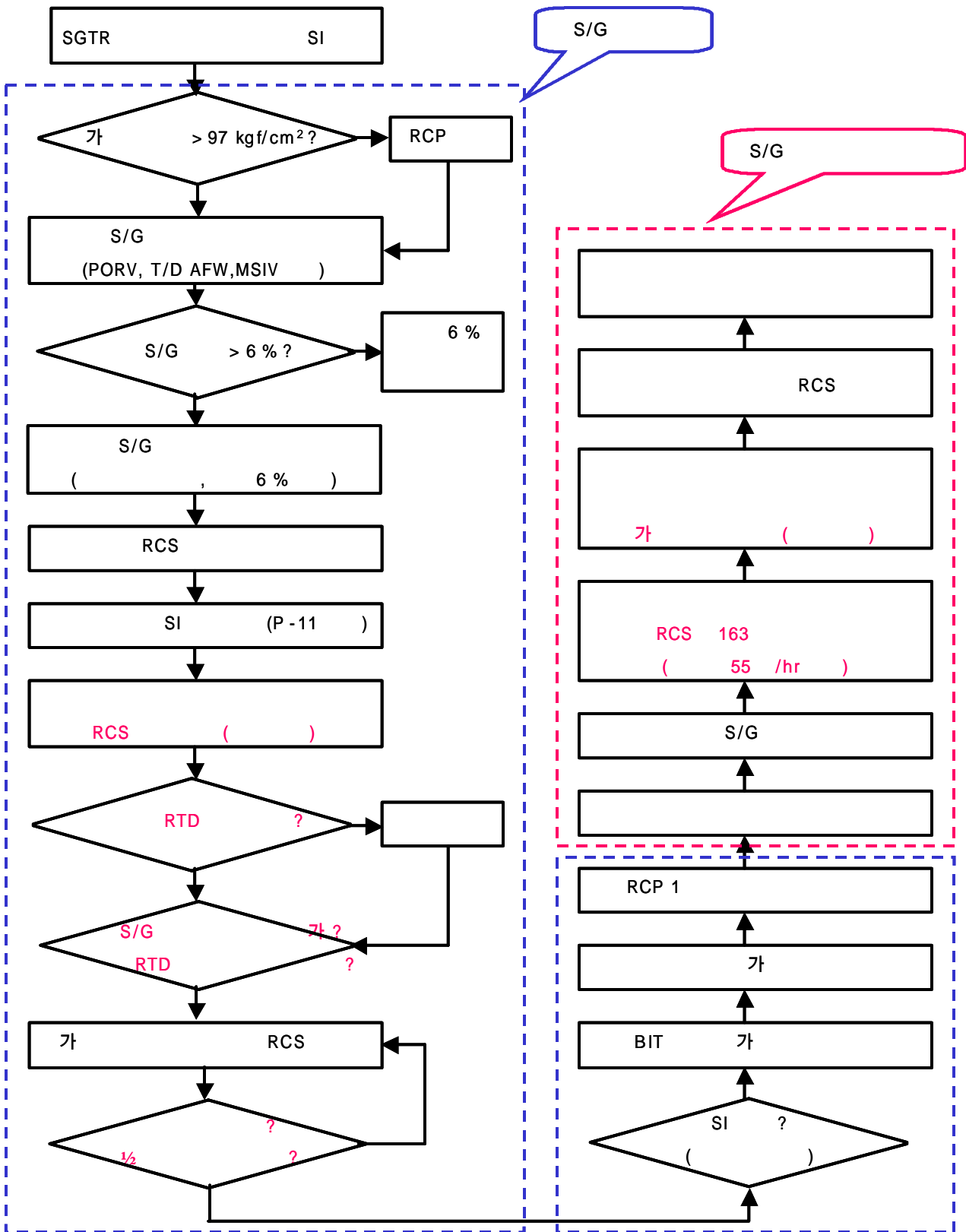
1

1

1/2

RCS

RCS



4.

3/4

RETRAN-3D

4.1

3/4

1

1. 3/4 (1000 null transient)

			(%)
(MWt)	2775.0	2774.5	0.0
가 (kg/cm ²)	158.2	158.1	-0.1
가 (%)	58.0	58.0	0.0
(kg/s)	4580.4 (× 3)	4580.4 (× 3)	0.0
()	326.7	326.6	0.0
()	291.7	292.1	0.1
()	309.2	309.3	0.0
(kg/cm ²)	68.2	68.2	0.0
(%)	50.0	50.0	0.0
(kg/s)	516.2 (× 3)	516.2 (× 3)	0.0
(kg/s)	516.2 (× 3)	516.2 (× 3)	0.0

1

3

가

가

가

1

가

‘S/G’

‘S/G’

‘SI’

가

2

RCP

3

1

97 kg/cm²

RCP

가

MSIV

가 6 %

가 RCS

가 RCS

1

5 % 가

RTD

RCS 가 /cm²

11 RTD 가 260 77 kg

가 13 가

가 650 가 1 (3) 가

가

가

가

0 P-11 BIT SI manual block trip "ON" 가

가

1/2 가

가

가 가

1/2

RCP 1 RCP

2 RCP , 가

가 1 RCP

'S/G

'S/G

. 2

()		
1.0	1 (3)	
9.6	가 'On'	
100.4	가 < P-11	
106.5	(가)	
108.1	(가)	
120.7		
194.5	MSIV	
249.0 ~ 271.0	RCS ()	
664.0		
678.0	가 /	
722.6		
1417.0	1 RCP	
1600.0		
1778.0		
4500.0	(: 175)	

가

20

nodalization

NSSS

4.2

가

, RETRAN-3D

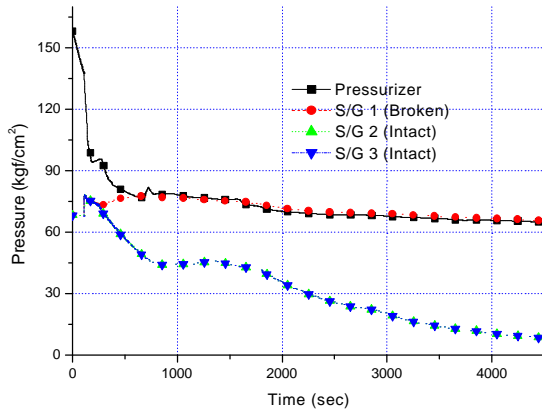
가 5

1

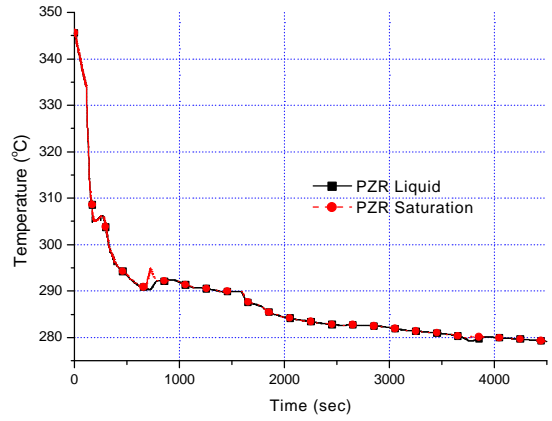
가

가

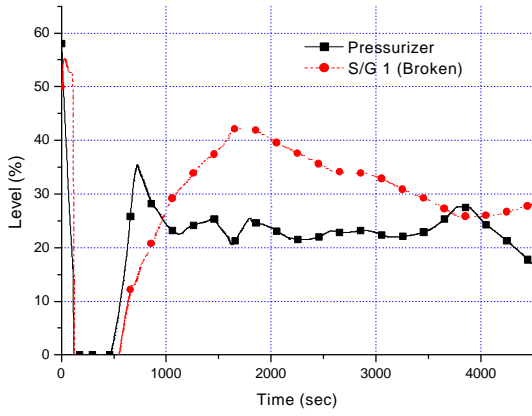
15 ~ 18



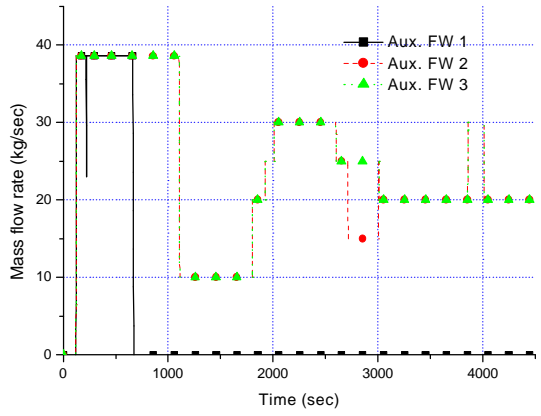
3. 가



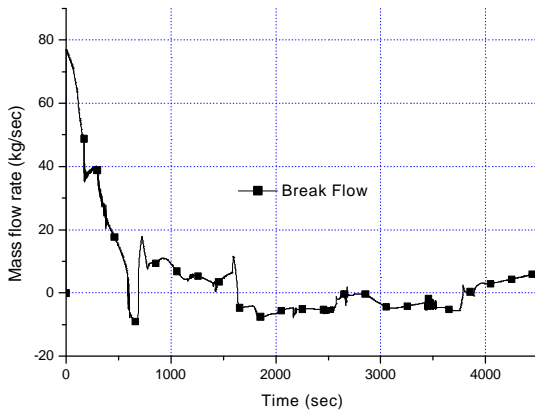
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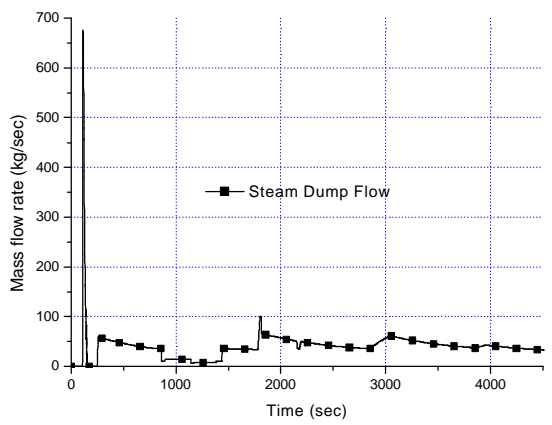
5. 가



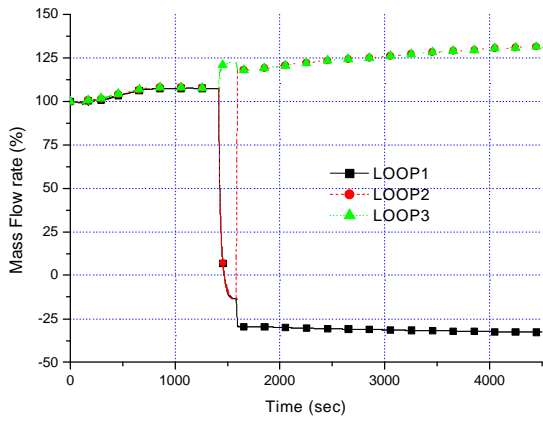
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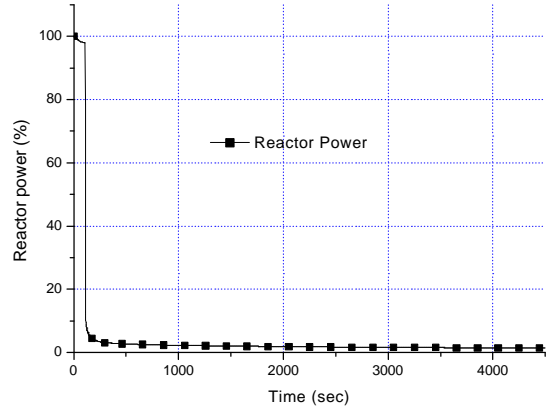
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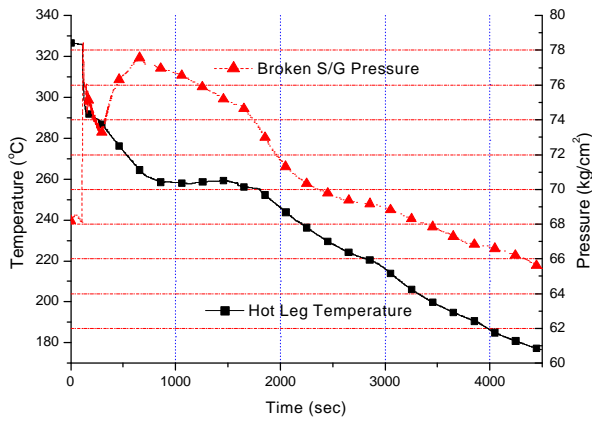
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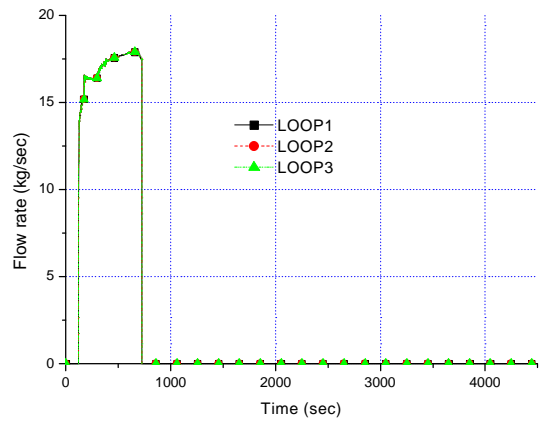
9. RCS



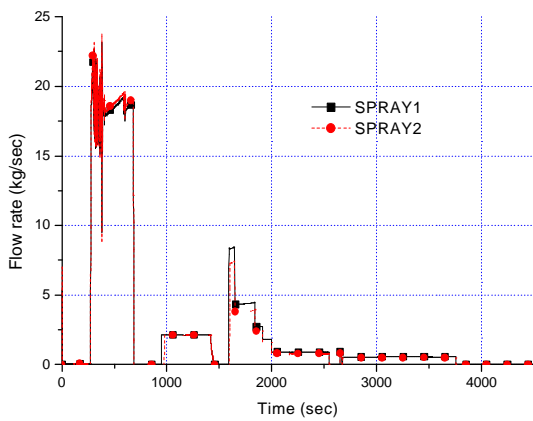
10.



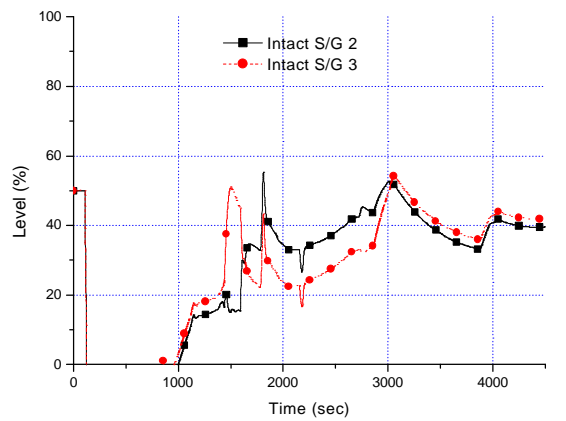
11. RTD



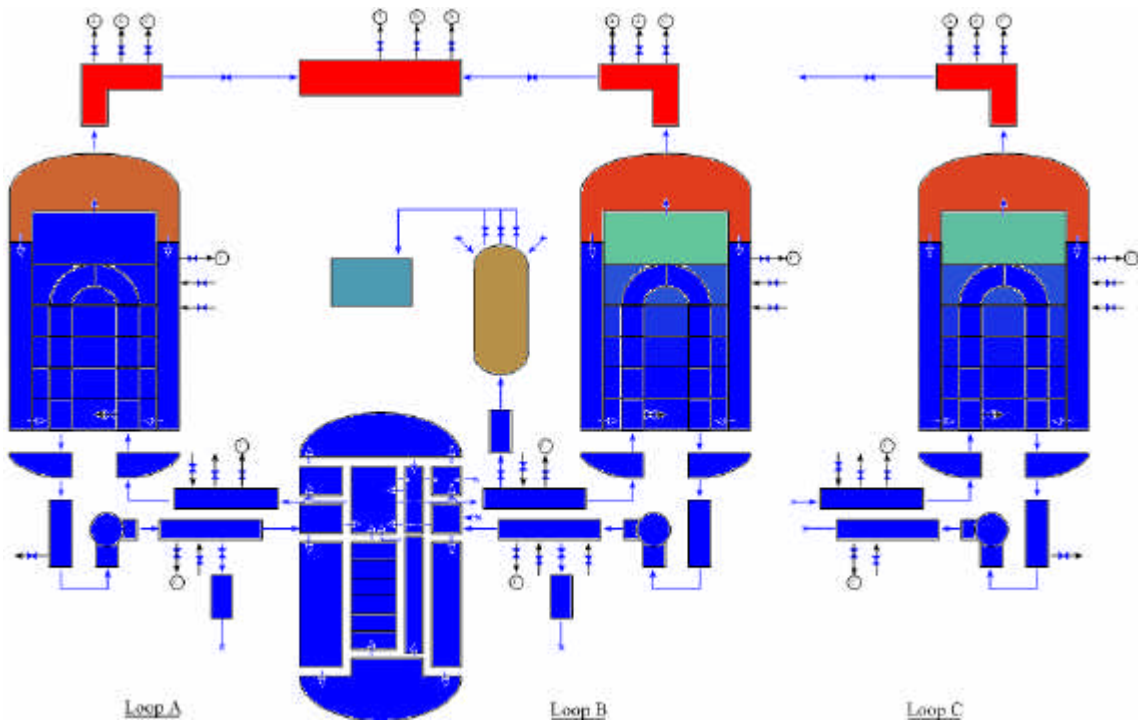
12.



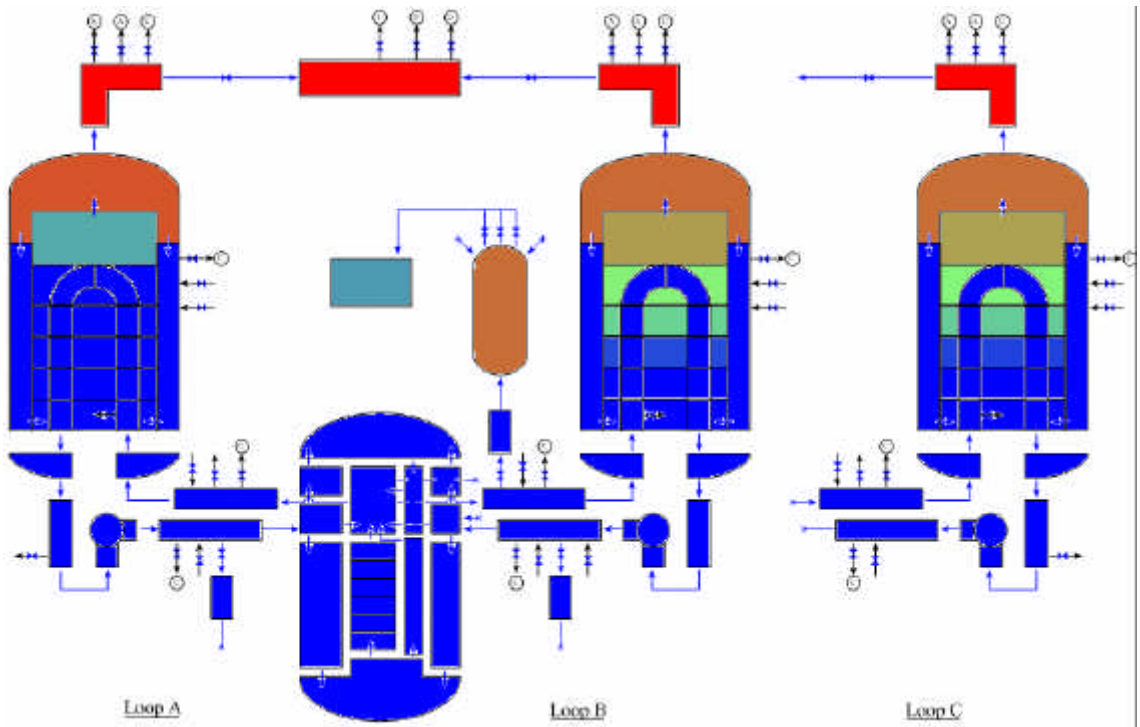
13. 가



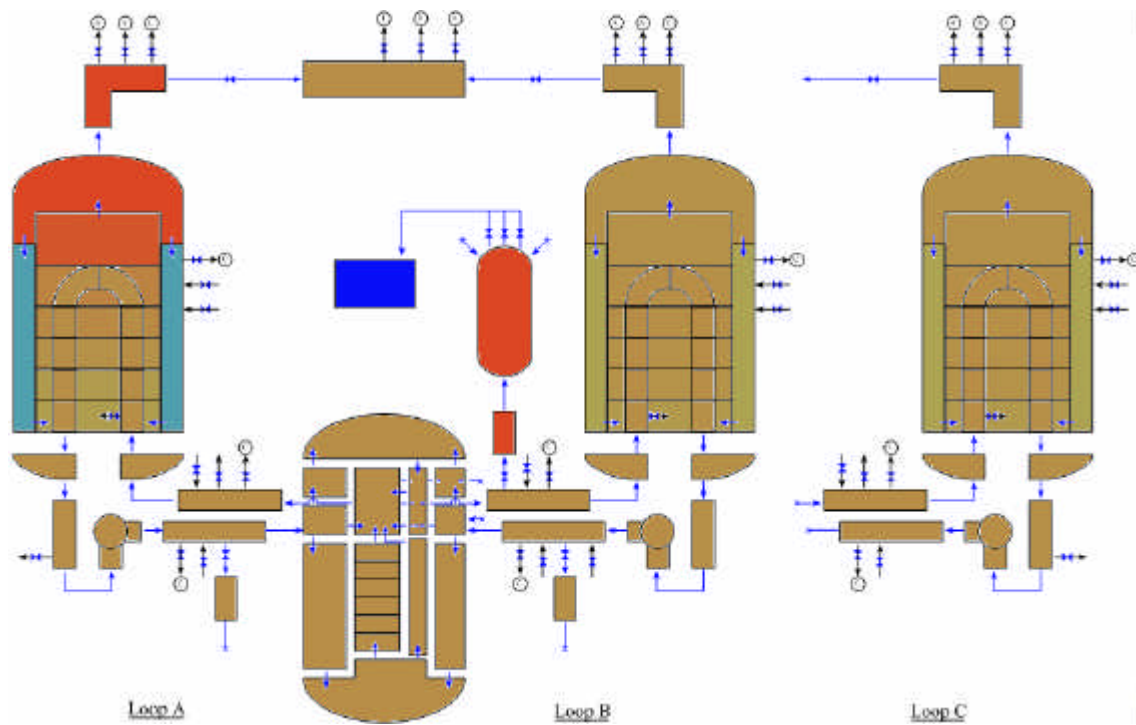
14.



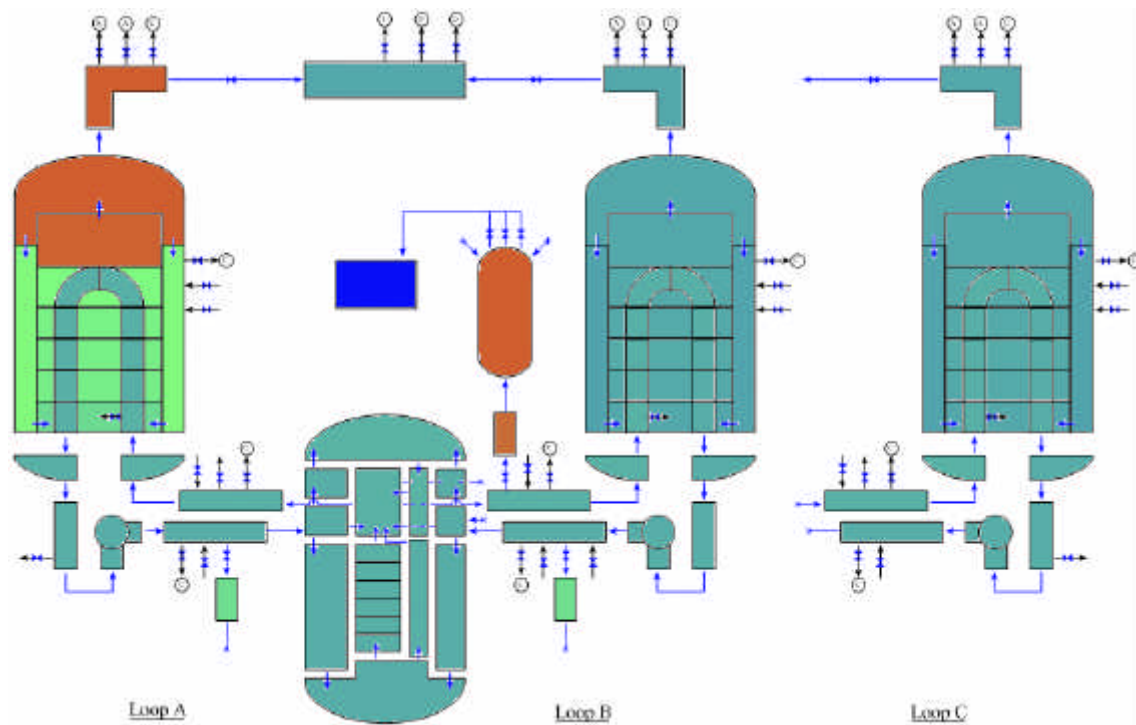
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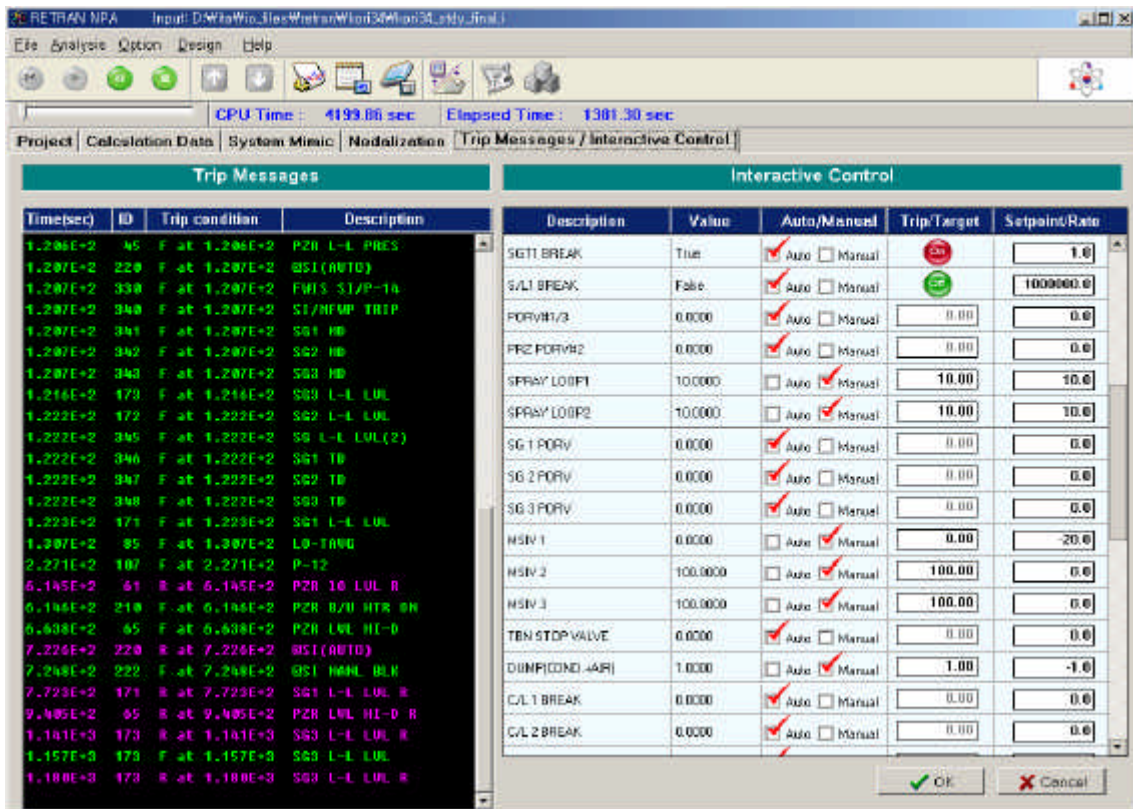
16. (175)



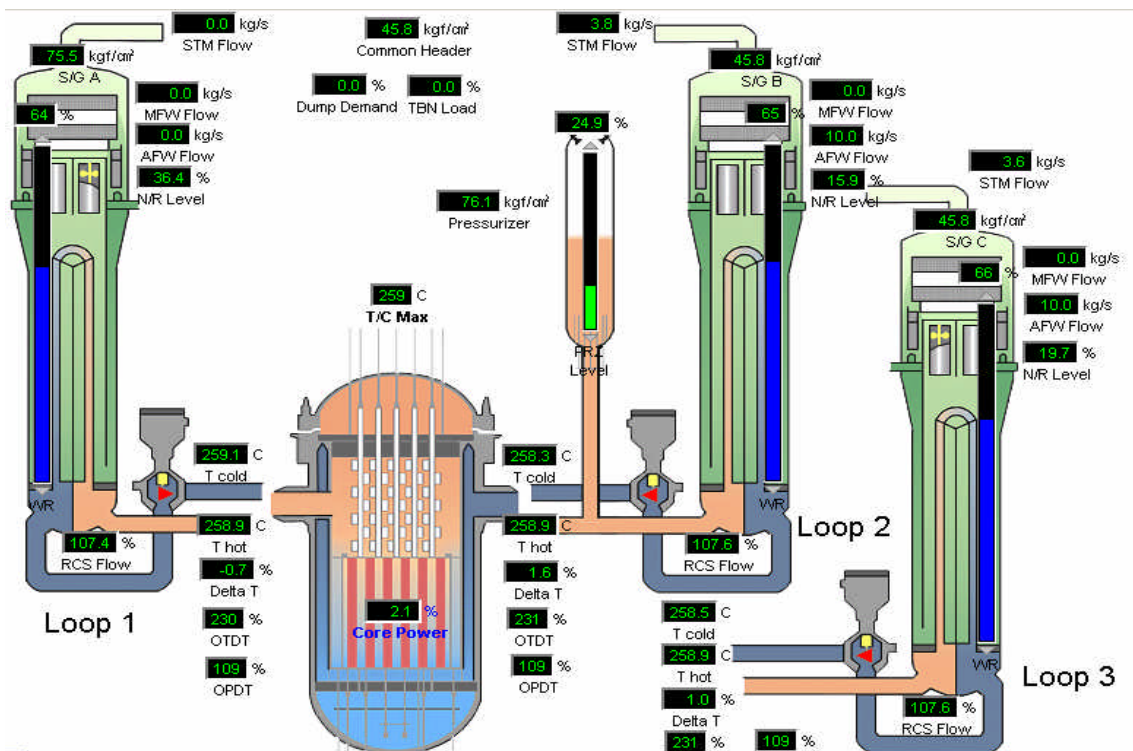
17.



18. (175)



19.



20.

(mimic)

5.

3/4
가 가
RETRAN-3D
가
가 MARS
가 가
가

1. , 3/4 RETRAN , KAERI/TR-2376/2003 (2003).
2. M. P. Paulsen et al., RETRAN 3D code manual, EPRI NP-7450 (Rev. 5), Electric Power Research Institute (2001).
3. 3/4 , (1994).