

Simulator Activity Day 2 - Loss of Feedwater Flow

Step 0: Initial Condition

IC #1 100%
BOL natural
circulation

The screenshot displays the 'SMALL MODULAR REACTOR SIMULATOR' interface. The 'Initial Conditions' window is open, showing a table of loaded initial conditions (ICs) and a list of variables.

LOADED IC

IC#	Time	Date	Description	N. Malf.	OvR.	RCSNP01_TR
1	7:57:39	17/10/2016	100%BOL, Natural Circulation	0	0	99.1
2	7:59:58	17/10/2016	100%EOL, Natural circulation	0	0	98.7
3	8:00:21	17/10/2016	100%EOL, Natural circulation	0	0	98.8
4	9:02:04	17/10/2016	100%BOL, Forced Circulation	0	0	99.3
5	9:02:47	17/10/2016	100%EOL, Forced Circulation	0	0	99.0
6	9:03:29	17/10/2016	100%EOL, Forced Circulation	0	0	98.9
7	9:04:11	17/10/2016	0% BOL, NC, Before withdrawing rods	0	0	0.0
8	9:04:49	17/10/2016	NC, Hot Reactor critical condition Keff=1	0	0	0.0
9	9:05:10	17/10/2016	NC, Hot zero power at the point of adding heat, POAH	0	0	0.0
10	9:05:47	17/10/2016	0%BOL_FC, Before withdrawing rods	0	0	0.0
11	9:06:22	17/10/2016	FC, Hot Reactor critical condition Keff=1	0	0	0.0
12	9:06:43	17/10/2016	FC, Hot zero power at the point of adding heat, POAH	0	0	0.0

VARIABLES

Description	Loaded IC	Current value	Selected IC
RCSNP01_TR Power		99.1	99.1

The schematic diagram shows the reactor system components: CORE, PIS, GIS, CCS, PDHR, SCS, and CWS. The 'Initial conditions' menu item is highlighted in red.

Reactor Status:

- Reactor neutron power: 99.098 %
- Reactor thermal power: 99.12 %
- Generator power: 45.17 MWe
- Steam header pressure: 2.70 MPa
- RPV water level: 100.00 %

Controls:

- Offsite power: ☐
- Diesel: ☐
- Batteries: ☐
- Turbine Trip:
- Reactor Trip:

Step 0: Pre-transient checks

a. Neutron power

b. SUR

c. Thermal power

d. Generator load

e. Control rod position

f. Condenser pressure

g. Steam pressure

h. FW flow

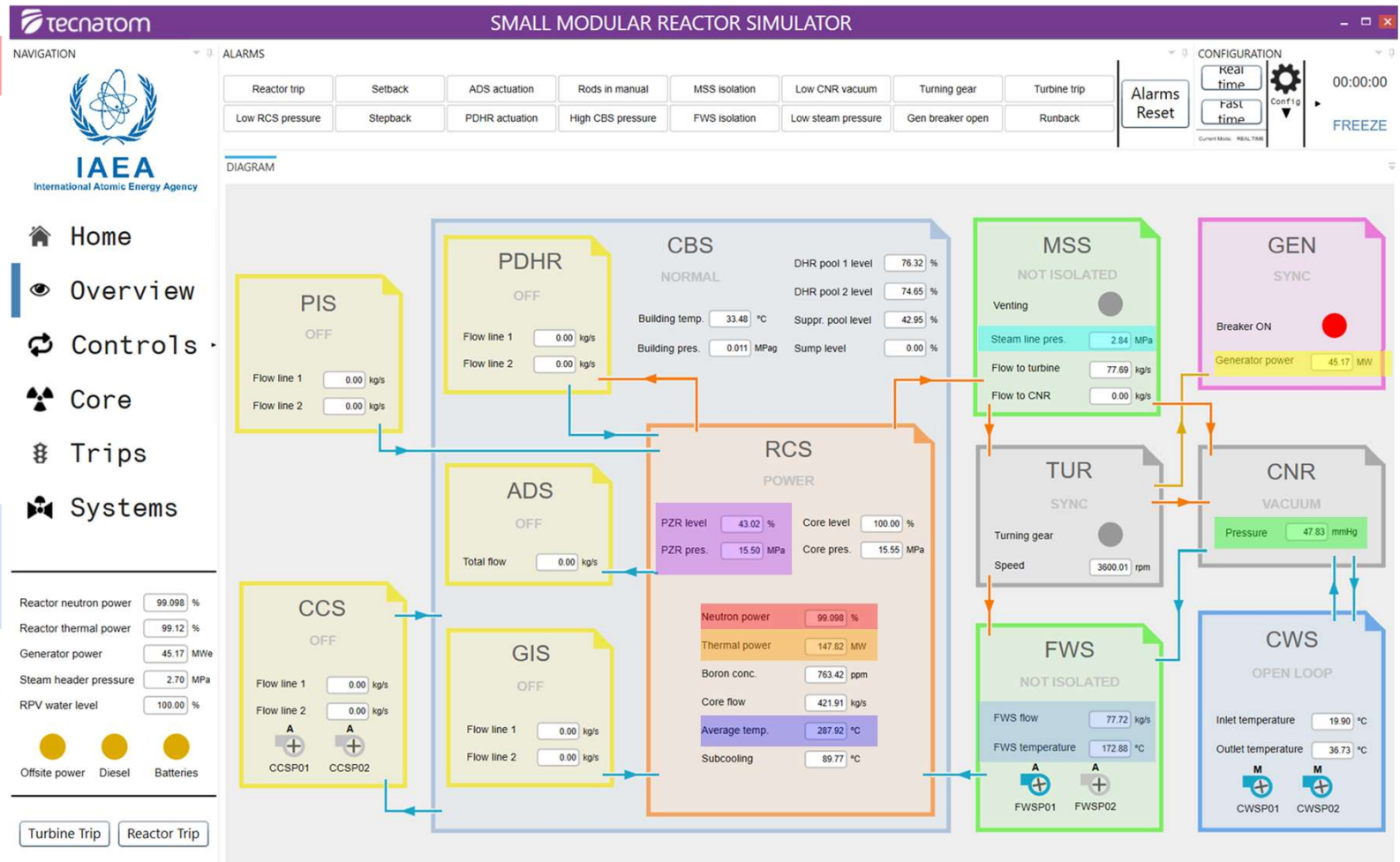
i. FW temperature

j. T_{avg}

k. PZR pressure

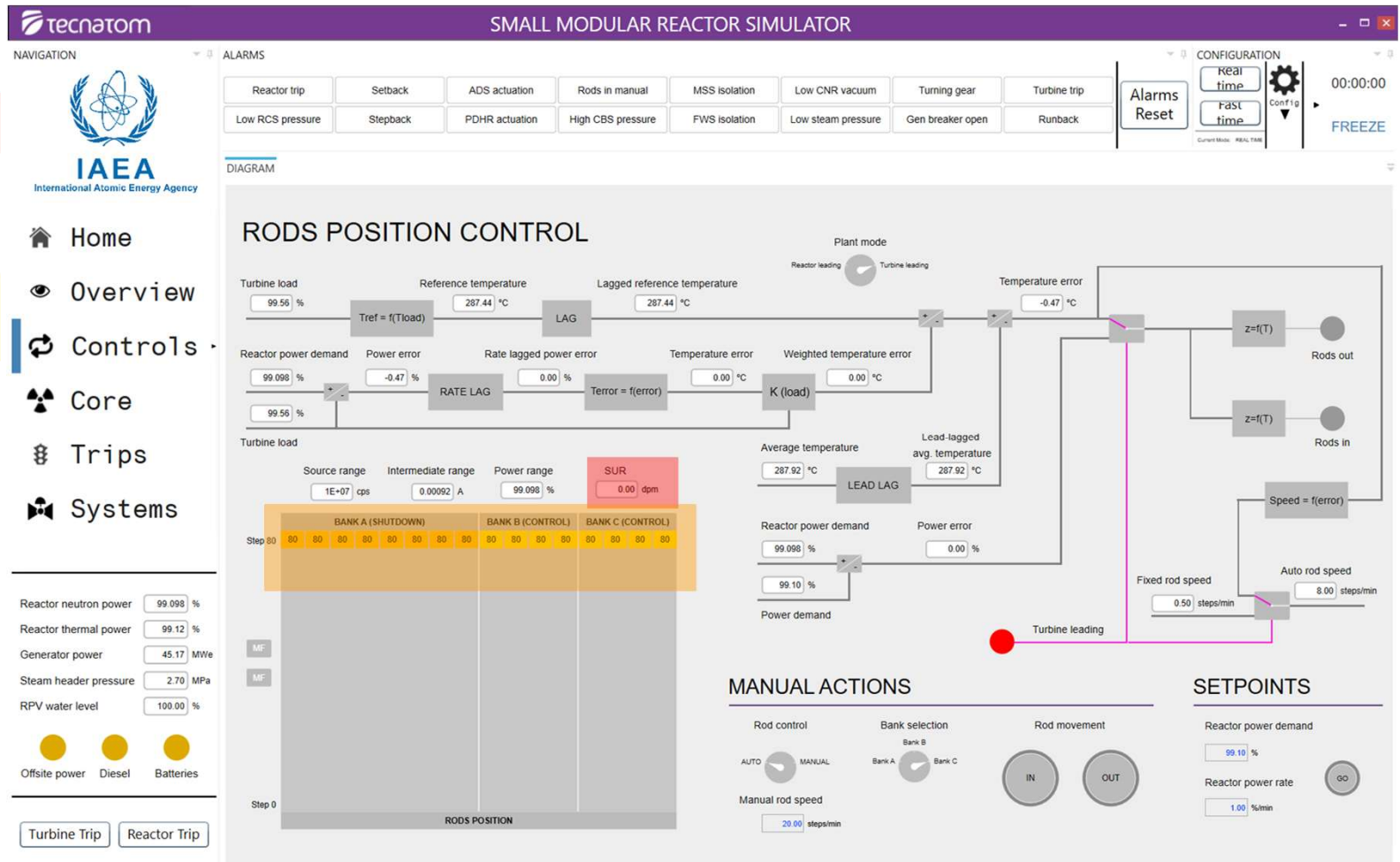
l. PZR level

m. Plant status



Step 0: Pre-transient checks

- Neutron power
- SUR**
- Thermal power
- Generator load
- Control rod position**
- Condenser pressure
- Steam pressure
- FW flow
- FW temperature
- T_{avg}
- PZR pressure
- PZR level
- Plant status

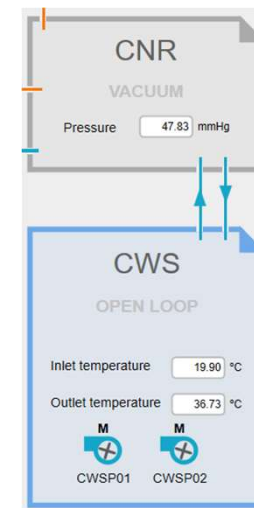
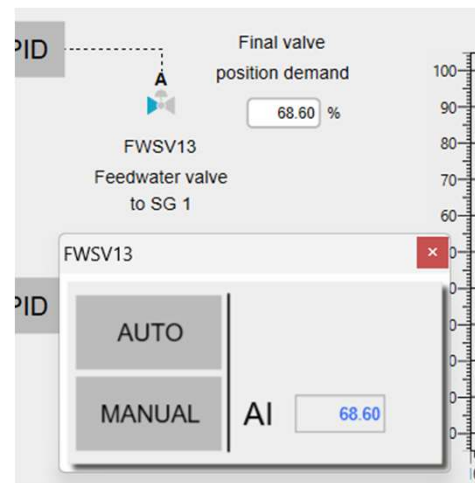
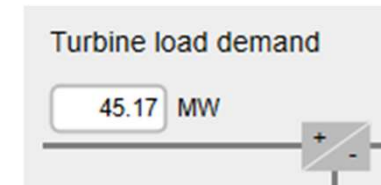
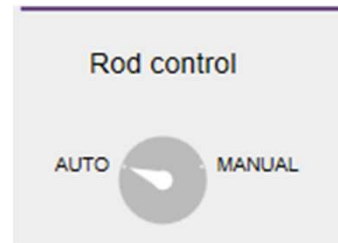


Step 1

Check the following conditions:

- (1.2) Turbine load at 45 MW;
- (1.3) Control rods in auto;
- (1.4) FW system in auto;
- (1.5) CW and condensate systems in service;
- (1.6) No active alarms;

**Run for 3 minutes
(simulator time)**



Reactor trip	Setback	ADS actuation	Rods in manual	MSS isolation	Low CNR vacuum	Turning gear	Turbine trip
Low RCS pressure	Stepback	PDHR actuation	High CBS pressure	FWS isolation	Low steam pressure	Gen breaker open	Runback

Step 2

Load 'loss of FW
flow' malfunction
(SM-FWS-3).

[illegible]

Step 3

Verify malfunction:

(3.1) Check FW header pressure lowers

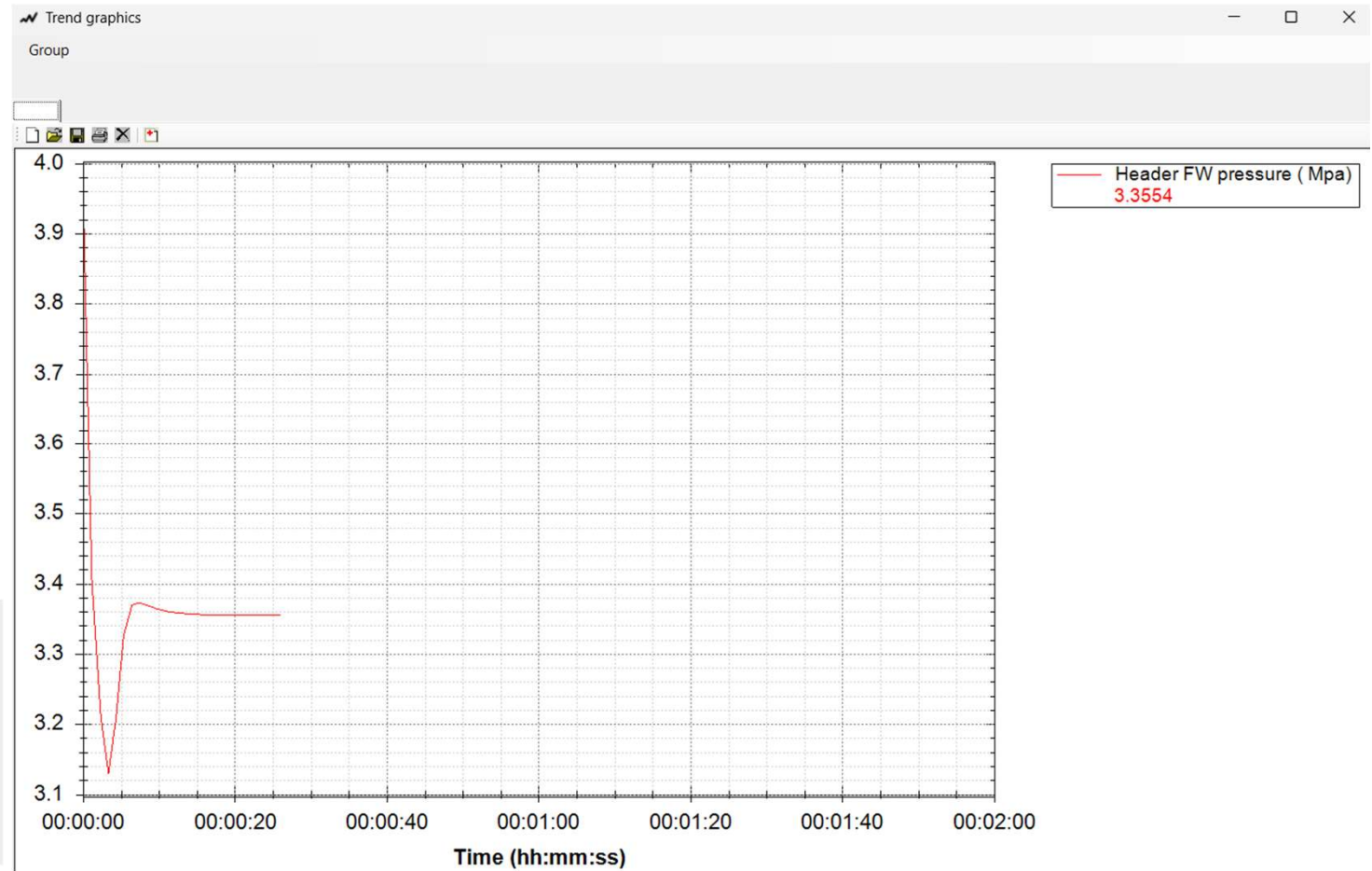
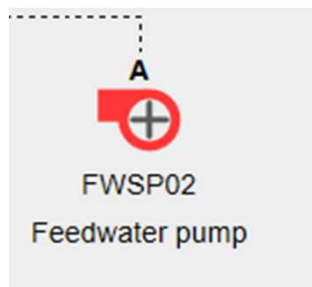
initially;

(3.2) Check second FW pump fails to start;

(3.3) Check FW control valve opens

completely;

(3.4) Check FW flow drops.

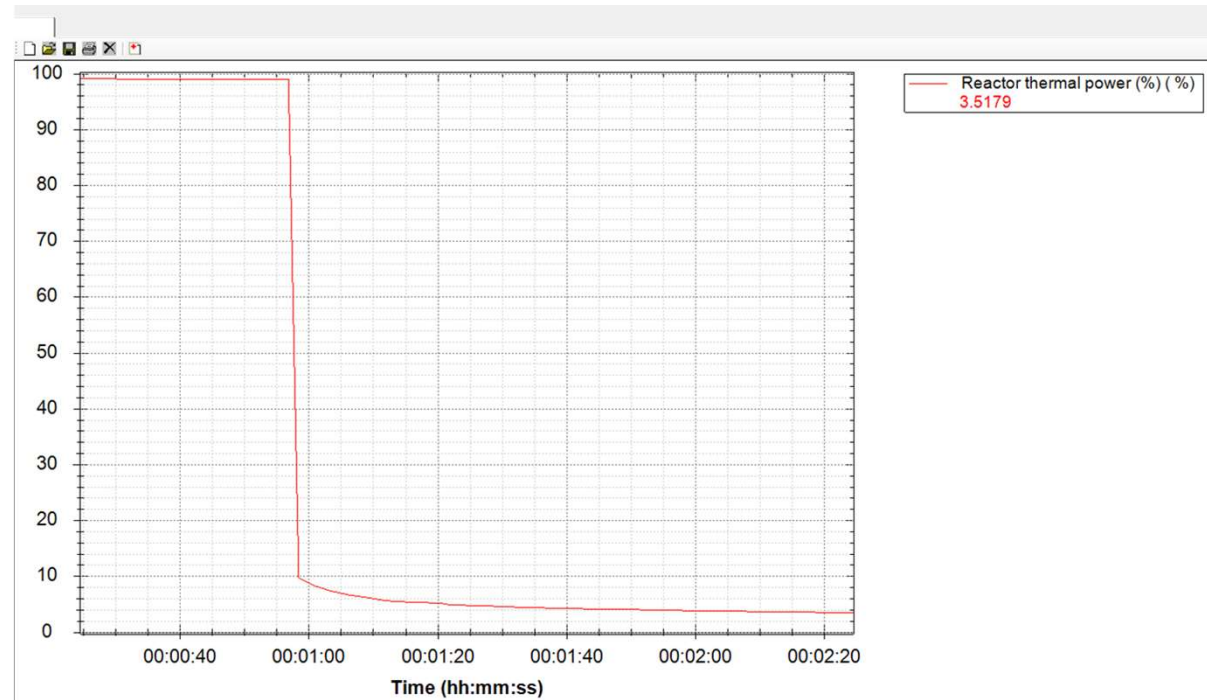


Step 4

Verify reactor trip:

(4.1) Verify all control and shutdown rods are fully inserted;

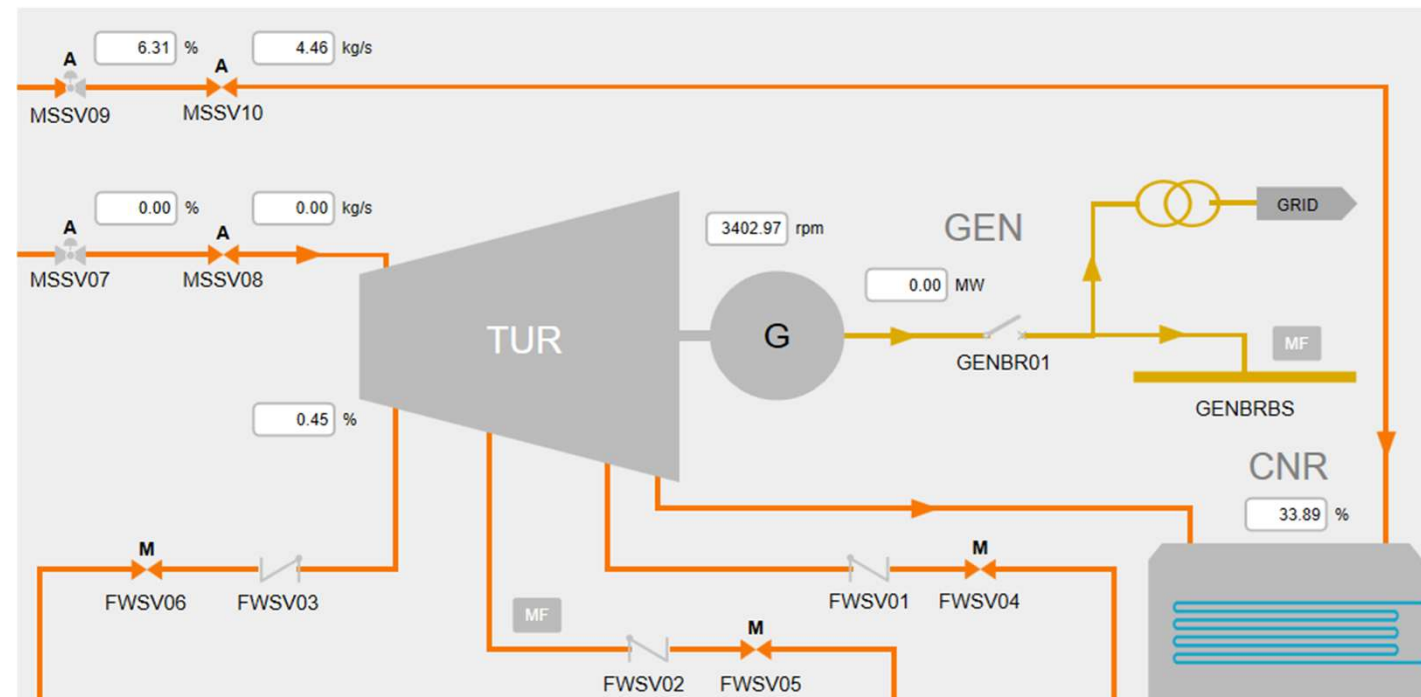
(4.2) Check neutron flux is lowering and Startup rate is negative.



Step 5

Verify turbine trip and steam path response.

Verify turbine control valve MSSV07 has closed.

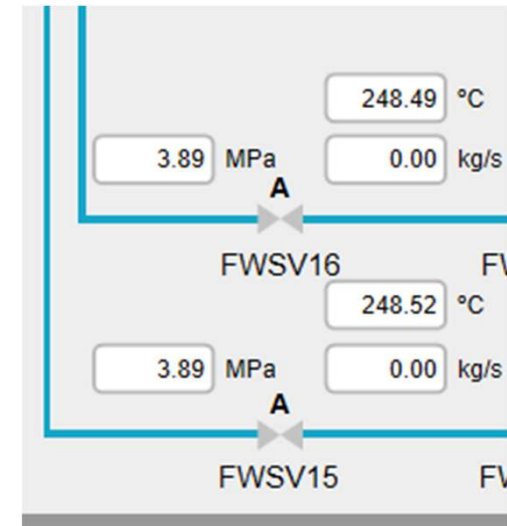
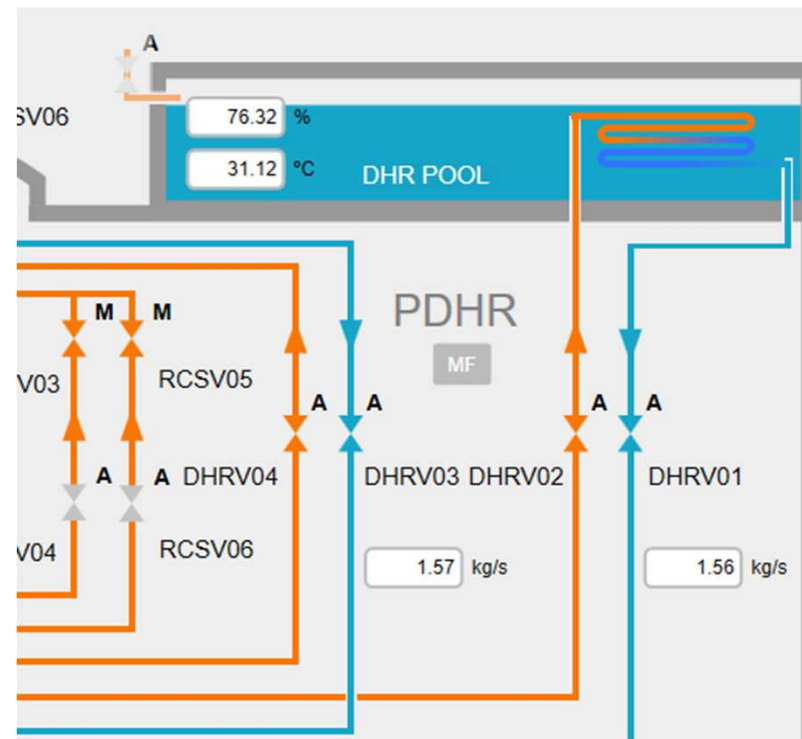


Step 6

Check DHR actuation:

(6.1) Verify DHR inlet and outlet isolation valves have opened and there is flow through both legs;

(6.2) Check FWS isolation.



PDHR ACTUATION

Heat sink loss

Manual



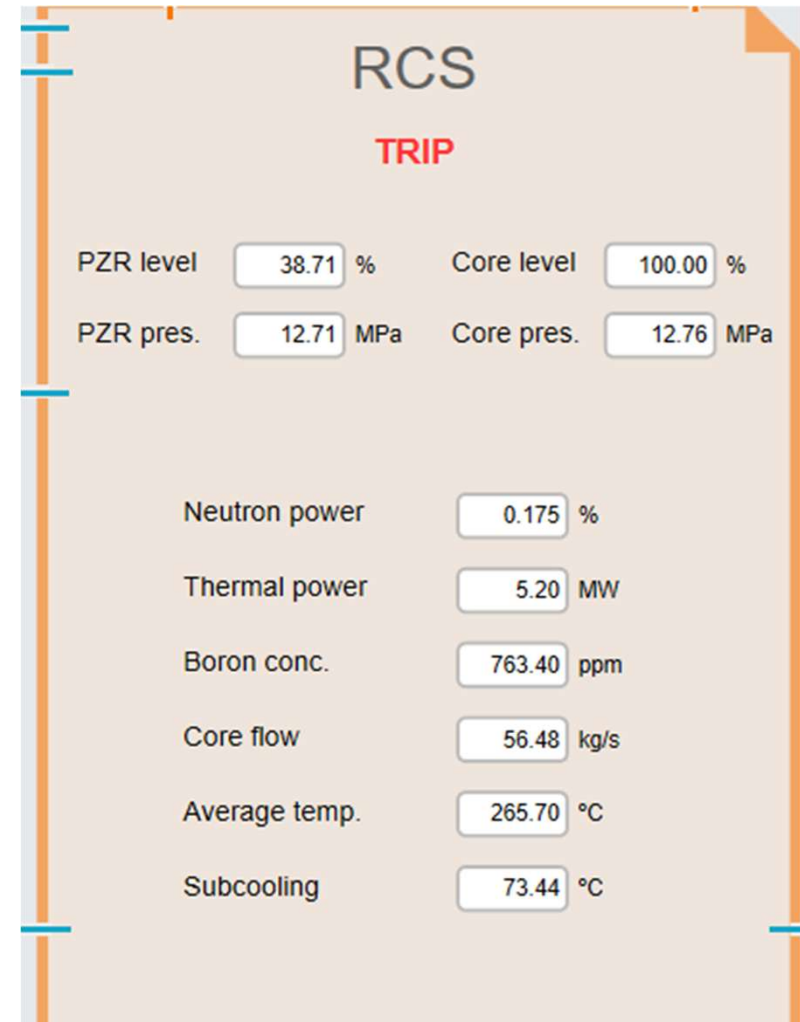
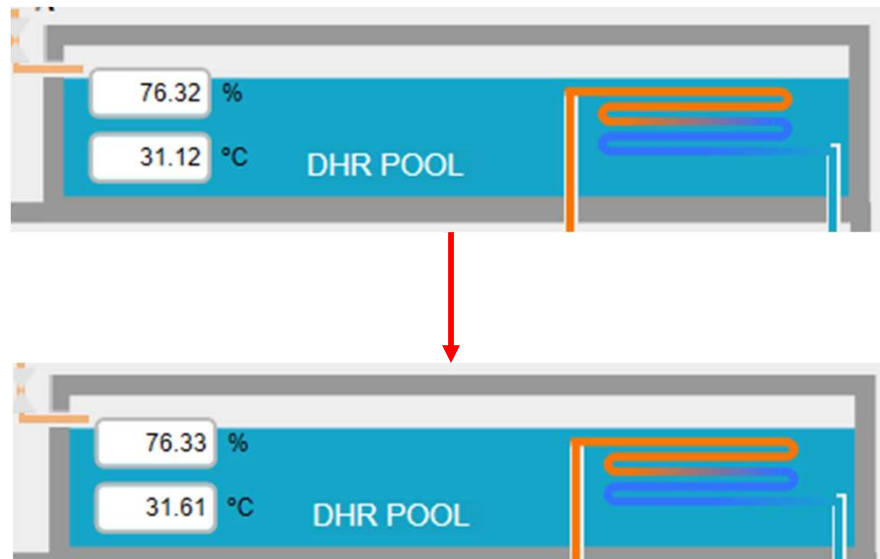
Step 7

Check DHR operation:

(7.1) RCS temperature is stable or lowering;

(7.2) RCS pressure is lowering;

(7.3) CB DHR pools temperature is rising.

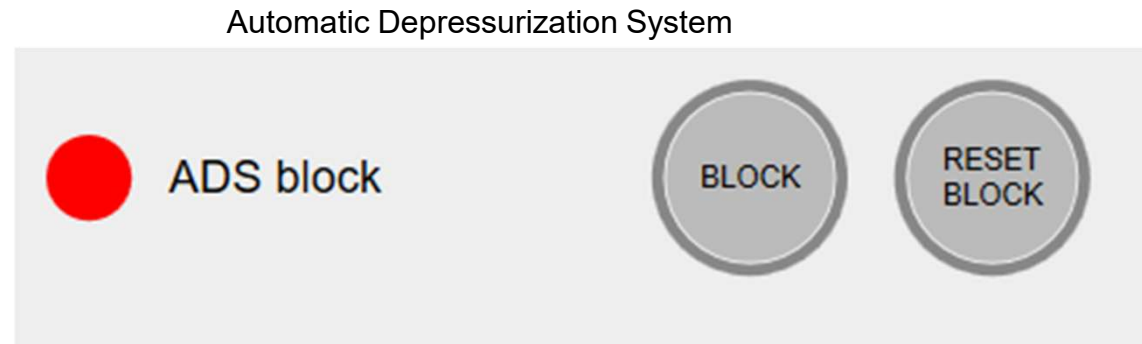


Step 8

Block ADS actuation:

(8.1) Press BLOCK on trips display;

(8.2) Verify ADS block status light is on.



**Run for 2 more minutes
(simulator time)**

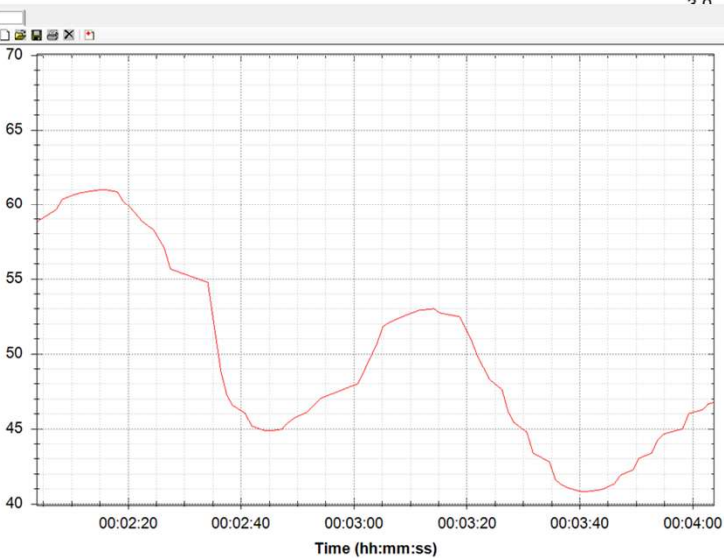
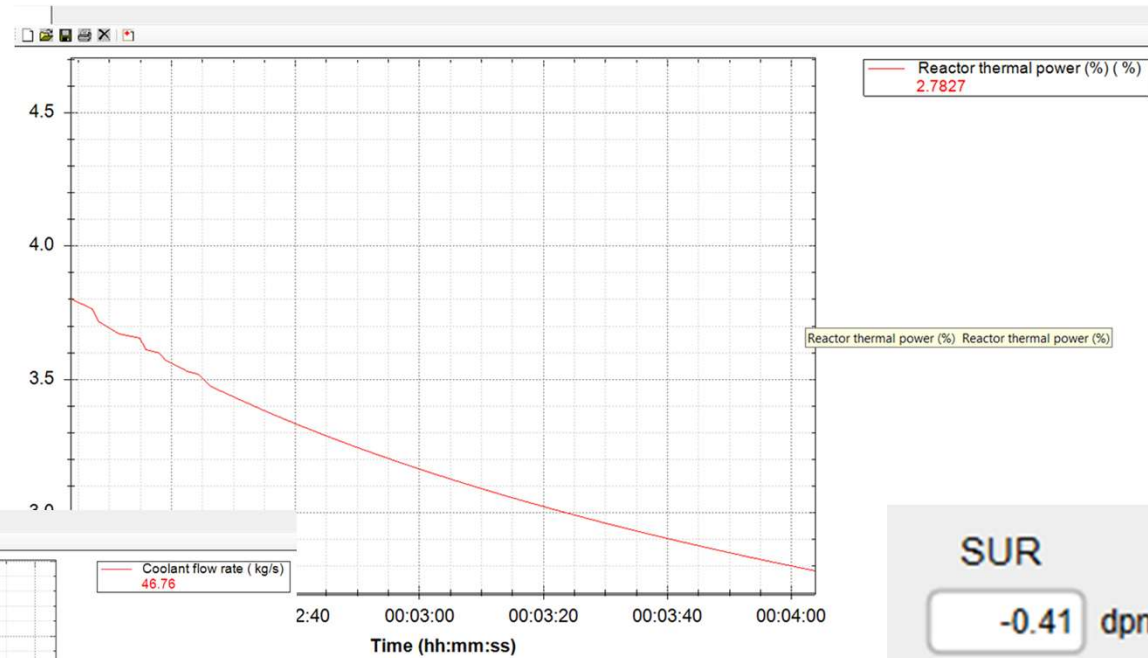
Step 9

Check reactor is stable:

(9.1) Neutron flux is not rising
and SUR is not positive;

(9.2) RCS flow is positive;

(9.3) RCS temperature is stable
or lowering.



SUR

-0.41 dpm

Core flow

46.84 kg/s

Average temp.

267.51 °C

Data to record

Time = 00:00:00 (pre trip)

00:05:00 (post block)

Parameter	Initial / target value	Observed value	Notes
Control rod position			
Neutron power			
SUR			
MSS to TUR flow			