

NUCLEAR ACCIDENT ANALYSIS REPORT

Generated: 2025-12-20 11:41:03

Reactor Unit: UNIT-1 (PWR)

Final Status: OPERATIONAL
Final Temperature: 400.0 C
Radiation Released: 0.00 Sv

SYSTEM SPECIFICATIONS

Reactor Type:	PWR
Max Thermal Power:	3200 MWth
Void Coefficient:	-0.020
Doppler Coefficient:	-0.040

SYSTEM CONFIGURATION & SAFETY

[SCRAM SYSTEM] READY
[ECCS PUMPS] STANDBY
[CONTAINMENT] 100.0%
[MSIV STATUS] OPEN (NORMAL)
[ROD CONTROL] MANUAL
[GRID DEMAND] 1000 MW

CHAIN OF EVENTS

T+0.0s TEST EVENT 1
T+0.0s TEST EVENT 2

DETAILED EVENT LOG

[05:30:00]
[05:30:00]

FULL TELEMETRY SNAPSHOT (End State)

boron_ppm: 500.0000	containment_integrity: 100.0000
flux: 1.0000	graphite_tip_position: 0.0000
health: 100.0000	iodine: 1.0000
melted: False	period: 0.0000
power_mw: 1000.0000	pressure: 155.0000
radiation_released: 0.0000	reactivity: 0.0000
scram: False	stability_margin: 100.0000
steam_flow: 500.0000	temp: 400.0000
void_fraction: 0.0000	water_level: 5.0000
xenon: 1.0000	

TELEMETRY TRENDS

(Graph generation skipped: '_io.BytesIO' object has no attribute 'rfind')

REACTIVITY BALANCE

Detailed breakdown of reactivity components (Control Rods, Void, Doppler, Xenon) contributing to the net reactivity state.

(Reactivity graph skipped: '_io.BytesIO' object has no attribute 'rfind')

TECHNICAL REFERENCE & GLOSSARY

Departure from Nucleate Boiling Ratio (DNBR)

A measure of the thermal safety margin. It is the ratio of the Critical Heat Flux (heat level where bubbles form a blanket, blocking cooling) to the actual heat flux. A DNBR < 1.3 implies a high risk of fuel rod damage and melting.

Void Coefficient of Reactivity

Determines how reactor power changes when water boils into steam (voids). Negative = Self-stabilizing (Power drops as boiling increases). Positive = Instability (Power rises as boiling increases, leading to runaway).

Doppler Broadening (Doppler Coefficient)

A negative feedback mechanism where heating up the fuel makes it absorb more neutrons (due to atomic vibration), naturally dampening the nuclear reaction. This is a key inherent safety feature.

Xenon Poisoning (Xenon-135)

A fission product that absorbs neutrons, 'poisoning' the reaction. It builds up after shutdown (Xenon Pit), preventing restart for ~24 hours. Attempting to override it by pulling control rods is dangerous.

Tip Effect (Positive Scram)

A design flaw in RBMK reactors where control rods have graphite displacers at the tips. When inserting rods to shut down, the graphite tip initially adds reactivity, potentially causing a power spike before shutdown.

Main Steam Isolation Valve (MSIV)

Safety valves that isolate the reactor from the turbine hall. Closing them while the reactor is at power causes a rapid pressure spike, necessitating the use of bypass valves or safety relief valves.