

# NUCLEAR ACCIDENT ANALYSIS REPORT

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## 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.