

Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna)

Dominion Generation

Nuclear Analysis and Fuel

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presented to

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**Dominion
Generation**

Enclosure 2

Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna)

Background

- ❖ TS LCO 3.1.3.4 -2.7 sec Drop time
- ❖ Periodic Test Procedure Rod Drop Time Measurement uses a reduced time for acceptance criterion:
 - ❑ <2.03 seconds for interior rods
 - ❑ <2.25 seconds for individual control bank A rods
 - ❑ <2.03 seconds for average of control bank A rods

Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna)

Background

- ❖ Reduced times in surveillance procedure account for the delaying effects of a concurrent seismic event
- ❖ LAR proposes elimination of the seismic adjustment

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Purpose

- ❖ Increased design flexibility- advanced fuel products have longer drop times
- ❖ Elimination of seismic adjustment will allow use of advanced fuel products without reducing plant trip/relief valve opening setpoints to accommodate longer drop times

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Operational Impact

- ❖ No impact on plant operations
- ❖ Rod drop time Surveillance limits may be relaxed (longer times but $< TS / \text{Analysis limit}$)
- ❖ Rod drop times to be tracked for adverse trends

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Current Practice (CONT)

- ❖ Difference between LCO and PT limit mainly seismic effect (i.e., the estimated increase in drop time resulting from a concurrent seismic event)
- ❖ Margins limited, particularly for peripheral rods
- ❖ New fuel products with enhanced DNB performance will slightly increase rod drop times
- ❖ Test criterion may not be met for new fuel products if seismic allowance is retained

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- ◆ Proposal- Eliminate Seismic Allowance Via LAR:

We are proposing the addition of the following Condition to each FOL:

- ◆ Consideration of the effects of a concurrent seismic event on the Rod Cluster Control Assembly (RCCA) drop time is excluded from the non-LOCA accident analyses.
- ◆ Add discussion of rod drop time trending to TS 3.1.3.4 Basis

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Technical Justification follows Principle Elements of Risk-Informed, Plant-Specific Decision making set forth in Regulatory Guide 1.174

1. Change meets the current regulations.
2. Change is consistent with the defense-in-depth philosophy.
3. Change maintains sufficient safety margins.
4. Negligible change in core damage frequency; consistent with the Commission's Safety Goal Policy Statement.
5. No impact on Virginia Power's Configuration Risk Management Program.

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Defense in Depth Considerations

Most accident sequences are NOT sensitive to control rod drop time. Those which are sensitive are only those events where a process parameter is (ALL must apply)

- Changing rapidly
- Approaching a design limit
- An input to the reactor trip system

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Defense in Depth Considerations

Potentially sensitive events are

- Control Bank Withdrawal From A Subcritical Condition (RCS overpressure case)
- Loss of external electrical load (RCS and main steam system overpressure case)
- Locked RCP Rotor (RCS overpressure and fuel integrity cases)
- Complete Loss of Forced Reactor Coolant Flow (fuel integrity case)
- Rod ejection (fuel integrity case)

Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna)

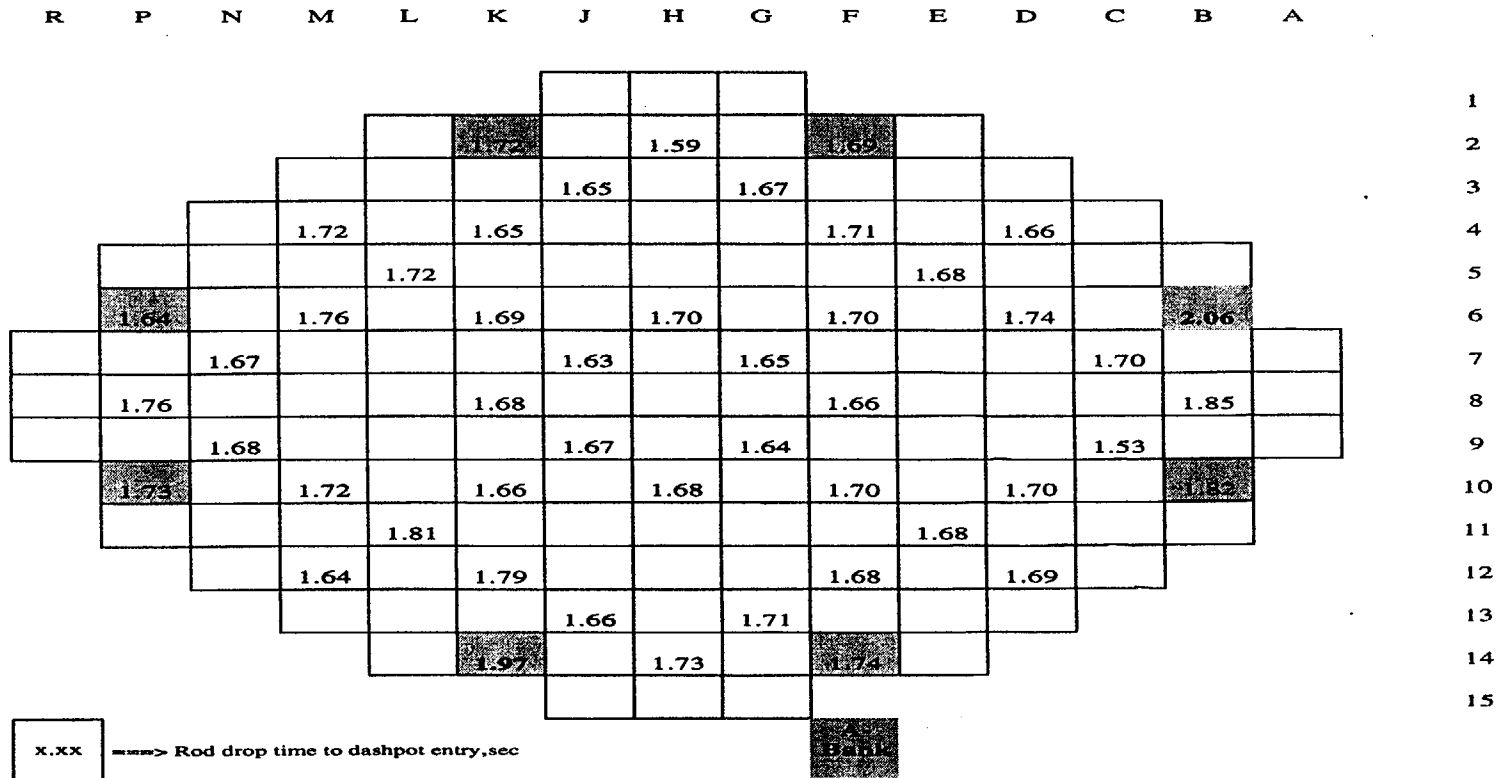
Defense in Depth Considerations

For all of these events, the following significant conservatisms apply

- The surveillance test ensures that the slowest measured rod has a drop time which is within the acceptance value. Since there is a distribution of drop times and many rods will have a drop time which is significantly less than the acceptance value, this ensures additional conservatism in the analysis.
- a bounding low trip reactivity ($\% \Delta k/k$), calculated by assuming the most reactive RCCA fails to insert into the core
- a trip reactivity versus RCCA position which is conservatively low in the core; this delays the post-trip power decrease.

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NORTH ANNA UNIT 1 - CYCLE 14 STARTUP PHYSICS TESTS
 ROD DROP TIME - HOT FULL FLOW CONDITIONS
 (Reference 9)



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Defense in Depth - Continued

- Other major conservatisms enumerated in UFSAR Chapter 15
 - single failure,
 - bounding core physics,
 - limiting reactor protection system setpoints and trip delays
 - conservative safety valve setpoints, etc
- are enumerated in the UFSAR and are unchanged.

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The proposed change maintains sufficient safety margins.

The proposed change

- will not alter the safety analysis assumptions or results
- will not alter the ability of the reactor protection and control system to perform their design functions
- RCS and main steam system continue to meet applicable code requirements
- RCCAs will perform their design function (inserting into the core).
- Rod drop time assumed in the current safety analyses not changed.

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TRENDING

1. Rod drop trending assessment will be done in parallel with startup.
2. Adverse trends will NOT stop startup unless the surveillance limits are violated.
3. The trending assessment will result in recommendations (if needed) for additional tests, measurements or assessments, probably at the next RFO. Recommendations might include
 - * Selected EOC hot rod drop tests
 - * Selected visual assessments of assemblies, guide tubes, split pins etc.

**Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna)
SPS Internal Events Sensitivity**

PORV Demand Probability	Core Damage Frequency (CDF)/yr	Large, Early Release Frequency (LERF)/yr	Comment
5.64E-3	2.73E-5	1.33E-6	Baseline, Zero Maintenance
1.00E-01	2.79E-5	1.33E-6	10% Demand Probability
1.00	3.68E-5	1.35E-6	Guaranteed PORV Demand

**Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna)
NAPS Internal Events Sensitivity**

PORV Demand Probability	Core Damage Frequency (CDF)/yr	Large, Early Release Frequency (LERF)/yr	Comment
6.65E-3	2.72E-5	2.57E-6	Baseline, Zero Maintenance
1.00E-01	3.01E-5	2.72E-6	10% Demand Probability
1.00	6.08E-5	4.35E-6	Guaranteed PORV Demand

Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna) NUREG/CR-4550 Seismic Study

- ❖ Surry report reviewed (Vol. 3, Part 3)
- ❖ Rod drop time or failure to insert not identified as important.
- ❖ Dominant contributors include switchyard, emergency bus components and tanks.
- ❖ Ceramic insulators most dominant

Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna) Seismic Impact

- ❖ Seismic PRA exists for Surry
 - key parameters: hazard curve, fragilities
 - random failures from other components

- ❖ IPEEE Seismic Damage State CCDPs based on
 - LOOP (T1B) event tree
 - Transient (T2) event tree
 - End state with breached RCS negligible

Eliminate Seismic Allowance from Rod Drop Time Criteria (North Anna) Risk-Informed Conclusions

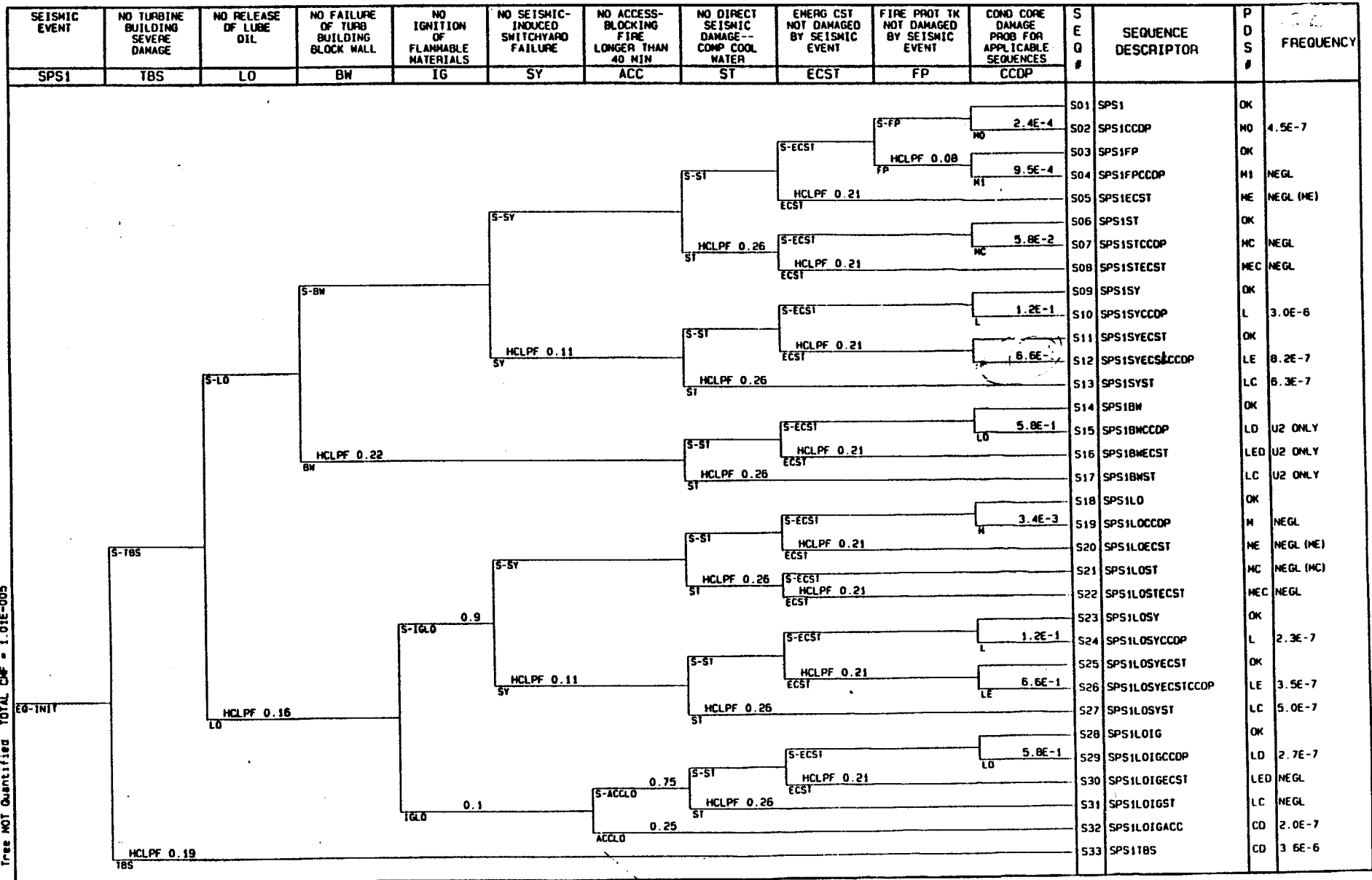
- ❖ Small internal events impact from sensitivities
- ❖ Loss of RCS boundary failure still small
 - ❑ Two conditions must be met
 - ❑ PORV failed open and block valve fails to close
- ❖ In Seismic CCDPs impact still small

Backup Material

Conclusions

- Proposed change meets criterion of 1.174
 - ◆ Defense in depth retained
 - ◆ Safety margins retained
 - ◆ Negligible impact on core damage /release risk
 - ◆ No impact on Mrule or configuration risk management
 - ◆ Will allow optimization of fuel performance margins without degrading operating margins to protection setpointsy

Figure 2-1 Surry Power Station Master Seismic Event Tree



C:\VPE\ST\EVT_4\46-400a 11-26-97 NERRA 2.33 VIRGINIA
 Tree NOT Quantified TOTAL CDF = 1.01E-005

