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10CFR50.69 Tabletop Exercise for New Reactors: Active PWR

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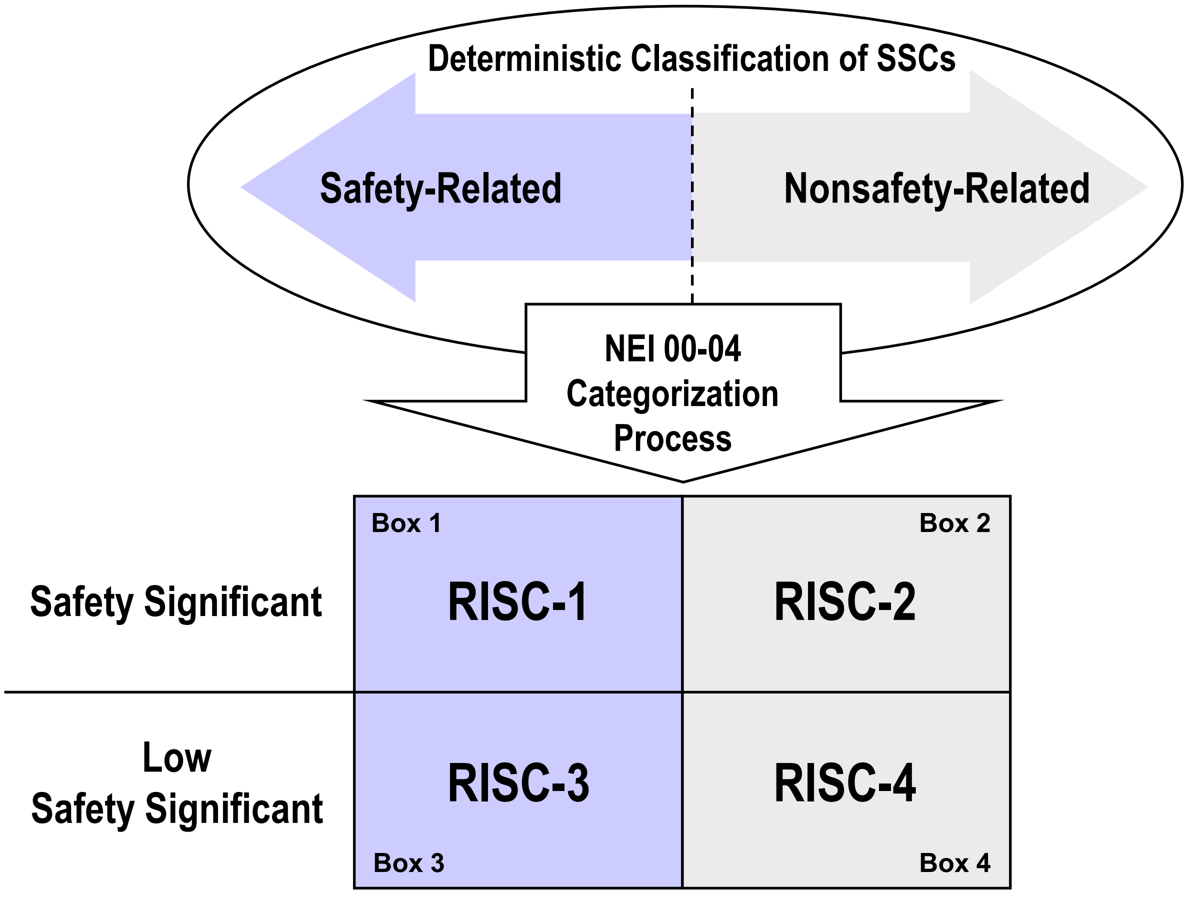
Event
10CFR50.69 TT Exercise

Date
August 9, 2011

OUTLINE

- **Active Components Ranking**
- **Passive Components Ranking**
- **Risk Sensitivity Study**

10CFR50.69 Rule



Safety Significance Criteria

The importance measure criteria used to identify safety significant components are:

- **Sum of FV for all basic events modeling the SSC of interest, including common cause events ≥ 0.005**
- **Maximum of component basic event RAW values ≥ 2**
- **Maximum of applicable common cause events RAW values ≥ 20**

SSC in PRA, Group Totals – Example

VALVES	Check, Flood, Manual, Pneumatic, Relief, Safety, **MOV, SOV**	**800**
PUMPS		**100**
ELECTRICAL	Battery, Battery Charger, Bus, **Circuit Breaker**, Converter, Diesel Generator, Inverter, Load Center, MCC, Rectifier, Switch, SWGR	**500**
I&C	**Processing Unit**, Sensor, Signal, Power Rack	**700**
OTHERS	Chiller, **Fan**, Filter, Heater, **Heat Exchanger**, Stand Still Seal, Strainer, Tank	**100**

SSC RISC Categorizations – Example

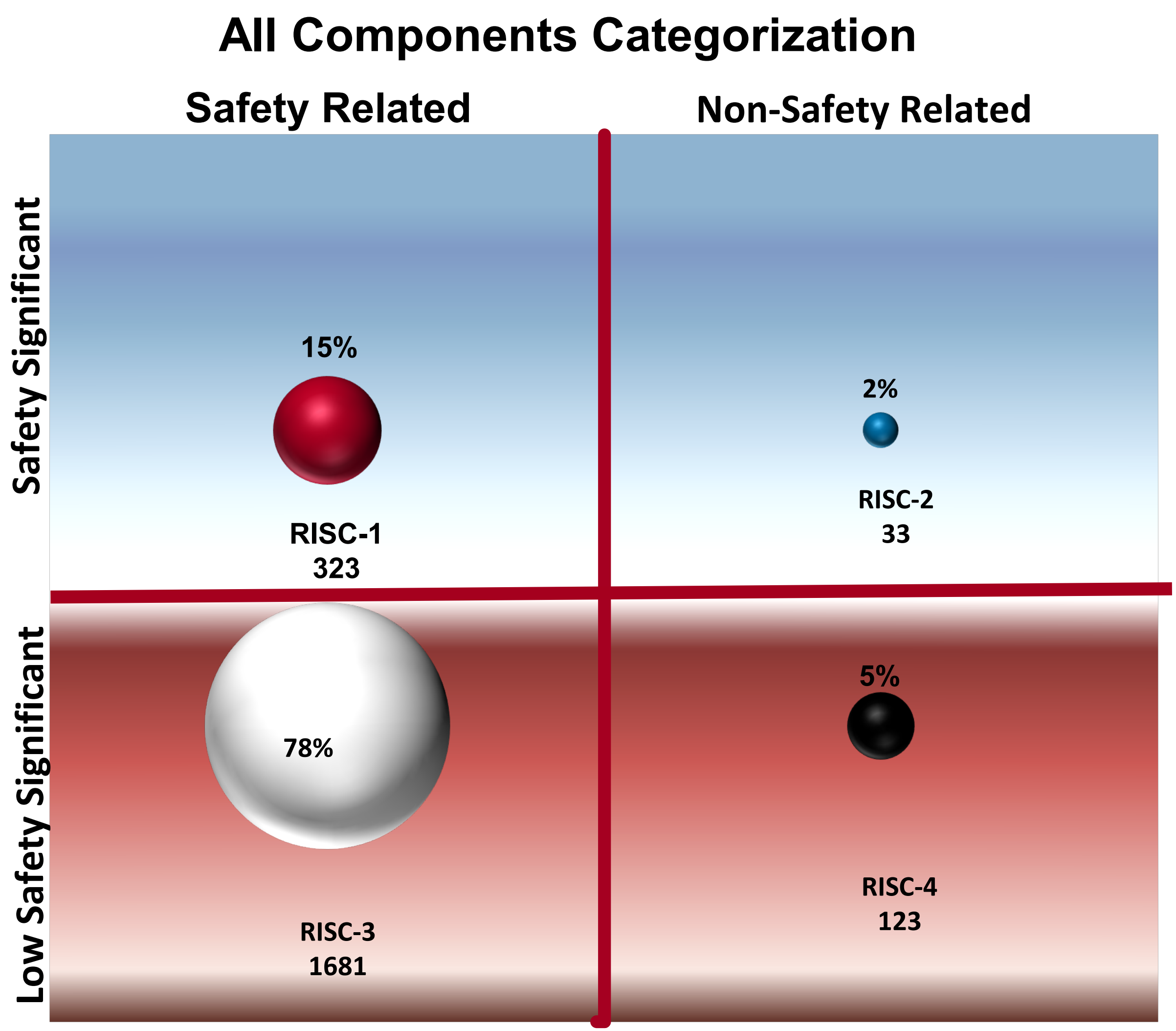
						At Power CDF				
Comp ID	**System**		**Component Description**	**Comp Type**	**SR**	**FV**	**RAW**	**CCF RAW**	**SS**	**RISC**
30LAS41AP 001	EFWS		EFWS, Train 4 Motor Driven Pump LAS41AP001	Pump	X	4.3E-02	2.3	2,800	X	**1**
30QNA22A P033	OCWS		OCWS, Train 2A Motor Driven Chiller Unit Pump QNA22AP033	Pump		3.8E-04	2.3		X	**2**
30KAA40A P001	CCWS		CCWS, Train 40 Motor Driven Pump KAA40AP001	Pump	X	1.5E-04	1.7	14		**3**
30PEB80A P001	ESWS		ESWS, SA-ESWS Motor Driven Pump PEB80AP001	Pump		1.3E-04	1.2			**4**

Categorization Results – Operating Plant

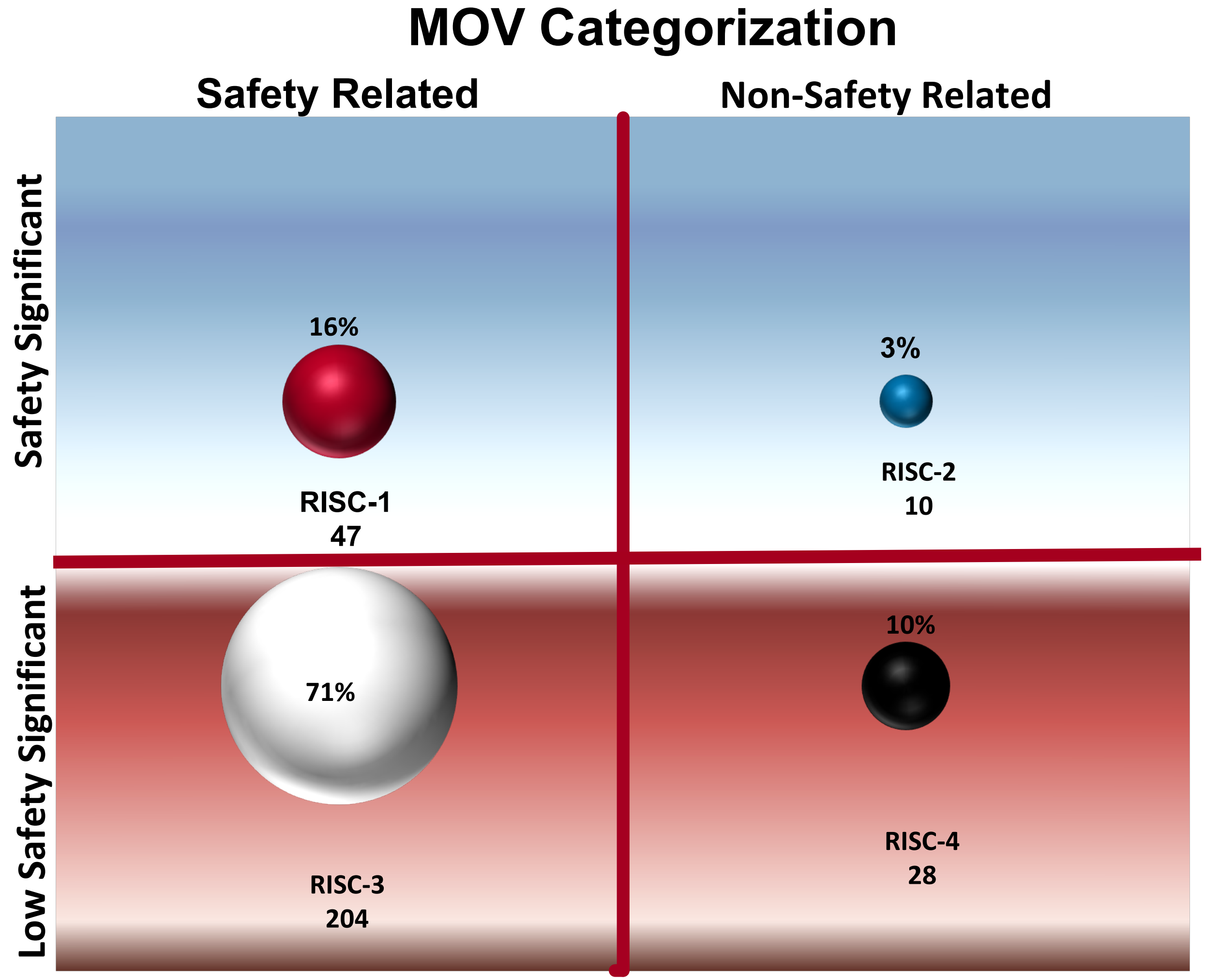
Plant C - Fullscope

	Safety-Related	Non-Safety-Related
Safety Significant	4772 (24%)	625 (1%)
Low Safety Significant	15331 (76%)	54654 (99%)

Categorization Results - Example
PRA Active Components Risk Classification



Categorization Results - Example
PRA MOVs Risk Classification



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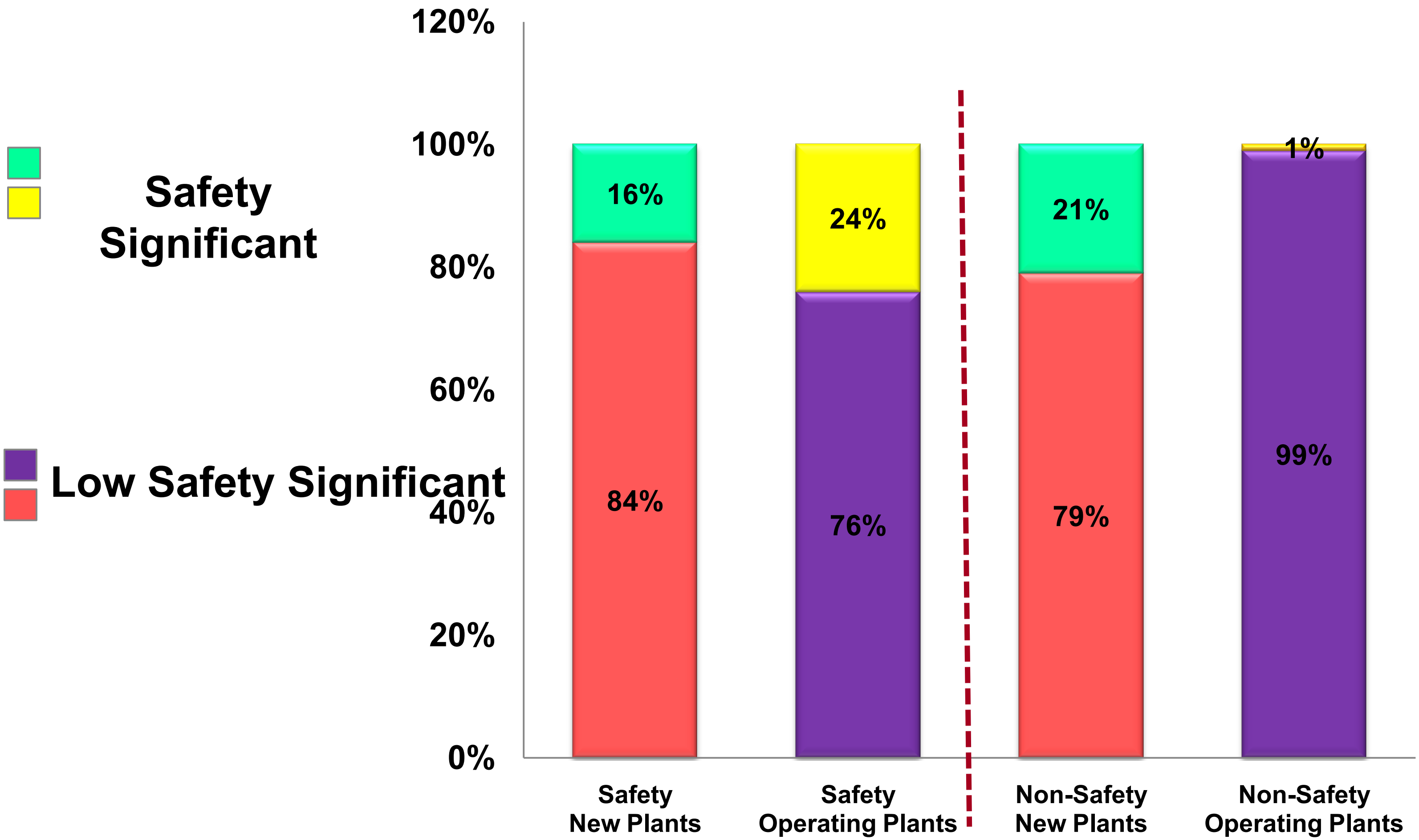
New Build vs. Operating – Comparison (Active)



Passive Components Risk Classification - Example

System ID	Comp/ Line #	Active/ Passive	Comp Type	Weld Class	Weld #s	Consequence Rank			Failure Modes	FV	RAW	CC RAW	Rank
MHSI	1	A	MOV	SIS Sump to MHSI/LHSI Train 1 Pumps Suction MOV					CL				Low
MHSI	2	P	Piping	2	10	HIGH							High
MHSI	3	P	Piping	2	1	MEDIUM							Medium
MHSI	4	P*	MV	MHSI Pump 10 Suction Manual Valve					MEC1	0.000	1.3		Low
MHSI	5	P	Piping	2	11	HIGH							High
MHSI	6	P	Piping	2	1	MEDIUM							Medium
MHSI	7	A	Pump	MHSI Train 1 Motor Driven Pump					FR, FS,	0.042	1.7	447	High
MHSI	8	P	Piping	2	24	MEDIUM							Medium
MHSI	9	P	Piping	2	1	MEDIUM							Medium
MHSI	10	P	Piping	2	1	MEDIUM							Medium
MHSI	11	A	MOV	MHSI Pump 10 Discharge MOV					CL	0.000	1.0		Low
MHSI	12	P	Piping	2	8	MEDIUM							Medium
MHSI	13												N/A
MHSI	14	P	Piping	2	2	LOW							Low
MHSI	15	P*	CV	MHSI Pump 10 Discharge Check Valve					CL, FO	0.000	1.1	420.5	High

Active vs. Passive SSCs Ranking

Reasons for differences in the Active vs. Passive SSCs Ranking:

- Relative (FV, RAW) vs. Absolute (CCDP) Ranking
- Common Cause Consideration for Active SSCs
- Spatial Effects/Isolation Consideration for Passive Components
- …

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Risk Sensitivity Study

The final step in the process of categorizing SSCs into risk-informed safety classifications involves the evaluation of the **risk implications of changes in special treatment**.

This risk sensitivity study is performed using the available PRAs to evaluate the **potential impact on CDF and LERF**, based on a postulated change in reliability.

In this risk sensitivity study, the **unreliability of all modeled low safety-significant SSCs is increased simultaneously by a common multiplier** as an indication of the potential trend in CDF and LERF, if there were degradation in the performance of all modeled low safety-significant SSCs.

Specific Factor to be used in the Risk Sensitivity Study

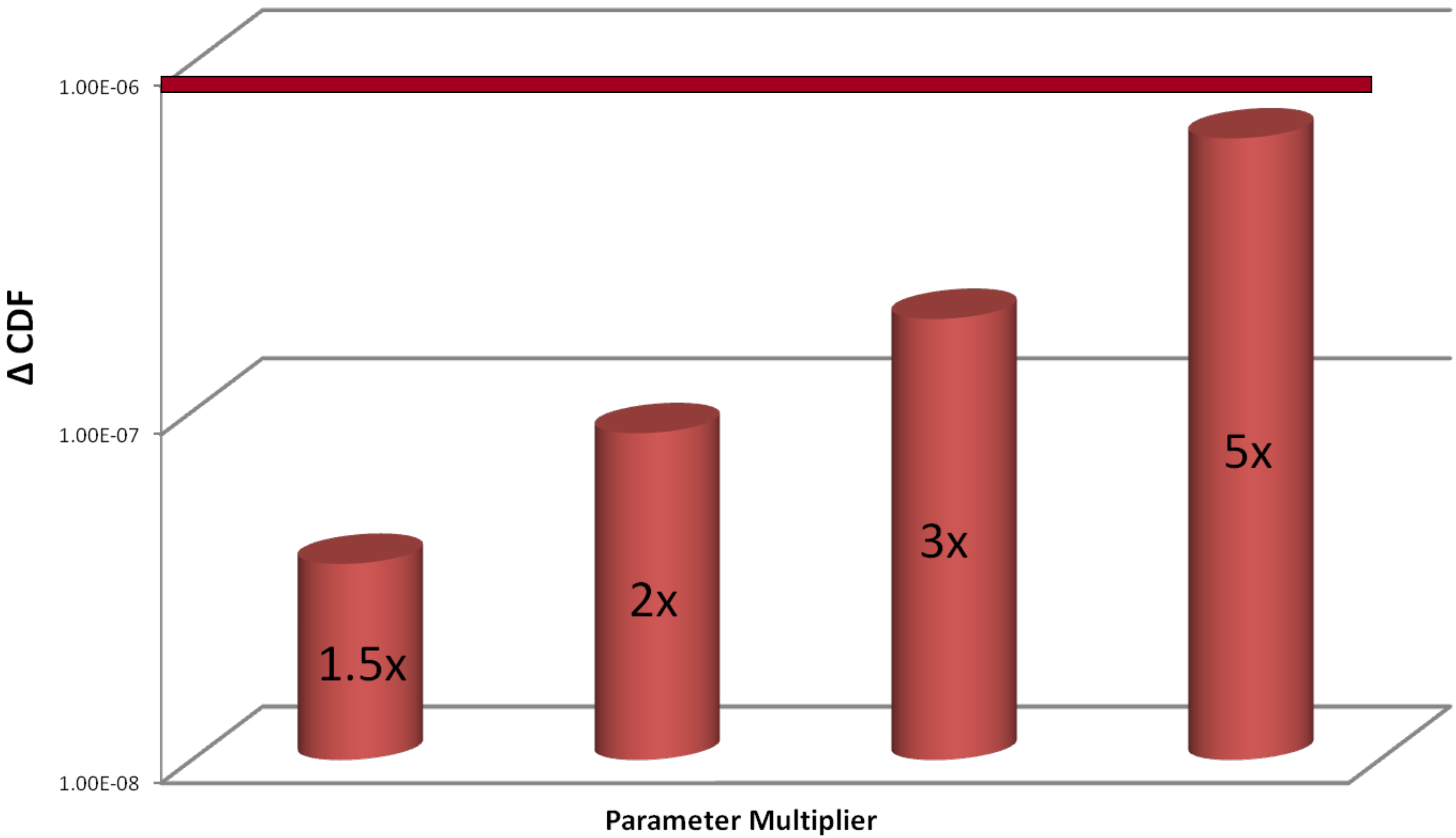
In identifying the specific factor to be used in the risk sensitivity study, two considerations should be considered:

1. The cumulative risk increase that would be computed if the unreliability of those SSCs were assumed to simultaneously increase by that factor. That is, the factor used should not lead to exceeding the quantitative acceptance guidelines of Reg. Guide 1.174.
2. The ability of a monitoring program to detect a change of that factor. This includes consideration of currently expected number of failures for the number of demands/hours of operation and the expected number of failures for the expected future number of demands/hours of operation for the population of SSCs that are expected to be classified as LSS. Standard practices used for setting performance criteria based on failures under the maintenance rule are applicable.

Risk Sensitivity Study Results – Example

1.5x	Δ CDF [1/yr]	3.7E-08
2x	Δ CDF [1/yr]	8.7E-08
3x	Δ CDF [1/yr]	1.8E-07
5x	Δ CDF [1/yr]	6.1E-07

Risk Sensitivity Study Results – Example



Conservatism in Risk Sensitivity Study - General

- In general, because one of the guiding principles of this process is that changes in treatment should not significantly degrade performance for RISC-3 SSCs and **should maintain or improve the performance of RISC-2 SSCs**, it is anticipated that there would be little, if any, net increase in risk
- A simultaneous degradation of all SSCs is extremely unlikely for an entire group of components. Utility corrective action programs would see a substantial rise in failure events and corrective actions would be taken long before the entire population experienced such degradation.
- Individual components may see variations in performance on this order, but it is exceedingly unlikely that the performance of a large group of components would all shift in an unfavorable manner at the same time.

Conservatism in Risk Sensitivity Study – Current Example

- Maximized the percentage of the SSCs in RICS3. The following inputs in the future are likely to reduce a percentage of the SSCs in RICS3 :

  1. Separate ranking for Fire & Internal Events
  2. Shutdown PRA ranking
  3. LERF PRA ranking
  4. Insights from the PRA Based Seismic Margin study
  5. Insights from IDP meetings

Performance Monitoring of RISC-3 SSCs

- Performance monitoring of RISC-3 SSCs, as required by 10 CFR 50.69(e)(3), is established to provide assurance that potential increases in failure rates will be detected and addressed before reaching the rate assumed in the integrated sensitivity study.
- Since implementation of §50.69 would allow RISC-3 SSCs to be procured with reduced special treatment, and used in multiple systems, it is important to be aware of inter-system common cause failure potential.
- As a means to monitor equipment performance changes, failures of RISC-3 SSCs are identified and tracked in the corrective action program.

CAP: Proposed Performance Monitoring

From NEI 00-04:

- If the number of failures for a group of SSCs exceeds a factor of two increase over the expected number of failures, a potential adverse trend is identified requiring further assessment. The factor of two is selected so to assure an assessment is initiated prior to exceeding the factor used in the risk sensitivity study (e.g., a factor of 3 to 5). The licensee should take the appropriate actions, (which could include changes in treatment or categorization), to preclude reaching unacceptable performance.