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Southern Nuclear Company

Operational Decision Making Reflects Safety First;
Prescribed Probabilistic vs. Systematic Probabilistic Decision Making

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Ground Rules



Rule 1: There is no desirable/practical "Zero" risk option

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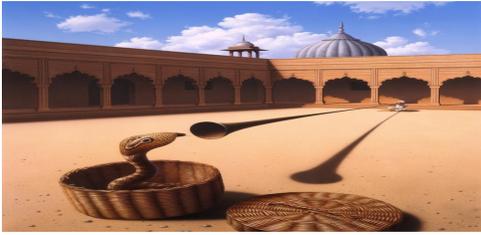
Ground Rules

Impact	Likelihood				
	Rare	Unlikely	Possible	Likely	Almost certain
Catastrophic	moderate	moderate	high	critical	critical
Major	low	moderate	moderate	high	critical
Moderate	low	moderate	moderate	moderate	high
Minor	very low	low	moderate	moderate	moderate
Insignificant	very low	very low	low	low	moderate

Rule 2: Maximizing success paths is preferred option

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Ground Rules



Rule 3: Risk management through engineered decision making process



Decision Making and Uncertainty



If a man will **begin with certainties** he shall **end in doubts**, but if he will be content to **begin with doubts**, he shall **end in certainties**.

Francis Bacon *The Advancement of Learning*, 1605. 

Options for Decision Making

- Prescribed-Probabilistic (PP) Analysis and Requirements (AKA "deterministic")
 - These are analyses and requirements that are set by using **engineering judgment** to establish
 - Frequency of certain classes of bounding initiating events
 - AND
 - Combination of bounding deterministic and **engineering judgments** to address uncertainties with respect to plant response to occurrence of selected classes of initiators.
- Systematic-Probabilistic (SP) Analysis and Requirements (AKA Risk-Informed)
 - These are analyses and requirements that are based on
 - Statistical evaluation of the frequency of possible initiators
 - AND
 - Combination of deterministic and probabilistic evaluations of accident mitigating functions response to each (class of) initiators.
- Deterministic Analysis- Not often discussed
 - These are analyses and rules which are purely based on deterministic analysis. For example, the amount of water required in the RWST and the amount of water is calculated based on mechanistic calculations.



Prescribed-Probabilistic Analysis

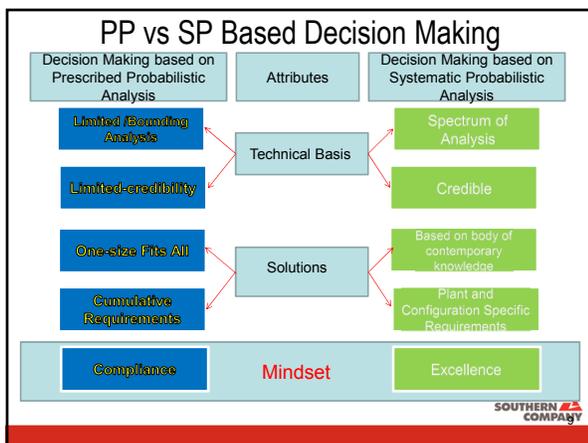
- Universe of accidents is limited
 - single failures only
 - limited treatment of operators
- Use of margins to address uncertainties, based on engineering judgment
 - can lead to excessively conservative design
 - can lead to belief that DBAs are limiting
- No assessment of relative risk significance (importance)
- No quantitative indication of risk to ease constructive decision-making



Systematic-Probabilistic Analysis

- Focused on determining the level of risk & the risk contributing features of the design and operations
 - PRA identifies accident initiators and inductively derives accident scenarios (i.e., not limited to pre-determined set of accidents)
 - Analyzes multiple failures, including failures of redundant "barriers"
 - Non-safety equipment is credited
 - More extensive treatment of operator actions
 - Use of conservative margins avoided; focus on "best-estimate" analysis where possible
 - Goes beyond Design Basis
 - Assesses risk-importance of modeled elements
 - Provides quantitative results and a "model" for decision-making





PP vs SP Based Decision Making

Prescribed Probabilistic Decision Making Creates Manager-Type Focus	Systematic Probabilistic Decision Making Create Leader-Type Focus
Tasks/Things	People
Control	Empowerment
Efficiency	Effectiveness
Having right to do things	Doing the right thing
Speed	Direction
Practices	Principles

Be a yardstick of quality. Some people aren't used to an environment where excellence is expected.
Steve Jobs

Conclusions

- Status Quo Mindset- Future unpredictable, risk minimization only achieved through maximizing each level of defense-in-depth through prescribed-probabilistic analysis
 - Siloed conservatism - cumulative patchwork requirements, non-credible solutions
 - Compliant but unengaged and combative regulatory environment
- Progressive Mindset- Unpredictable future best managed by integrated reallocation of resources, state-of-knowledge and state-of-practice improvements through systematic probabilistic analysis
 - Holistic conservatism that focuses resources on the key choices that influence major risk-drivers.
 - Focus on increased chance of success vs. eliminating the risk
 - Credible and better managed Defense-in-Depth strategy embraced by implementers (utility management and staff)
