

Industry Proposed Method to Address RIS-2015-006

- Currently only one available analytical method (TORMIS) to assess risks posed by tornado missile scenarios
- Technical expertise to support TORMIS assessments is limited
- Additional methods needed to allow timely assessment of risk to exposed components within the period of enforcement discretion defined in NRC EGM 15-02.
- Industry proposes an alternative:
 - Risk-informed
 - Based on existing precedent

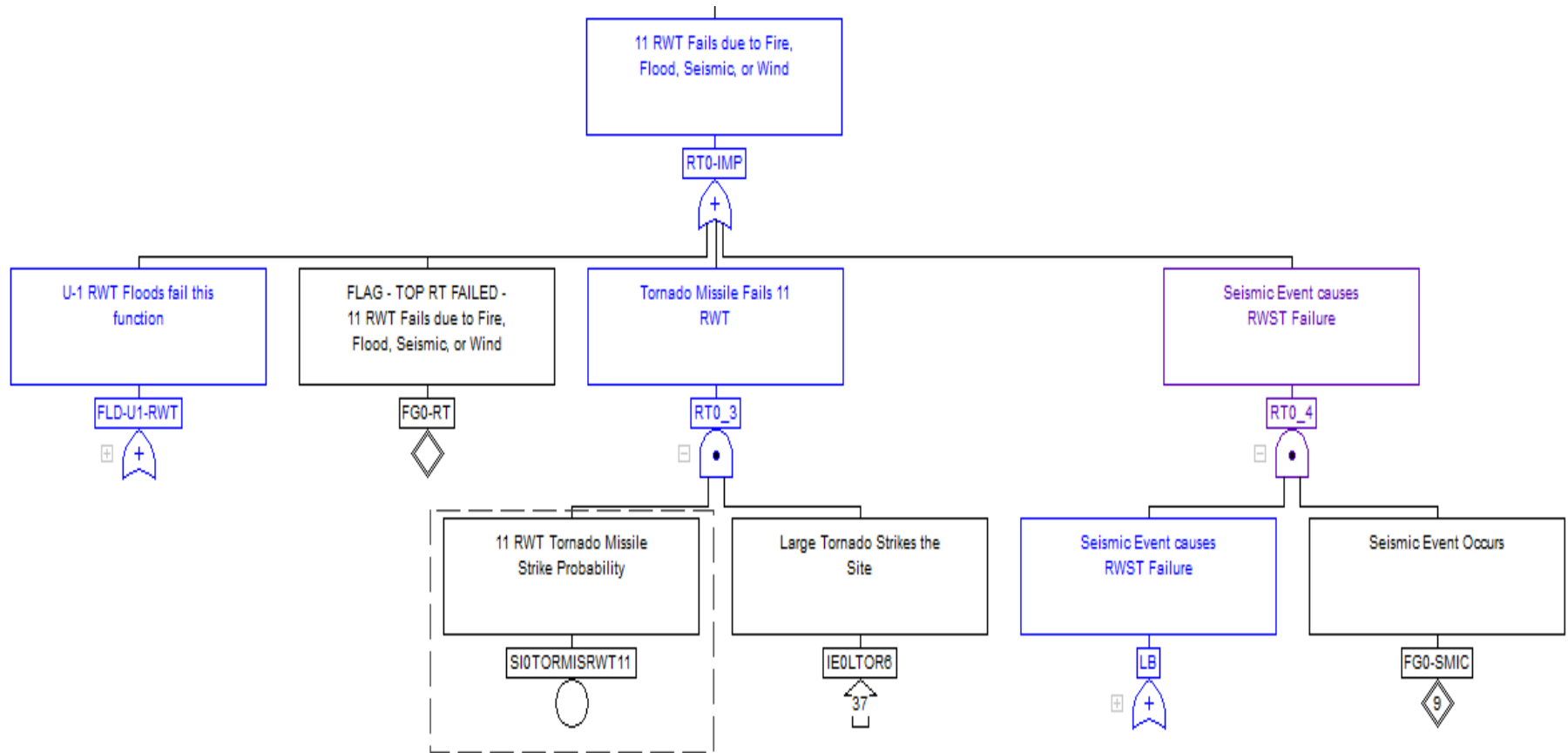
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- Risk to NPP safety recognized as low
 - NRC bounding risk assessment (April 2014) used to inform RIS
 - Hazard lower priority (Tier 2) than seismic and flooding in Fukushima response
- Proposed approach based on approved Calvert Cliffs submittal (1995) with suitable enhancements
 - Require site specific walkdown to identify SSC vulnerabilities / degraded conditions / estimate of missile inventory within proximity of unprotected targets
 - Conduct tornado hazard analysis using most recent NRC guidance (NUREG/CR-4461) rev 2
 - Include latest site applicable OE (recent tornado strikes near site)
 - Include point strike + line strike models
 - Apply PRA average maintenance model for risk assessment calculations

Characteristics of Calvert Cliffs Approach (w/ Enhancements)

- Applies SSC hazard exposure to tornado generated missiles of $< 1E-6/yr$ (*total for all identified unprotected GDC2 SSCs*) as criteria for meeting GDC-2 requirement that risk is sufficiently low and physical protection is not required
- Methodology:
 - Site walk-down to identify vulnerable SSCs required for safe shutdown
 - Tornado strike frequency estimates based on NUREG/CR-4661 rev2 updated to include OE of recent tornado occurrences near site
 - Applies PRA average maintenance model for risk assessment calculations
- Tornado Analysis:
 - Point strike model applied for tornadoes of all strengths (EF0 – EF5)
 - Assumes off-site power and any SSC failures are non-recoverable
 - Applies weighted missile strike parameter (ψ) from NUREG/CR-4710
 - *Conditional Missile Strike Probability = Target Area x Missile Population x ψ*
 - Assumes SSC fragility (conditional failure probability given a missile strike) 1.0 *unless analysis conducted to justify different result*

Example of Missile Strike Modeling



Technical Adequacy of Supporting Risk Information

- Proposed approach does not constitute traditional risk-informed licensing application
 - Qualitative application of risk information supports license application
- RG 1.200 applies to traditional risk-informed licensing applications
 - Peer review not required to support this proposed approach
- RG 1.200 discussion on bounding analysis in Section 1.2.5
 - Screening methods can be employed to show that contribution to CDF and/or LERF is insignificant
 - Event can be screened out if:
 - Meets the criteria in the NRC's 1975 SRP or a later revision
 - Can be shown using a demonstrably conservative analysis that the mean value of the design-basis hazard used in the plant design is less than $1E-5$ per year and that the conditional core damage probability is less than $1E-1$, given the occurrence of the design-basis-hazard event
 - Can be shown using a demonstrably conservative analysis that the CDF is less than $1E-6$ per year.