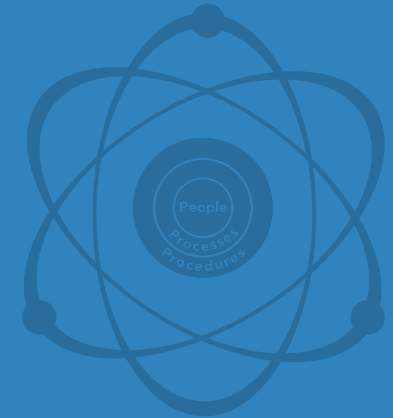


SEISMIC PRA FRAGILITY SENSITIVITY STUDIES

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Discussion Topics

- **Introduction**
- **Realism in SPRA**
- **The Sensitivity Study Process**
- **Grouping of SSCs supporting the same PRA Function**
- **Multiple Rounds of Sensitivity Studies**
- **Conclusions**

Introduction

- **Fukushima Earthquake/Tsunami**
- **Issuance of 50.54(f) letter**
- **NTTF Recommendation 2.1**
- **Seismic PRA**
 - Seismic Hazard
 - Fragility
 - Plant Response Modeling

This interface is where fragility refinement exercise take place

Realism in Fragilities – How good is good enough?

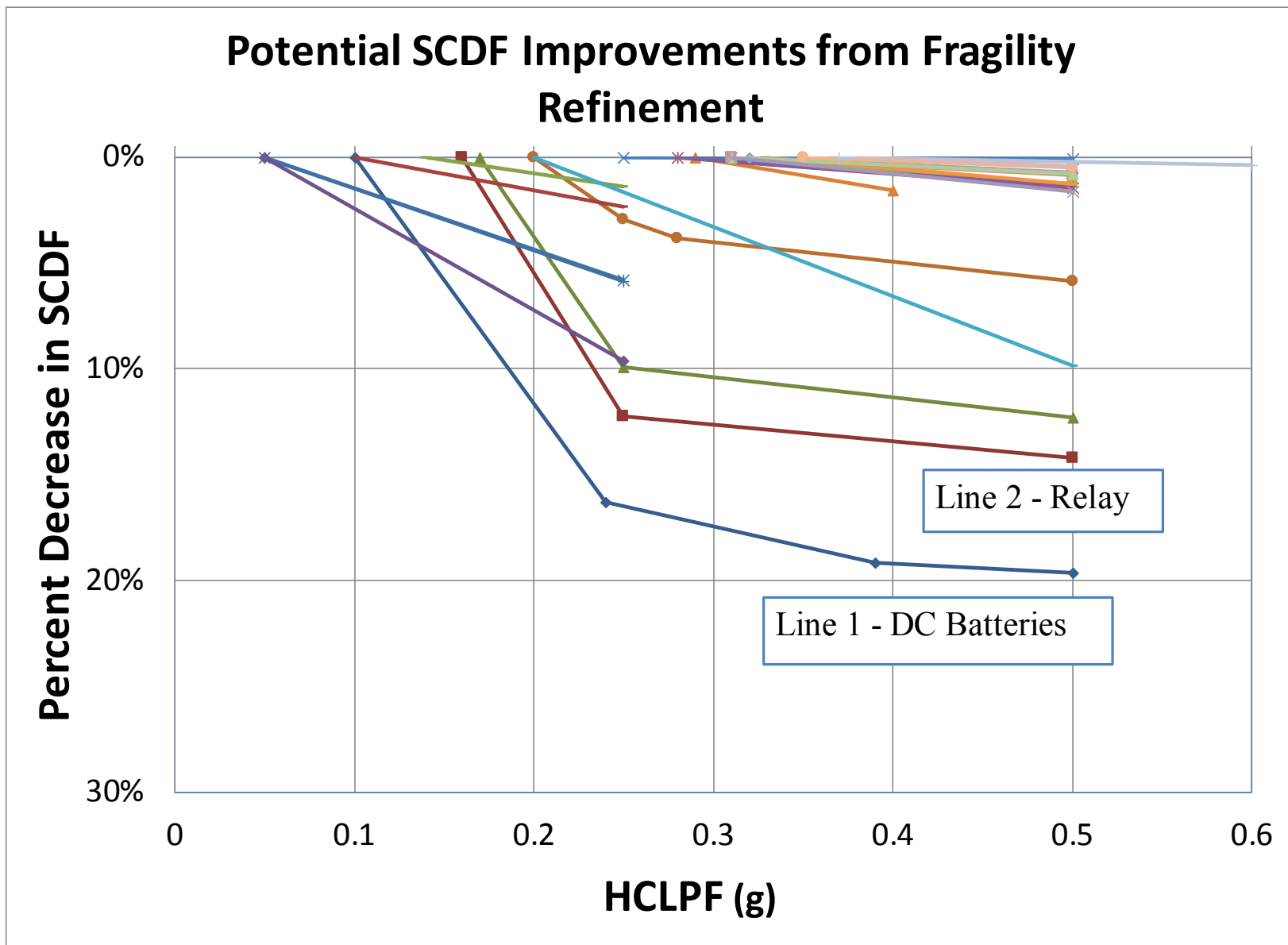
- **ASME/ANS PRA Standard requires Realism in fragilities**
- **Obtaining realistic fragilities for SSCs requires extensive resources**
 - Need to identify risk-significant SSCs
 - Demonstrate that SSCs with conservative/generic fragilities pose minor or acceptable impact to plant risk results

Index No. SFR-A	Capability Category II
SFR-A2 [Note (2)]	CALCULATE the seismic fragilities based on plant-specific data, and ENSURE that they are realistic (median with uncertainties). Generic data (e.g., fragility test data, generic seismic qualification test data, and earthquake experience data) may be used for screening of certain SSCs and for calculating their seismic fragilities by applying the Requirement HLR-SFR-F, which permits use of such generic data under specified conditions. However, DEMONSTRATE that any use of such generic data is applicable.

Seismic Sensitivity Study Process

- **We can perform Sensitivity Studies to vary Fragility parameters (Am or HCLPF) and assess the impact of such a change to CDF/LERF**
- **Fragilities can be varied for individual SSCs or groups of SSCs with similar impacts**
 1. Identify Important Equipment groups using traditional PRA risk metrics (FV importance)
 2. Assume hypothetical improved Fragility parameters for those Equipment groups
 3. Evaluate impact of improved Fragility parameters to CDF/LERF
 4. Identify which Equipment Group(s) drive model results, feed this information back to Fragility analysts to verify if calculation is realistic or if there are more conservatisms that could be removed

Sensitivity Study Results

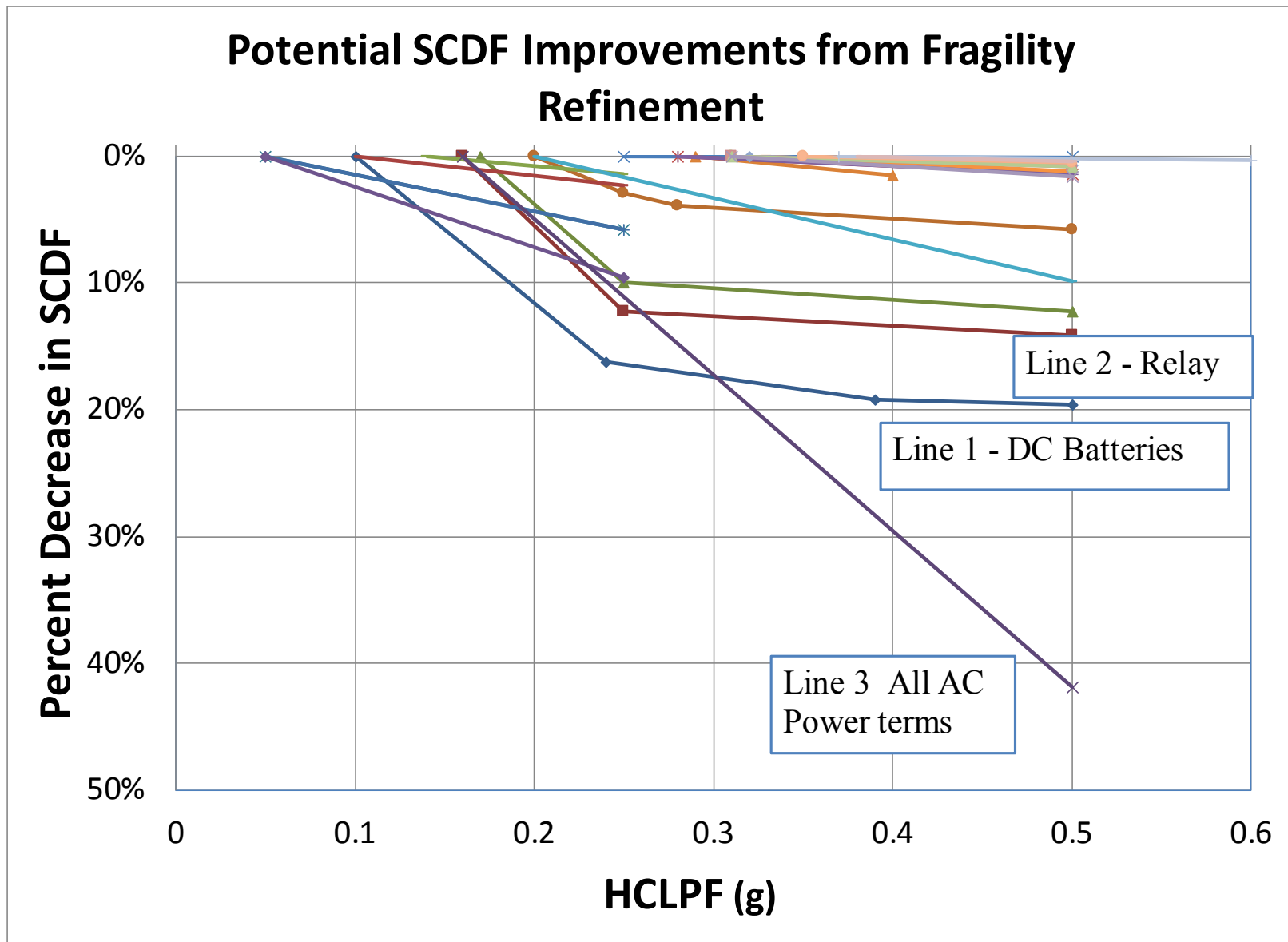


SSCs supporting the same PRA function

- Many SSCs modeled in the PRA may support the same functions, such as AC power availability
- A low fragility value for one SSC may mask the impacts to improvements in other SSCs supporting the same function

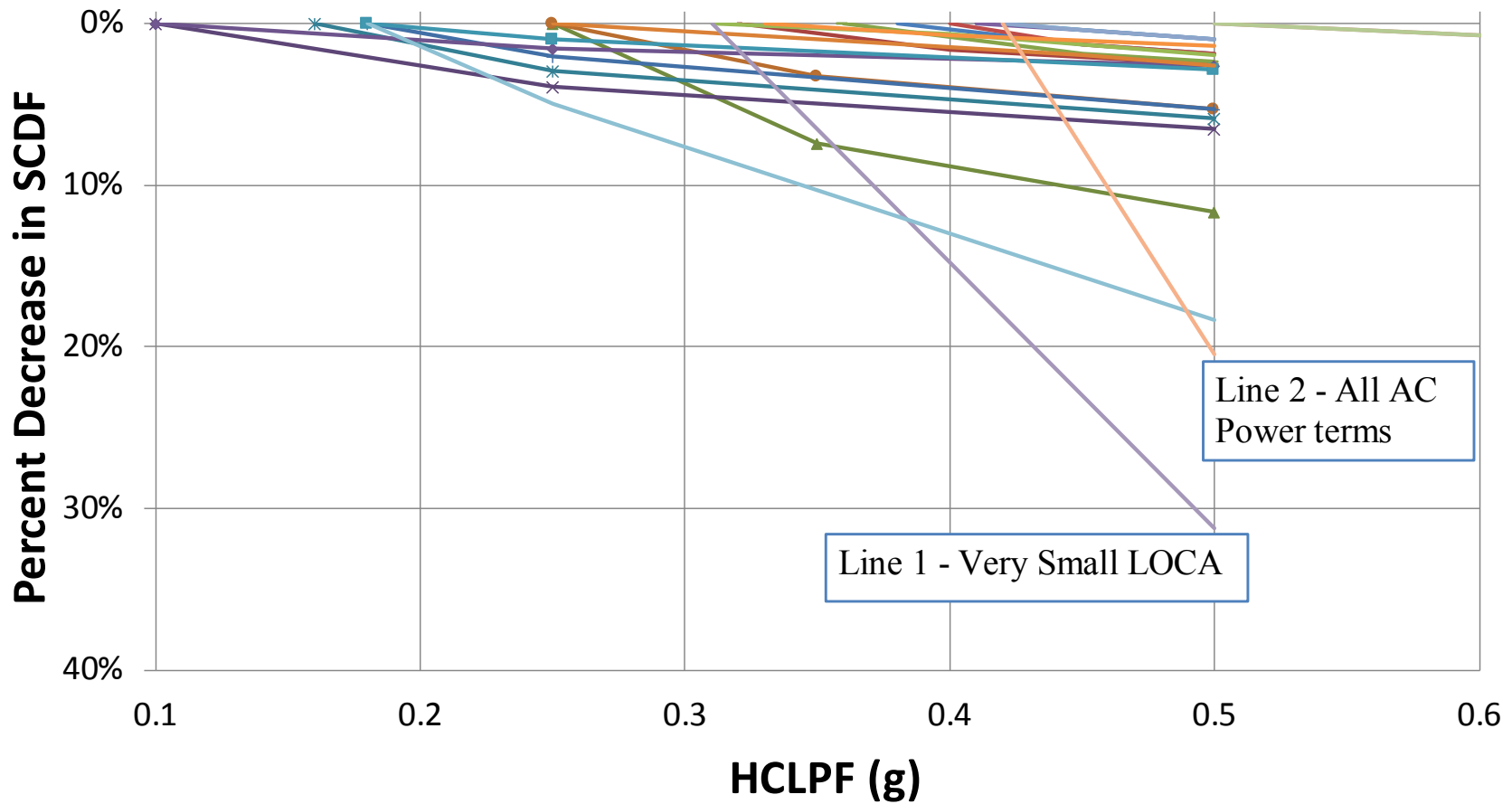
Fragility Group Description	HCLPF (g)
480 VAC Panels and MCCs	0.29
125 VDC Panels	0.32
Emergency Service Water Pumps	0.31
Division 3 Emergency Diesel Generator	0.33
Division 1 and 2 Emergency Diesel Generators	0.33
EDG Heat Exchangers	0.38
EDG Fuel Oil Storage Tanks	0.40
EDG Fuel Oil Transfer Pumps	0.47
EDG Lube Oil Sump Tanks	0.48

Results with Grouping



Sensitivity Studies - Second Round

Potential SCDF Improvements from Second Round of HCLPF Refinement



Conclusion

- **These Seismic Sensitivity Studies on the calculated fragility parameters can be used to identify the key model drivers in the PRA**
- **Focus on those drivers for further fragility calculation refinements – ensure these terms are realistic**
- **For terms that do not have much impact to the PRA results, the calculated fragility parameters may be acceptable, even if conservative or generic.**
- **If SCDF or SLERF is still judged to be too high and all key contributors have realistic fragility parameters, these sensitivity studies can be used to identify plant modifications to further reduce SCDF/SLERF**

THANKS FOR YOUR ATTENTION QUESTIONS???

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