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Accident Management Rulemaking

NRC Public Meeting

September 19, 2013

Overview

- Responses to Open Items from Aug 14 Meeting
- Release Categories and Identification of Representative Scenarios and Sensitivities
- Preliminary Cost Information
- Benefit-based Screening Option

Responses to Open Items

- In August 14 meeting the following items were requested by the NRC staff:
  - Define “Small” vs. ”Large” filter
  - SRV Hysteresis
  - Measurement of PCPL at reference plant

“Small” vs. ”Large” Filter

- “Large” filter
  - Accommodates >100kg of aerosol mass loading, and
  - Over 1000kW in decay heat (from the aerosol loading).
- “Small” filter
  - Accommodates ~15-30 kg of aerosol mass loading (scalable), and
  - ~250kW of associated decay heat

SRV Hysteresis

- What is the pressure band in which the SRV cycles?

- Reference plant indicates:
  - SRV begins to open at set point
  - Re-closure at 90% of set point

- Recommendation:
  - In relief or safety mode, use 10% hysteresis band
  - In manual control, use 200 psig (400 psig open-200 psig close), including hysteresis

Measurement of PCPL

- EPG/SAGs provide guidance on how to establish the PCPL, including consideration of which instruments are to be used (See EPG/SAG Rev. 2, Appendix B)

- For the reference plant, the PCPL reflects the drywell airspace pressure and the limits account for the impact of water level.

- Recommendation:
  - Use drywell pressure of 60 psig to represent PCPL

Release Categories, Scenarios, and Sensitivities

APET End States and Sensitivities

- MAAP will be used to analyze:
  - Potentially significant APET end states
  - All alternatives

- Interpolation of MACCS2 results for consequence analysis

- Sensitivities will focus on:
  - Phenomenological uncertainties, *e.g.*, MSL rupture, in-vessel retention, etc.
  - Key human actions

Preliminary Cost Information

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Collection of Cost Information

- Industry has initiated efforts to collect and provide representative cost information for the alternatives under consideration
- For some alternatives, the costs can vary significantly from site to site
- Best efforts are being applied to provide representative data that includes the following cost components:
  - Equipment
  - Fabrication/Installation
  - Engineering
  - Project Management
- Implementation and on-going operating and maintenance costs are still being developed

Alternatives

- External RPV Injection Point
- External DW Injection Point
- Small Filter
- Large Filter

External RPV Water Injection Point

- As part of FLEX, all plants will have a two connection points to utilize a portable pump to provide a diverse means of makeup to the RPV
- Generally, for FLEX, this connection is made inside the Reactor Building
- Under severe accident conditions, these connection points may not be accessible
- This alternative would provide one connection point external to the Reactor Building
- Cost will vary significantly from site to site based on the plant-specific configuration
- Preliminary estimates are ~$1M per unit

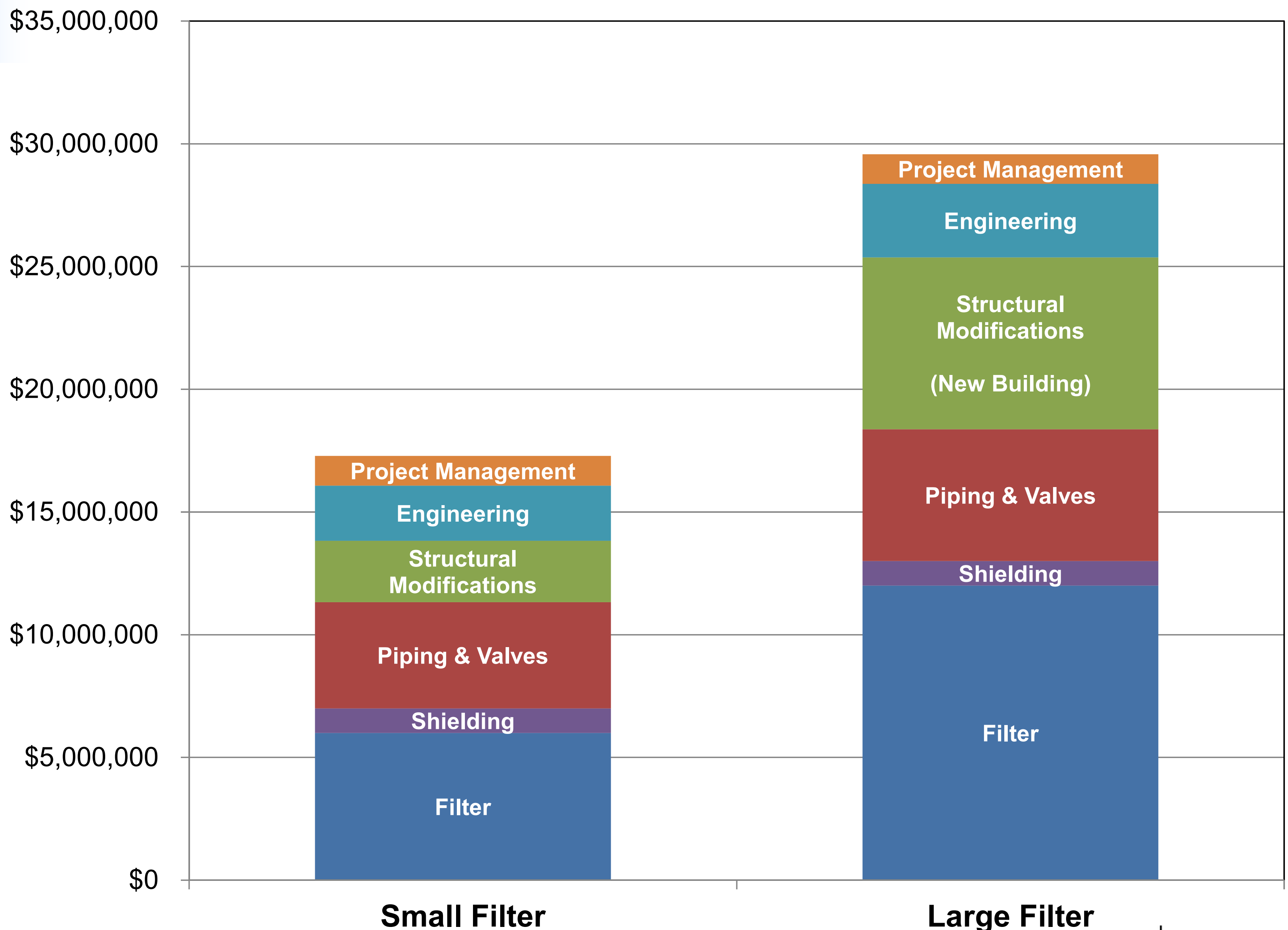
External DW Water Injection Point

- As part of FLEX, all plants will not necessarily be able to utilize a portable pump to provide injection to the DW
- FLEX connection are generally made inside the Reactor Building and may not be accessible
- This modification would provide a connection point external to the Reactor Building with a flow path to the DW
- This alternative would provide one connection point external to the Reactor Building
- Cost will vary significantly from site to site based on the plant-specific configuration
- Preliminary estimates are $2+M per unit
  - Some estimates as high as $8M

Small & Large Filter

- The installation of an engineered filter is a significant modification involving:
  - Structural modifications
  - Shielding
  - New piping and valves
- Cost much greater than the filter itself
- Ideally, a large filter would be located near Reactor Building
  - Not possible for some sites
- Significant variability in costs site-to-site
- Small filters may be able to be installed in existing structures, but structural modifications are still likely required

Preliminary Representative Filter Costs



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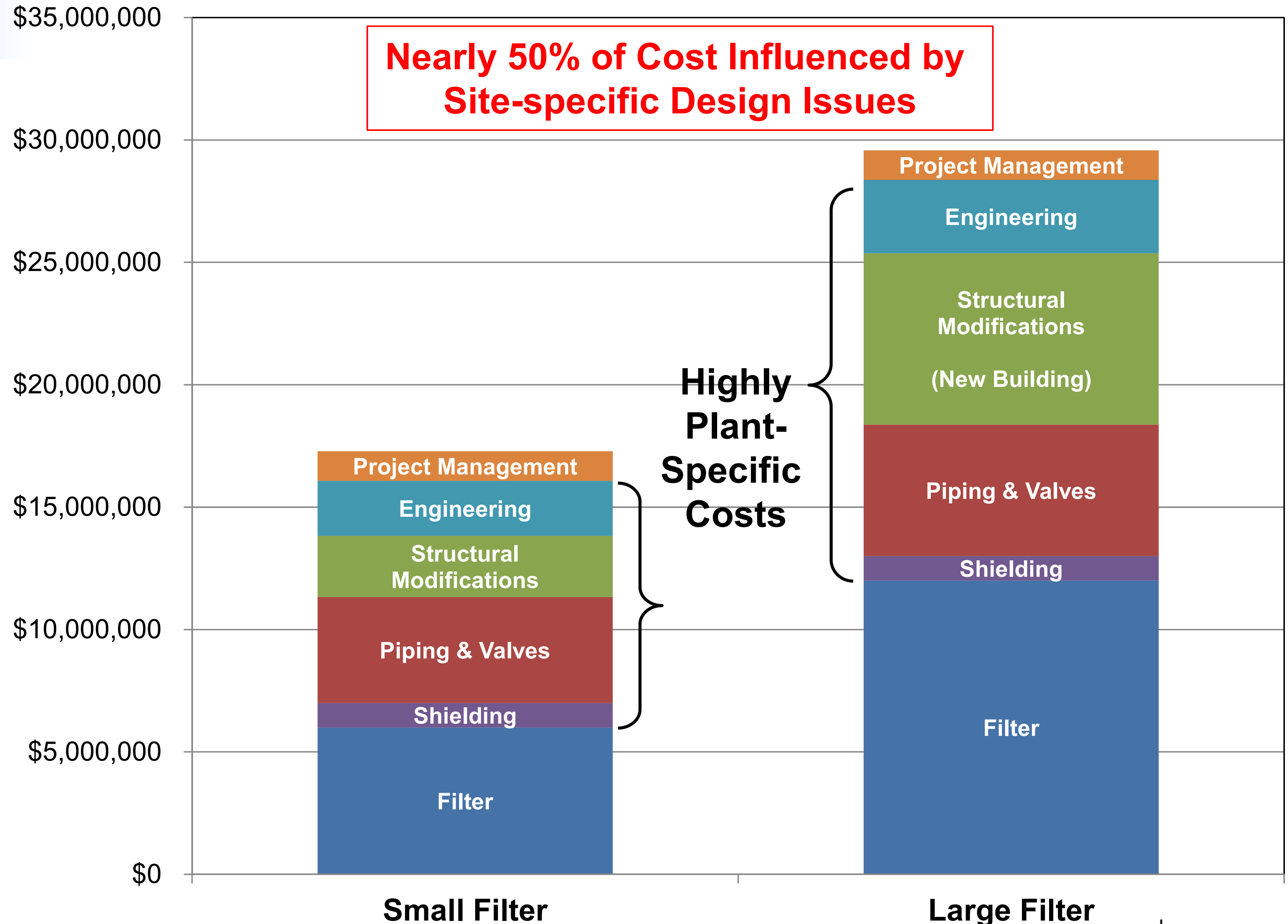
Important Variable Cost Elements



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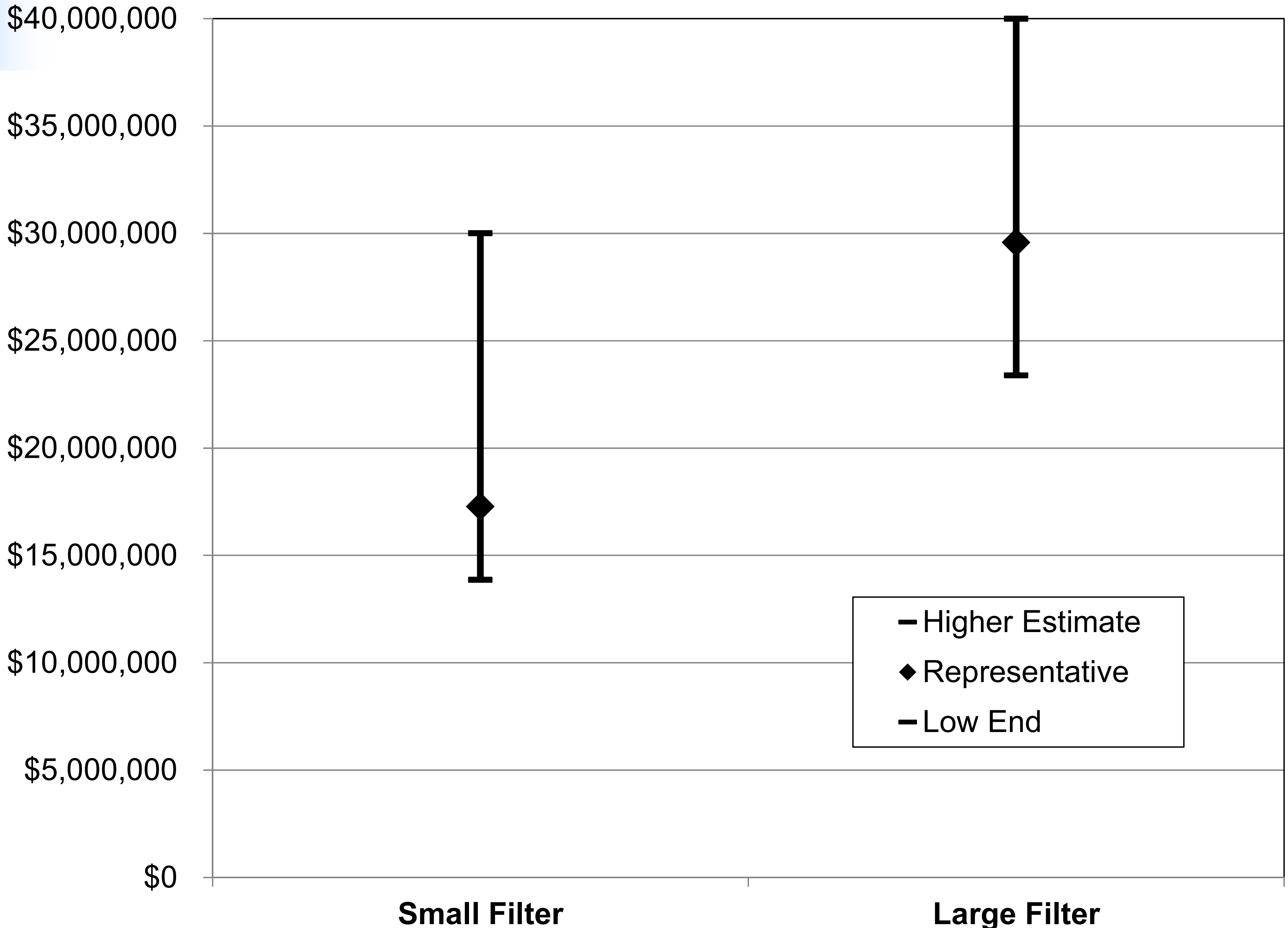
Preliminary Filter Cost Ranges



Cost Information on Alternatives

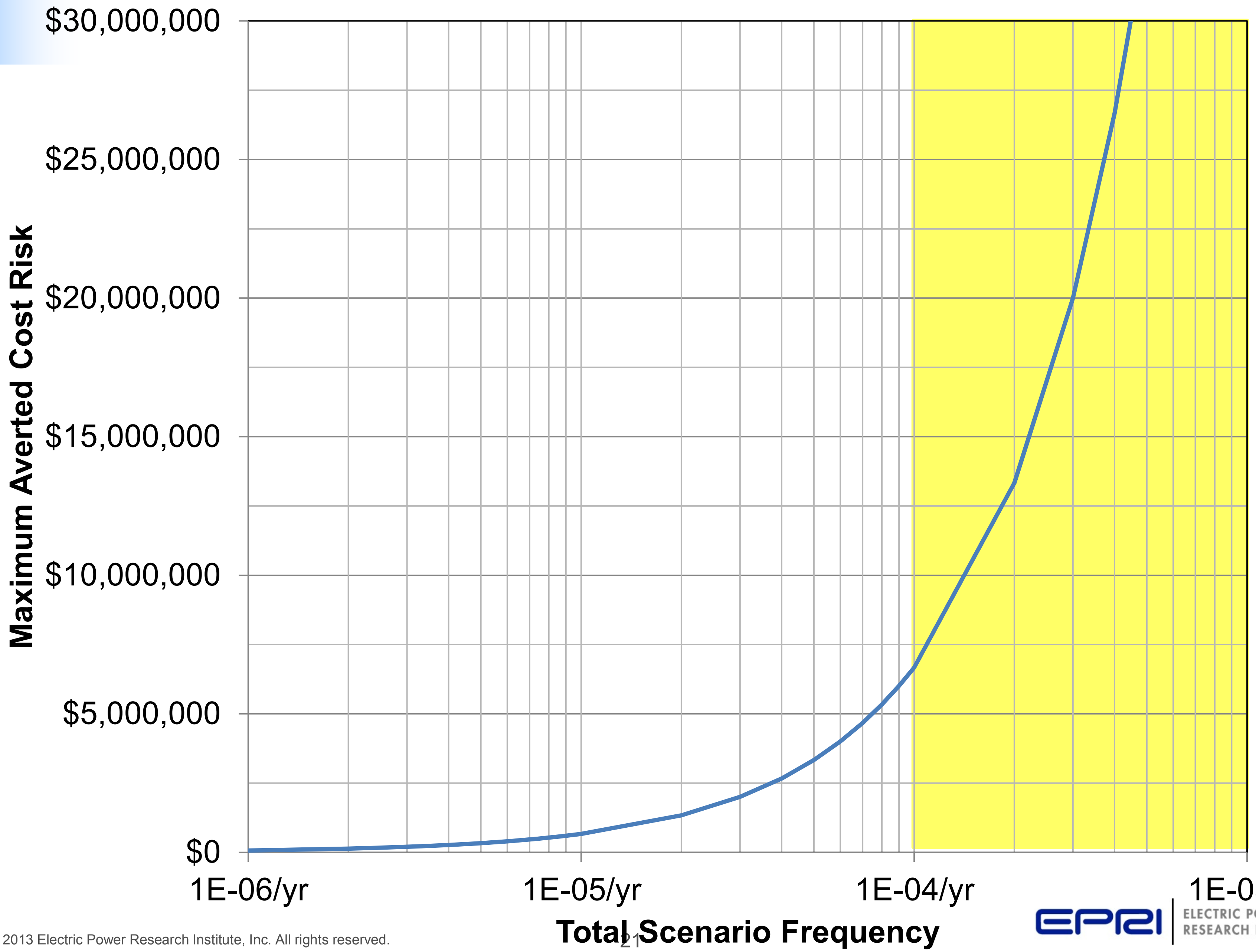
- Industry plans to formally provide cost information similar to the above
  - Representative costs and ranges
- Is there additional information that would be beneficial?

Benefit-based Screening Option

Purpose

- Use SECY-12-0157 analysis to provide screening tool for evaluation of rulemaking options
- Approach:
  - Compute Maximum Averted Cost Risk (MACR) from MACCS2 results provided in SECY-12-0157
    - Compute total economic cost for a range of assumed CDF
    - CDFs>1E-4/yr. shown, but excluded due to lack of credibility
  - MACR represents the theoretical maximum benefit that could be cost-justified (*i.e.*, assumes risk becomes 0.0)

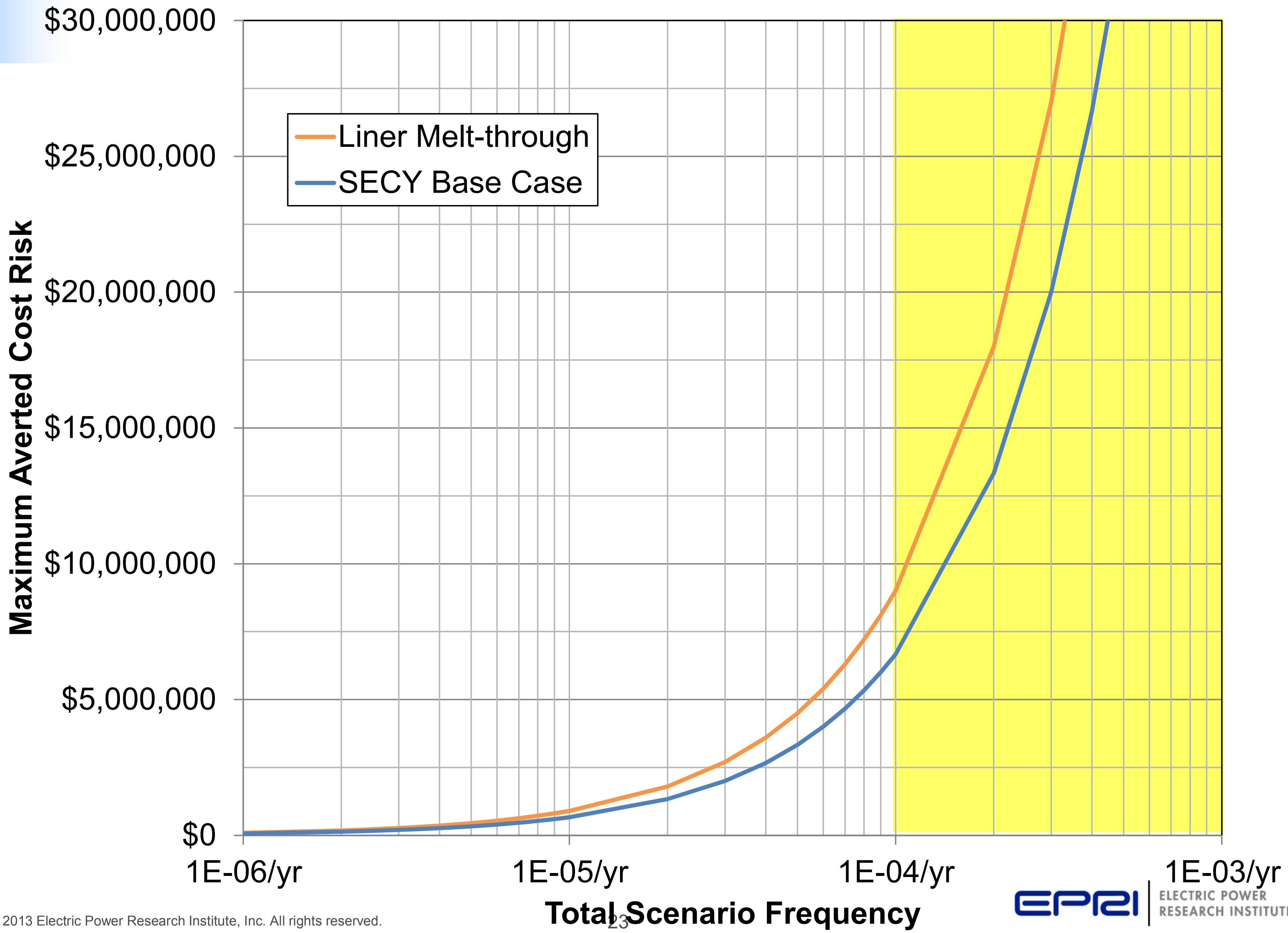
SECY-12-0157 Best Estimate Results



Liner Melt-through Case

- SECY-12-0157 included credit for water makeup to the containment that makes the base case results non-conservative
- To present a more limiting case, the cost analysis was re-evaluated assuming that all core damage scenarios impacted by venting resulted in liner melt-through
  - Assume 100% of scenarios result in liner melt-through (Case 2 of Enc. 5a,b,c)
  - This minimizes credit for B5b and maximizes the consequences
- Result is ~35% increase in maximum averted cost risk

Results Assuming Liner Melt-through



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Conclusions Based on Benefit-based Screening

- Cost-benefit difficult to justify when costs exceed ~$2M
- More costly alternatives may not merit undertaking cost-benefit evaluation