

# ***SPAR UPDATE PROCESS***

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# OVERVIEW

- SPAR Model Pedigree and QA Process
- SPAR Model Maintenance
- SPAR Model Update and Benchmarking Process
- SPAR Model Upgrades/Enhancements
- Plug for more Documentation

## ***SPAR Model Pedigree and History***

- Originated in early 90s to generate order of magnitude CDF estimates as part of “Daily Events Evaluation”
- Plant visits/information gathering (some benchmarking) during SDP notebook development (2001 – 2004)
- Benchmarked against latest PSA models/cut sets (2007 – 2009)
- Coordination with EPRI to identify/implement best practices and methods
  - LOOP/SBO
  - SSIE
  - Service water environmental impacts
  - Others
- Peer review of representative BWR and PWR models (August 2009)

## ***SPAR Model Pedigree and History (cont)***

- ASME Peer Reviews
  - Participants
    - BWR – Led by E.T. Burns of ERIN Engineering, and consisted of Ching Guey (Florida Power & Light), Dave Passehl (NRC), Wayne Schmidt (NRC), Martin Stutzke (NRC), and Chris Hunter (NRC).
    - PWR – Led by Barry Sloane of ERIN Engineering, and consisted of Chris Cahill (NRC), Robert Cavedo (Constellation Energy), Laura Kozak (NRC), Allen Moldenhauer (Dominion Generation), Jeffery Wood (NRC), and George Replogle (NRC)
  - NRC purpose for SPAR models usage
    - Tools that generate ‘risk informed’ insights independent of the PRAs with the application of these insights being confirmatory in nature.
  - Conclusions of Peer Review
    - The SPAR model structure is robust and well developed.
    - The SPAR model fault trees are streamlined with an appropriate level of detail for its intended uses.
    - The SPAR model structure and the SAPHIRE computer software are at the state of the technology.
    - The SPAR model is an efficient method to develop qualitative and quantitative insights for applications, SDP evaluations, inspections, event assessments, and model evaluations

## ***SPAR Model Maintenance***

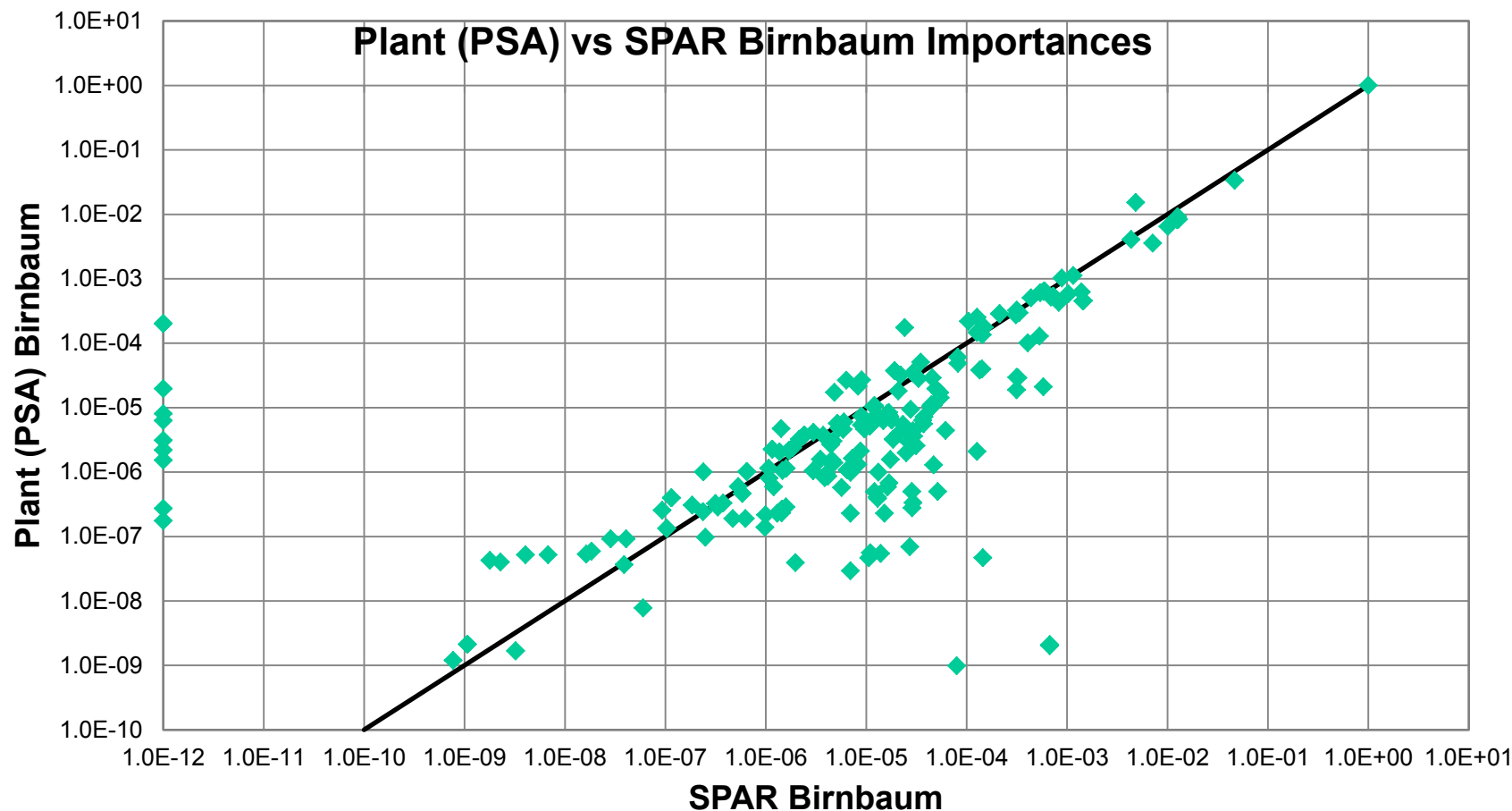
- Active error reporting and correction program
  - Web based tracking of model change requests
  - Changes made to support ASP/SDP analyses as needed
- Approximately ten models/year selected for major update and re-benchmarking
  - SRAs identify plants having significant modifications
  - Plant is contacted for supporting information
    - Mandatory
      - Details of modifications
      - Cut set file from latest PSA quantification
    - Desirable
      - Logic files (CAFTA, WinNUPRA)
      - PRA notebooks
- Data updates every two-to-three years
- Consistency/standardization sweep through all models every 5-to-7 years

# ***SPAR Update and Benchmarking***

- Purpose
  - Accurately model current plant operation and configuration.
  - Identify the significant differences between PRA and SPAR logic.
- The main steps in the update and benchmarking process:
  - Modify SPAR model in accordance with latest available information.
  - Load current licensee cut sets into SAPHIRE.
  - Map important events (based on Birnbaum importance) in the licensee PRA to analogous SPAR events.
  - Incorporate key licensee probabilities into SPAR model (via temporary change set).
  - Load SPAR and PRA importance reports into comparison spreadsheet.
  - Identify the outliers and make any additional changes allowed by SPAR policy and precedent.

## ***SPAR Update and Benchmarking (cont)***

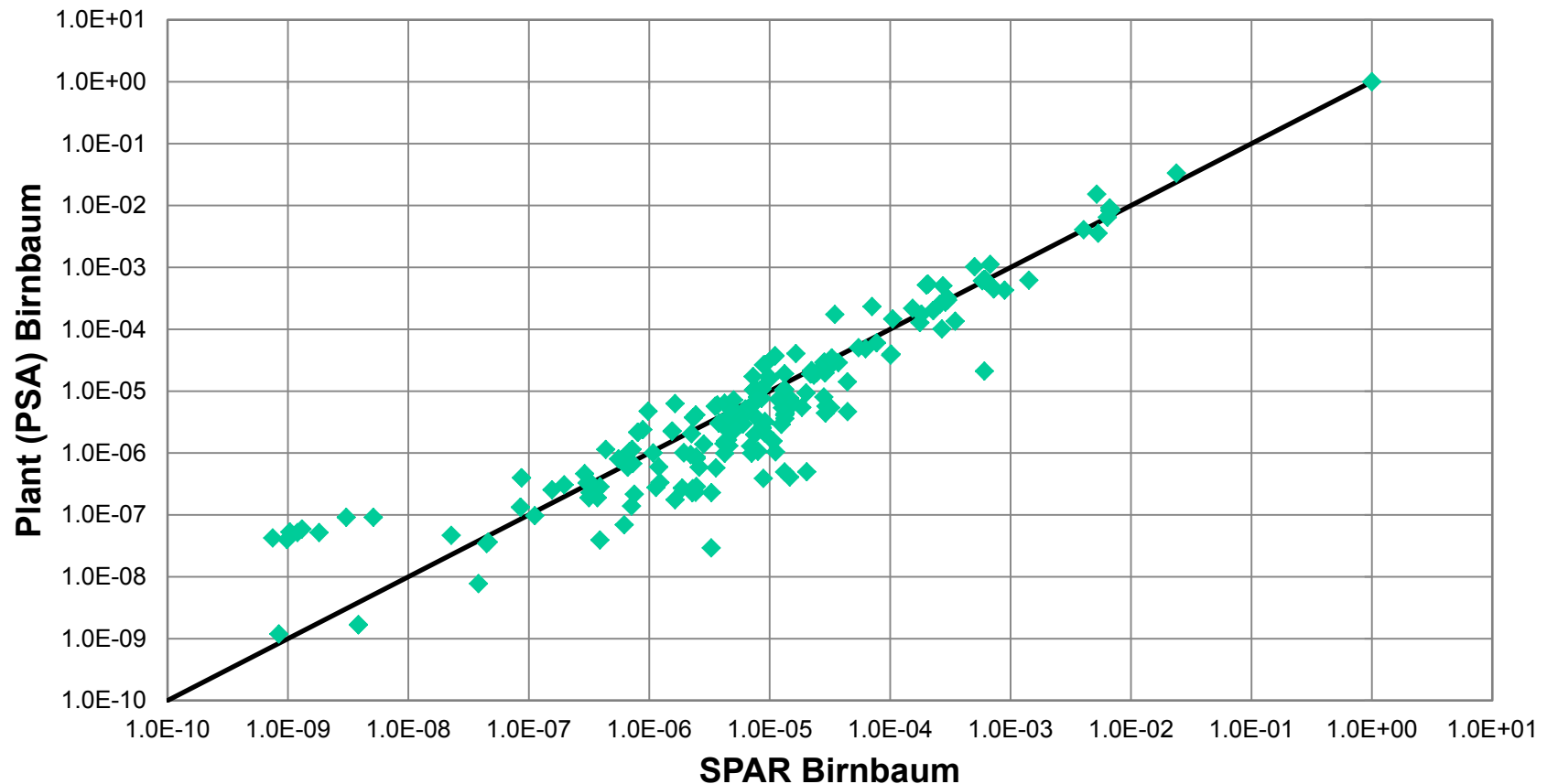
- Example of basic event match prior to benchmarking



# SPAR Update and Benchmarking (cont)

- Example of basic event match after benchmarking

Plant (PSA) vs SPAR Birnbaum Importances





## ***SPAR Model Enhancements/Upgrades***

- Automated application of convolution correction factors
- Support System Initiating Event (SSIE) logic
  - Includes explicit modeling of SWS environmental events
- Consequential LOOP logic
- Integrated documentation
  - Convergence discussion and results table added to each model's documentation
- Event tree linkage rules minimalization
  - Sequence FT substitutions direct tree event tree nodal substitutions
  - Explicit sequence level rules with SAPHIRE's new layering capability
- External Events
- Inclusion of rules based LERF impacts
- Converting CCF events to use 'R' type calculation

## *Plug for More Documentation*

- SPAR models are only as good as the available documentation
- No formal mechanism for informing INL of plant modifications or PSA updates
- INL documentation resources
  - FSARs
  - IPE/IPEEE documentation
  - MSPI Documents (2006)
  - SDP Notebooks (2008)
  - Smattering of other documentation on a plant specific basis
    - Logic models (CAFTA, WinNUPRA)
    - PSA Notebooks
    - TH Analyses
- Additional documentation will benefit everyone!
- Regional SRAs facilitate information exchange