

# EPRI External Flooding Research Program Overview

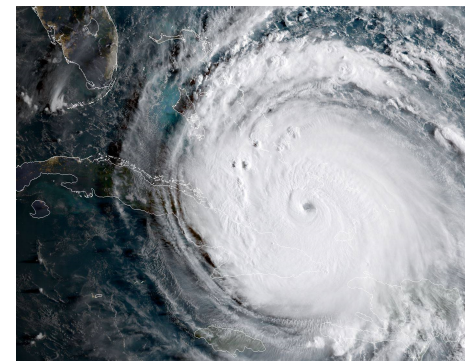
Marko Randelovic, Senior Technical Leader

4th Annual Probabilistic Flood hazard Assessment  
Workshop  
April 30<sup>th</sup> – May 2<sup>nd</sup> 2019



# Presentation Outline

- Fundamental Resources
- Recently Published Reports
- On-Going Research
- Future Research Plans



# EPRI Fundamental Resources

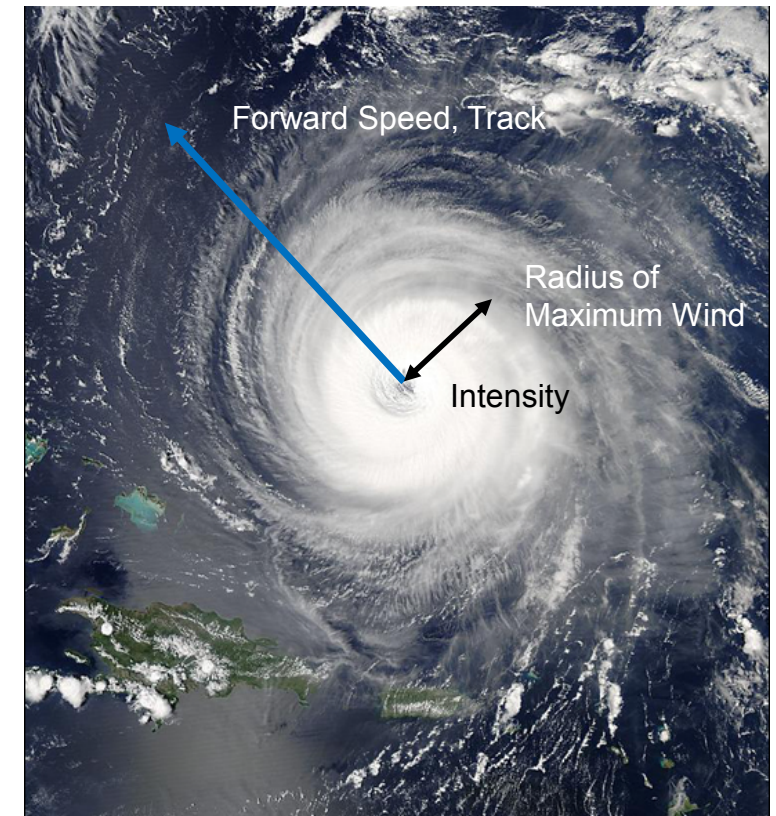
- Hazard Assessment
  - State of knowledge of external flooding analysis – [3002005292](#) (Freely available to public)
  - Riverine flooding – [3002003013](#)
  - Local intense precipitation – [3002004400](#) (Freely available to public)
  - Probabilistic Flooding Hazard Assessment for Storm Surge – [3002008111](#)
  - Evaluation of Deterministic Approaches to Characterizing Flood Hazards – [3002008113](#) (Freely available to public)
- Analysis Techniques
  - Use of 3-D modeling techniques for Int. flooding – [3002010673](#) (Freely available to public)
- Managing existing design and licensing bases for flood protection barriers
  - Flood Protection Systems Guide – [3002005423](#)
  - External Flood Protection Design/License Basis Management Best Practices Guide – [3002010620](#)



# Recently Published - Storm Surge (Hazard)-JPM

- [3002012996](#) - EPRI conducted research into the use of joint probability method (JPM) to simulate hurricanes and establish flood hazard curve
- Hurricanes are simulated using stochastic model of storm parameters
  - Proximity of the landfall
  - Track angle of the storm
  - Storm intensity (central pressure)
  - Storm size
  - Storm forward speed

Storm Meteorological Parameters

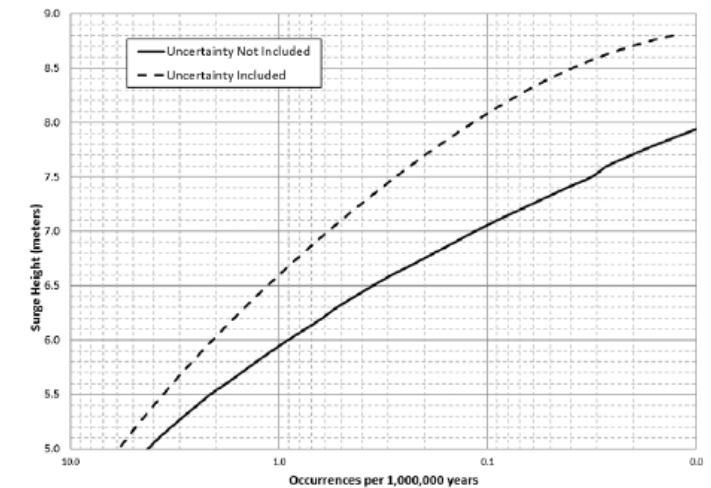
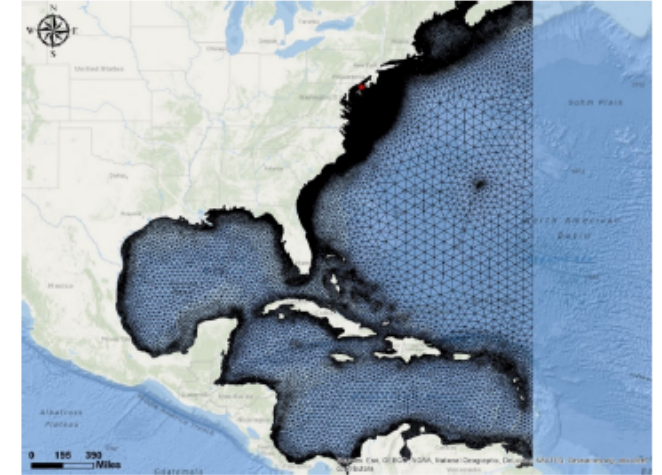


Source: NASA Earth Observatory Image



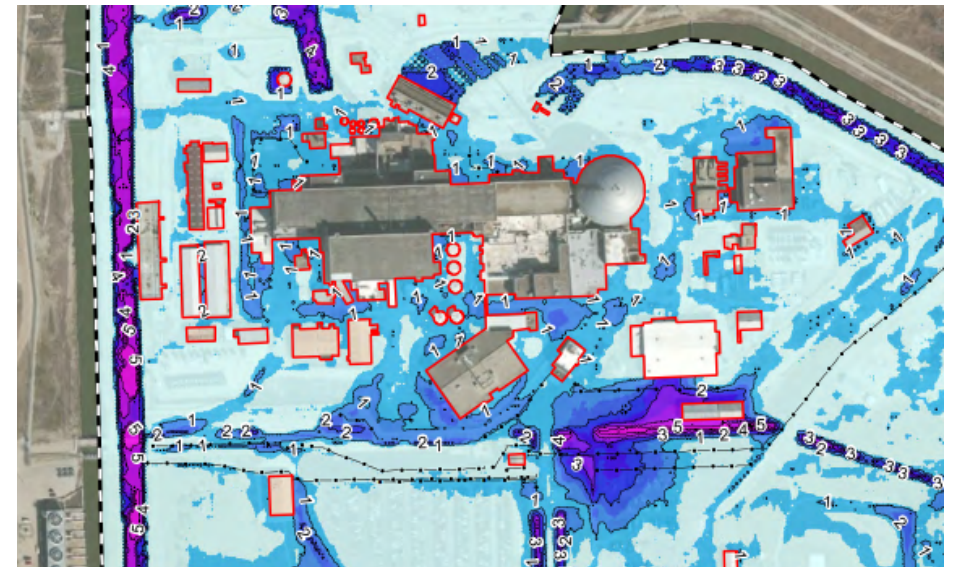
# Storm Surge (Hazard)-JPM

- Report provides step-by-step guidance for utilities to use for scoping and performing the analysis
  - Storm Surge Model Development
    - Recommendations on model selection
    - How to build a model mesh
    - Model calibration
    - Model Validation
  - Detailed discussions on tropical storm parameter attributes
  - Treatment of uncertainties
- Example of real application



# EPRI On-Going Research – Walkdown Guidance

- EPRI is developing guidance for performing an external flooding PRA walkdown in support of developing an external flooding PRA model
  - External flooding equipment list
    - List of components that could be required to mitigate the event
  - External flood operator actions list
    - Actions personnel take to provide flood protection prior to the arrival of the flood
    - Actions the personnel take after the flood arrives to mitigate the event that may be impacted by the flood
  - External flood protection features
    - Barriers to prevent flood waters from affecting plant equipment
    - Sumps or basements that may provide water retention
    - Drainage systems



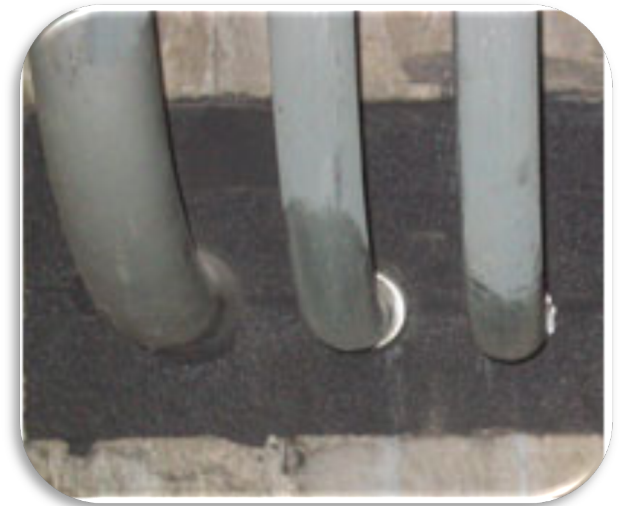
# Walkdown Process Flowchart





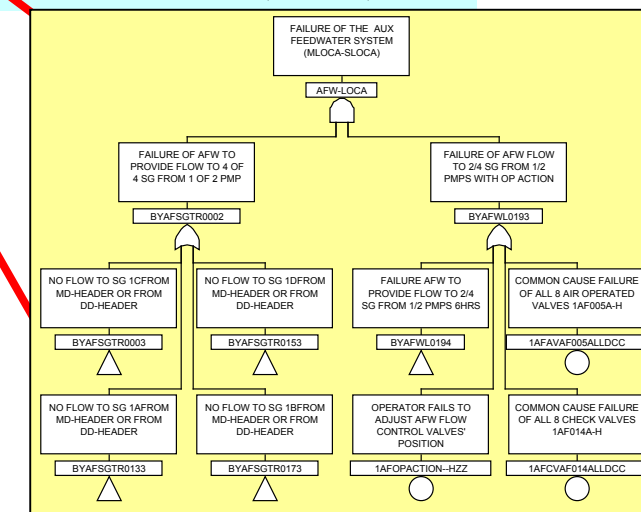
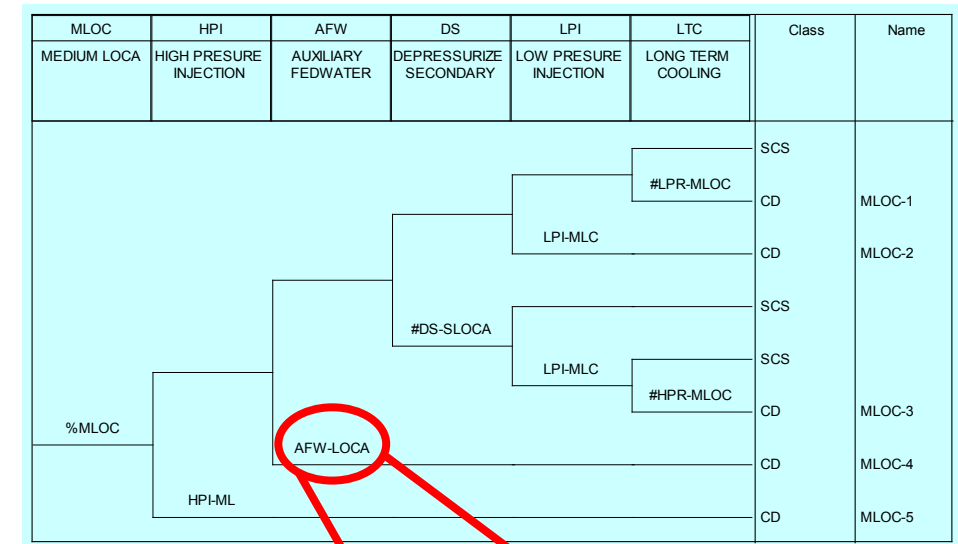
# EPRI On-Going Research – Flood Protection

- Flood barrier seals protect plant areas from external and internal flooding
- EPRI is currently developing a qualitative process for risk ranking plant flood seals based on:
  - Seal design and installation,
  - Maintenance,
  - Age,
  - Failure characteristics, and
  - Consequence to overall plant risk
- Process will explore means to assess risk to plant features due to potential water intrusions
- Work being done in coordination with deterministic maintenance EPRI guidance and existing industry testing
  - EPRI [3002005423](#) – Flood Protection Systems Guide



# EPRI Future Research – External Flooding PRA guidance

- EPRI is initiating a research project on guidelines for building a complete External Flooding PRA
- Capitalize on the lessons learned from domestic and international members
- The guidelines will assist utilities to perform External Flooding PRA if needed



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