



# FNP NFPA 805 LAR AUDIT

March 20, 2013

**Session 2 – LAR and LIC 109 Sensitivity Studies**

Young Jo

## Objectives

To clarify CDF and  $\Delta$  CDF estimates reported for the Farley NFPA 805 sensitivity cases

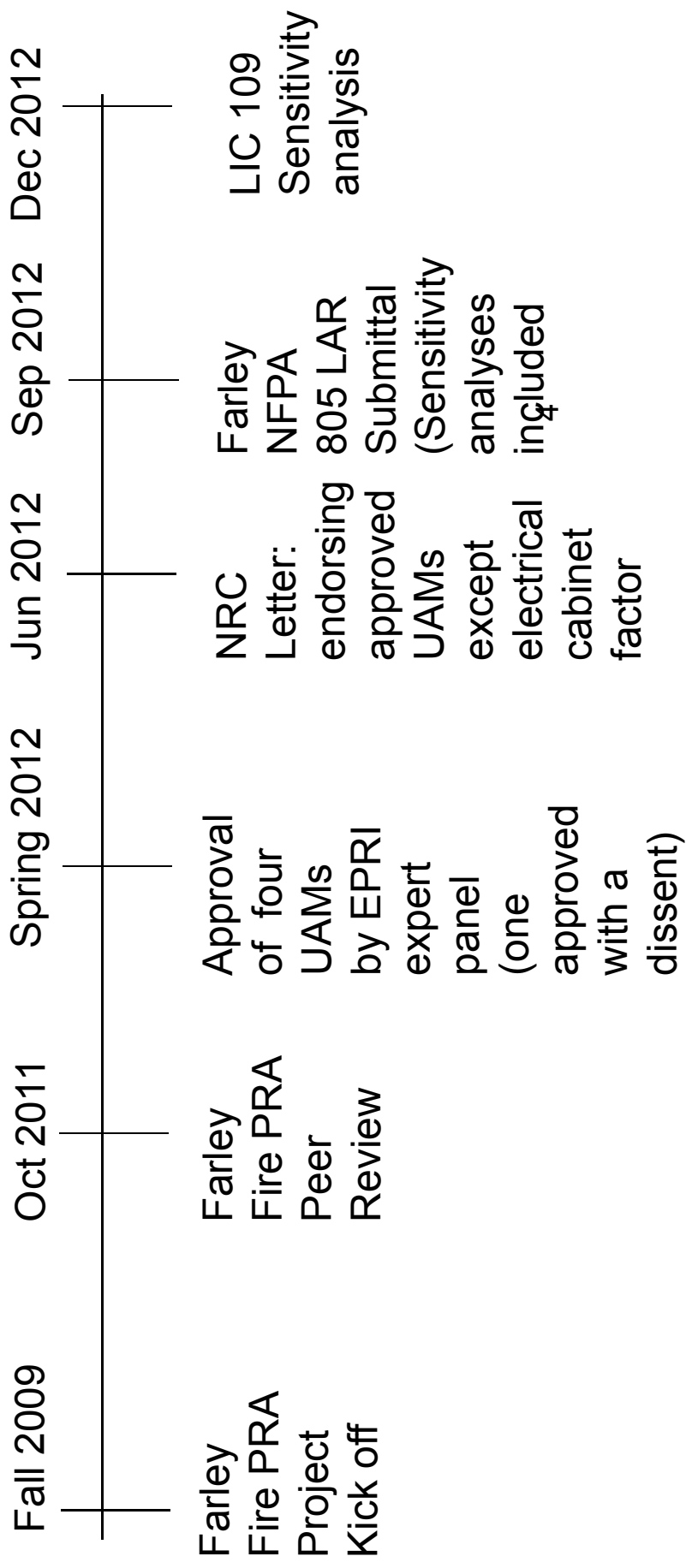
## Agenda

- Farley NFPA 805 LAR Time Line
- Farley Fire PRA and Sensitivity Analysis Time Line
- Explanation of CDF and  $\Delta$  CDF Calculations in Sensitivity Cases

# Farley NFPA-805 LAR Timeline

- NFPA-805 Submittal – September 25, 2012
- NRC Acceptance Review Questions – December 12, 2012
- SNC Acceptance Review Response – December 20, 2012
- NRC LAR Acceptance – January 24, 2013
- Pre-LAR Audit Presentations – March 19~21, 2013
- LAR Audit – Week of March 25, 2013<sup>3</sup>
- Round 1 RAls Issued – April 2013

# Farley Fire PRA and Sensitivity Analyses Time Line



# Fire PRA RAI (draft)

In Enclosure 6 to the supplement dated December 20, 2012( Agency wide Document Access and Management System Accession Number ML12359A050), both the total and delta core damage frequency (CDF) results are actually lower than previously reported in the September 25, 2012 submittal, when only the credit for the electrical cabinet factor was removed. With the additional removal of credit for the main control room (MCR) very early warning fire detection system (VEWFDS), it is expected that these CDF results would increase, consistent with the increases in the large early release frequency (LERF) values.

Provide an explanation of the reasons for the divergent results, including the key modeling assumptions that are causing the divergence.

# Sensitivity Studies for Farley NFPA 805

➤ To ensure Farley NFPA-805 risk insights are valid:

- 1) LAR Sensitivity Analysis:
  - Removal of crediting electrical cabinet factor
- 2) LIC 109 Sensitivity Analysis:
  - Removal of crediting electrical cabinet factor and
  - Removal of crediting Very Early Warning Fire Detection System (VEWFDS) for cabinets in the Main Control Room (MCR)

# Sensitivity Studies for Farley NFPA 805

- Process for performing sensitivity analyses:
  - 1) Factor of interest was removed
  - 2) NUREG/CR 6850 based refinements were applied to assess realistic risk
  - 3) CDF and  $\Delta$  CDF were recalculated

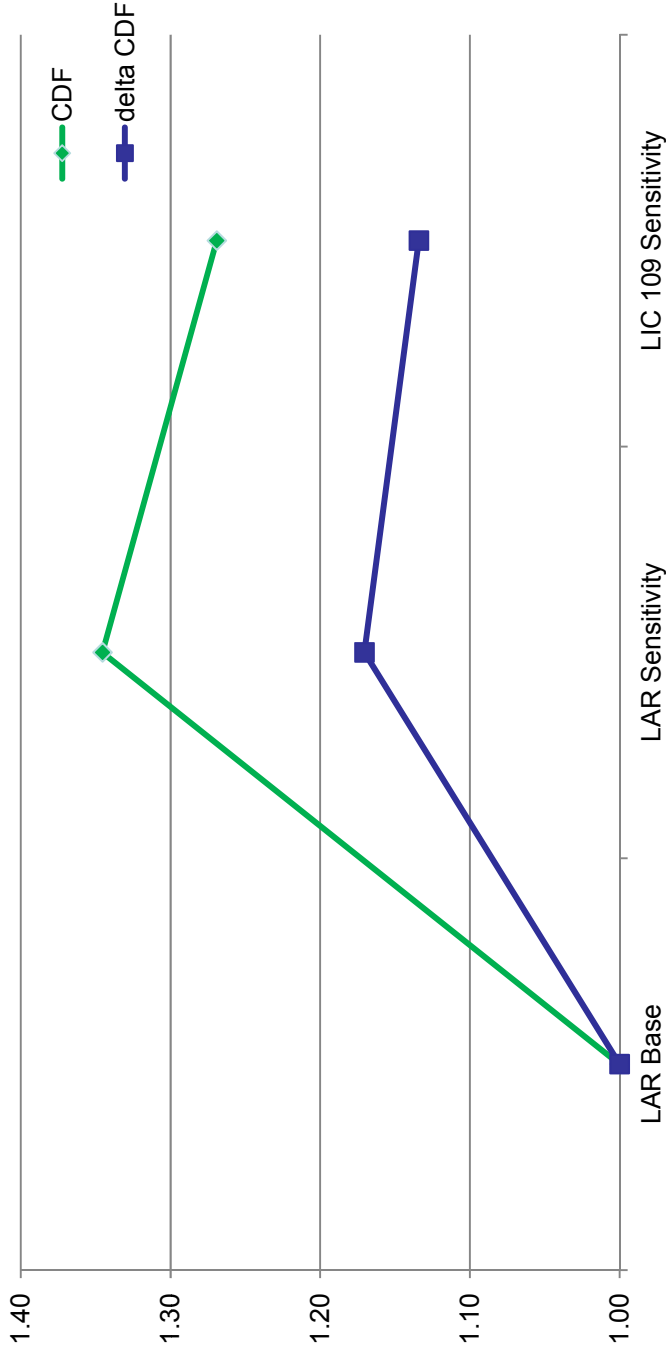
# Sensitivity Studies for Farley NFPA 805

	LAR base	LAR sensitivity (Sept 2012)	LIC 109 sensitivity (Dec. 2012)
<b>Crediting electrical cabinet factors</b>	Yes	No	No
<b>Crediting incipient detection for MCR</b>	Yes	Yes	No
<b>Refined manual suppression</b>	No	Yes	Yes
<b>Refined Main Control Board fire scenarios (APP L)</b>	No	No	Yes
<b>More realistic HGL probabilities</b>	No	No	Yes
<b>Refining selected fire scenarios using refined circuit analysis</b>	No	No	Yes
<b>Correcting some anomalies in fire ignition frequencies in certain scenarios</b>	No	No	Yes



# Sensitivity Studies for Farley NFPA 805

CDFs and  $\Delta$  CDFs relative LAR Base case values



(note) Graph is based on as reported values in the LAR and in the Response to LIC 109 RAIs

# Revised Sensitivity Studies for Farley NFPA 805 (3/4/2013)

- To compare CDFs and  $\Delta$  CDFs after applying the same refinements to both sensitivity cases:
  - Refined manual suppression
  - Refined Main Control Board fire scenarios (App. L)
  - More realistic HGL probabilities
  - Refining selected fire scenarios using refined circuit analysis results
  - Correction of anomalies in fire ignition frequencies in certain scenarios

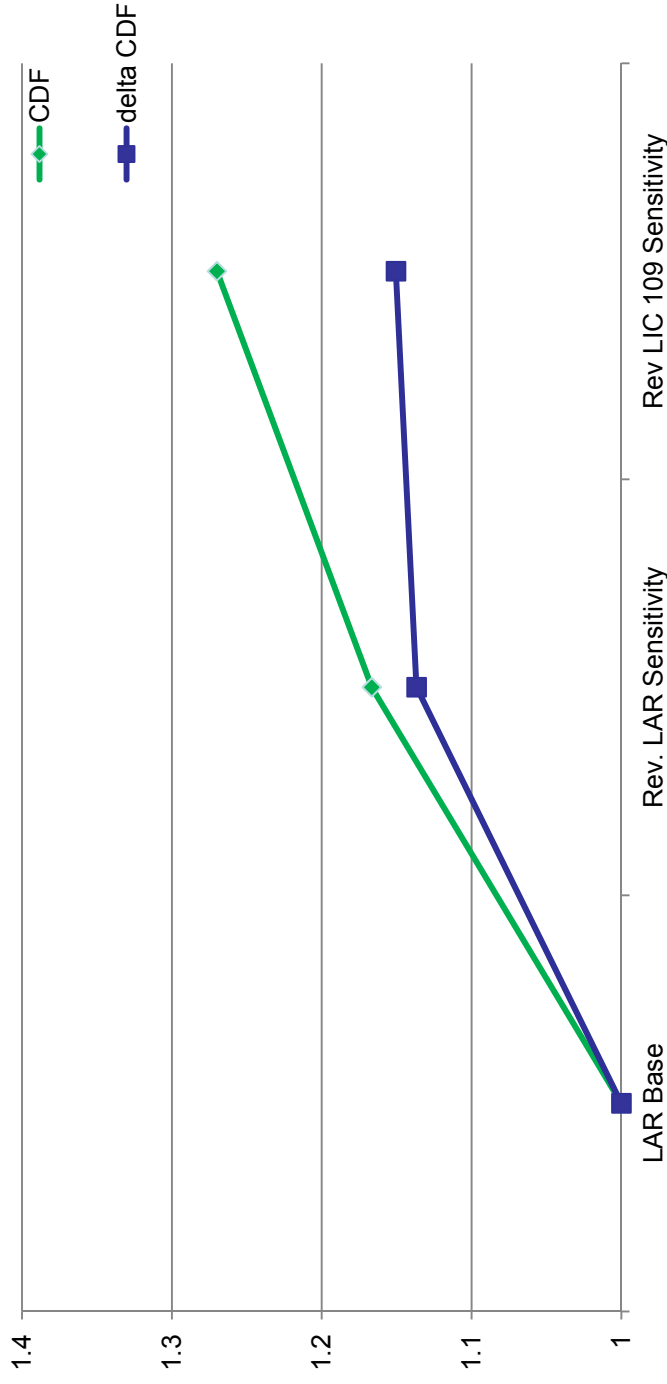
# Revised Sensitivity Studies for Farley NFPA 805 (3/4/2013)

	LAR base	LAR sensitivity (Sept 2012)	LIC 109 sensitivity (Dec. 2012)
Crediting electrical cabinet factors	Yes	No	No
Crediting incipient detection for MCR	Yes	Yes	No
Refined manual suppression	No	Yes	Yes
Refined MCB fire scenarios (APP L)	No	Yes	Yes
More realistic HGL probabilities	No	Yes	Yes
Refining selected fire scenarios using refined circuit analysis	No	Yes	Yes
Correcting some anomalies in fire ignition frequencies in certain scenarios (*)	No	Yes	Yes

(\*) one more anomaly in ignition frequency was corrected in Cable Spreading Room HGL scenario  
In the revised sensitivity studies

# Revised Sensitivity Studies for Farley NFPA 805 (3/4/2013)

CDFs and  $\Delta$  CDFs relative LAR Base case values



(note) Graph is based on revised sensitivity analyses on 3/4/2013

# Additional Candidates for Refinement

- Refinement of Hot Gas Layer treatment
- Incorporate findings from additional walk down:
  - Example) some cabinets in the Cable Spreading Room are found to be sealed (fire will not spread out of the cabinet)

## Summary

- Farley Fire PRA was developed based on the state-of-the-art methodologies available in 2010
  - ~ 2012 time frame
- SNC believes that the methods used are technically adequate for the application

## Summary

- Sensitivity analyses were performed for addressing the methods not accepted by the staff
- The results from the sensitivity analyses demonstrate that conclusions documented in the LAR are valid