

# **NRC Audit of Palo Verde Units 1, 2, and 3 Next Generation Fuel License Amendment Request**

November 2-3, 2016



# Introduction of Personnel

- Michael Dilorenzo – Section Leader, Regulatory Affairs, APS
- Matthew Cox – Sr. Licensing Consultant, APS
- Brian Blackmore – Department Leader, Nuclear Engineering, APS
- Robert Hicks – Sr. Engineer, Transient Analysis, APS
- Lun-Chih [Larry] Hwang– Sr. Engineer, Reload Analysis, APS
- Max O’Cain – Program Manager, Westinghouse
- Darrin Smith – Project Manager, Westinghouse
- Sukhwans Singh - Sr. Engineer, Westinghouse
- Hans Van De Berg – Fellow Engineer, Westinghouse
- Steven Grill – Fellow Engineer, Westinghouse
- Brett Kellerman – Principal Engineer, Westinghouse
- Doug Atkins – Principal Engineer, Westinghouse
- Vick Nazareth – Director, Nuclear Fuel Technology, Anatech



# Agenda

- Introduction
- LAR Overview
- Analysis Methods
- Fuel Assembly Structural
- Chapter 15 Analysis
- LOCA & LTC Analysis
- Summary

# Introduction

- This submittal revises the licensing basis to implement Next Generation Fuel<sup>(1)</sup> at Palo Verde (NL16188A332)
  - Permanent cladding exemption request per 50.12
  - Revises TS 4.2.1 and TS 5.6.5b IAW 50.90
  - Adds a license condition addressing IN 2012-09
- Two public meetings held with the NRC
- Lead Use Assembly test program in Unit 3
- Transitioning to NGF ensures security of supply, improved fuel cycle economics, and increase in DNB margin
- Consistent with precedents for other Combustion Engineering (CE) digital protection plants [ML080840015, (3/26/2008) & ML080880014, (4/15/2008)]

1) Next Generation Fuel design, is CE\_16x16\_NGF and is referred to as CE16NGF through the presentation



# License Amendment Request Submittal Package Contents

- Enclosure
  - Cover letter, Requested Technical Specification changes, License Condition, Regulatory Analysis, Environmental Evaluation, Exemption requests
- Attachment 1 - License Condition Mark-Up
- Attachment 2 – Technical Specification Page Mark-Ups
- Attachment 3 – Clean Technical Specification Pages
- Attachment 4 – Technical Specification Basis Mark-Ups For Information Only
- Attachment 5 – Assessment of Topical Report Limitations and Conditions
- Attachment 6 – Proprietary Affidavit
- Attachment 7 – Non-Proprietary Technical Analysis
- Attachment 8 – Proprietary Technical Analysis



# NRC Staff Audit Areas

- Application of Analysis Methodologies
- Fuel Assembly Structural
- Chapter 15 Analyses
- LOCA and LTC Analyses



# Application of Analysis Methodologies

- Limitations and Conditions and CHF correlations for specific applications
  - Lun-Chih [Larry] Hwang, APS
  - Sukhwans Singh, Westinghouse
  - Vick Nazareth, Anatech
- Setpoints and MSCU related methods
  - Steven Grill, Westinghouse
  - Robert Hicks, APS

NOTE: Other APS and Westinghouse support staff will be available by phone.

# Fuel Assembly Structural

- Seismic/LOCA testing and analyses
  - Eugene Montgomery, APS (remote)
  - Mike Martin, Westinghouse (remote)
  - Eric Eggleston, Westinghouse (remote)



# Chapter 15 Analyses

- Analysis inputs, methods, and results
- Bounded/unaffected determinations for events
- Transition core effects
- Fuel failure analyses and DNB propagation
- For all topics:
  - Robert Hicks, APS
  - Hans Van De Berg, Westinghouse

NOTE: Other APS and Westinghouse support staff will be available by phone.

# LOCA and LTC Analyses

- Treatment of thermal conductivity degradation
- Impact of radial fall-off curve implementation
- Review of sensitivity analysis cases and burnup dependent analyses (described in Att 8, Pg 67) not presented in submittal
- Impact of assumption concerning unavailability of offsite power for LBLOCA case
- Transition mixed-core analysis results
- Understanding how conditions are set for hot rod
- Burnup / initial stored energy assumptions for LBLOCA and SBLOCA
- Long-term cooling / boric acid precipitation
- Reference description for SKBOR code (described in Att 8, section 8.4.5)

# LOCA and LTC

- Robert Hicks, APS
- David Medek, APS (remote)
- Douglas Atkins, Westinghouse
- Brett Kellerman, Westinghouse
- David Rumschlag, Westinghouse (remote)

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