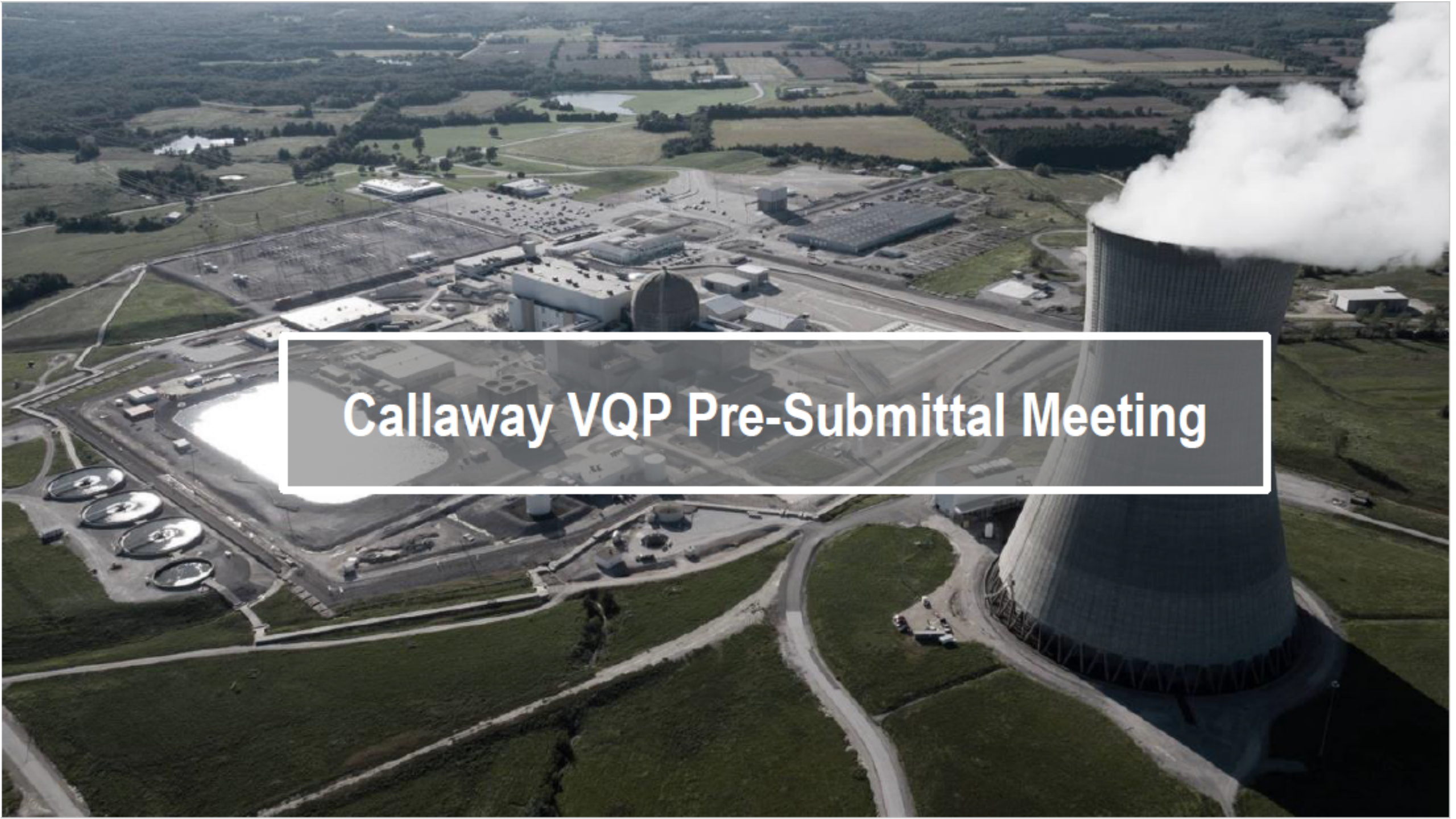
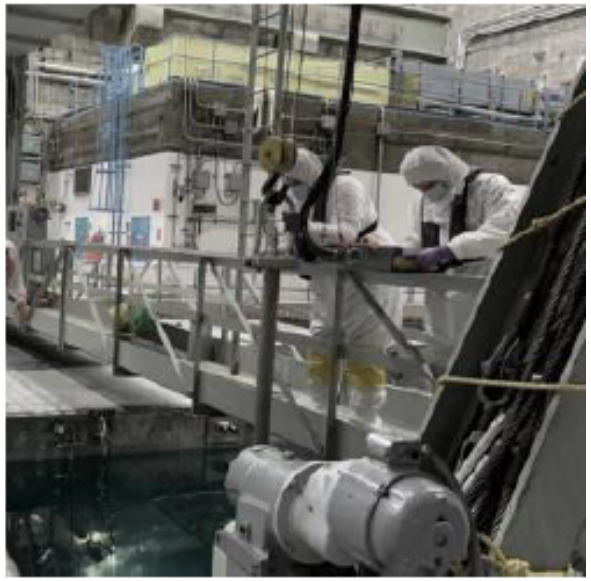
Enclosure 1 to
ULNRC-06694

Callaway Unit 1 Presentation Information for Planned Pre-Application Meeting (Public Meeting)



Callaway VQP Pre-Submittal Meeting



Callaway VQP Pre-Submittal Meeting

Stephanie Banker – Ameren - Vice President Nuclear Engineering & Support

- Welcome
- Meeting Purpose – to provide the NRC with information on the Vendor Qualification Program (VQP) of Framatome as a supplier of nuclear fuel to Callaway Energy Center
- Desired Outcomes – to solicit questions / comments and gain insight from the NRC regarding the VQP information presented.

Team Members

Presenters in Bold

Ameren Team Members	Titles
Stephanie Banker	**Vice President Nuclear Engineering & Support**
Steve Meyer	Manager, Regulatory Affairs
Tom Elwood	**Supervising Engineer, Regulatory Affairs**
Jim Kovar	Regulatory Affairs Engineer
Don Rickard	Regulatory Affairs Engineer
Brian Richardson	Supervising Engineer, Reactor Engineering / Safety Analysis / Fuels
Jim Knaup	**Reactor Engineer / Core Design**
Justin Vinyard	Reactor Engineer / Fuels
Jim McInvale	Consultant Reactor Engineer

Framatome Team Members	Titles
Rick Williamson	Contract Manager
Tom Gardner	Project Manager
Christy White	**Technical PM**
Greg Borza	**Thermal-Hydraulics**
Morris Byram	Licensing
Kevin Segard	Neutronics
Michael Harris	Thermal-Mechanics
Tim Lindquist	Safety Analysis
Gordo Wissinger	LOCA Analysis
Pam Reed	Mechanical Design
Brian Painter	Mechanical Analysis

Agenda

• Purpose of Meeting / Desired Outcomes	Callaway
• Background	Callaway
• GAIA Fuel Assembly Design Description	Framatome
• GAIA Experience	Framatome
• Analyses	Framatome
• Summary of NRC Approved Methods	Framatome
• Technical Specification Changes	Callaway
• Schedule	Callaway

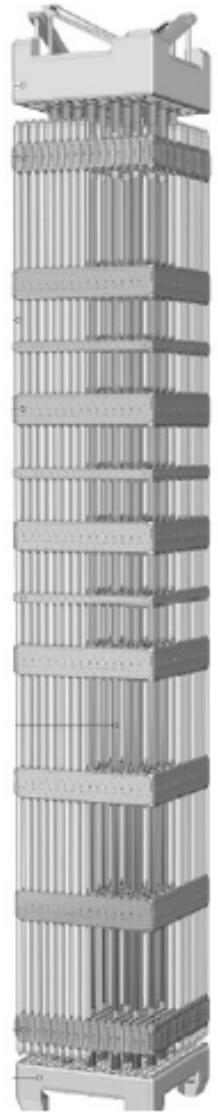
Background

- Callaway LFA / VQP Program for Framatome Fuel
  - Lead Fuel Assemblies (LFA) – 4 Fuel Assemblies
    - 3 cycles (Cycles 25, 27, 28)
    - Non-Limiting Operation (Cycle 25 only)
  - Vendor Qualification Program (VQP)
    - Fuel Transition Licensing Submittal
  - VQP Lead Fuel Assemblies – 4 Additional Fuel Assemblies
    - 3 cycles (Cycles 27, 28, 29)
    - Fully Licensed Operation
- GAIA Fuel Design
- Based on currently approved methods (with some changes)
- Technical Specification changes to add Framatome methods

Fuel Assembly Design Description

(ANP-10342P-A Revision 0, GAIA Fuel Assembly Mechanical Design)

- Standard Reconstitutable Top Nozzle
- M5 Fuel Rods
- M5 GAIA Mixing Grid (6x)
- M5 Intermediate GAIA Mixer (IGM) Grids (3x)
- Alloy 718 HMP Top (Relaxed) and Bottom Spacer Grids
- Q12 MONOBLOC Guide Tubes (24x)
- Q12 Instrument Tube
- GRIP Bottom Nozzle



Operating Experience (GAIA 12 ft. Design)

- LTAs have successfully completed failure-free performance in US and European reactors.

Plant (Year)	Cycle Length
US Plant (2015-2019)	3x 18-month cycles
Europe Plant (2012-2017)	5x 12-month cycles

- In the US, GAIA fuel assemblies in batch quantity will be in operation in 2021, as will GAIA LFAs at Callaway. GAIA LFAs with EATF features are in operation at another US Plant since 2019.
  - Callaway LFAs (4) – Begin operation in Cycle 25, 3 cycles
  - Callaway VQP LFAs (4) – Begin operation in Cycle 27, 3 cycles
- In Europe, GAIA fuel assemblies in batch quantity are in their first cycle of operation at two plants.

VQP Analyses

- Fuel rod thermal-mechanical
- Fuel assembly mechanical
- Neutronics
- Thermal-hydraulics
- Non-LOCA
  - Rod Ejection Analysis – Method meets new RG 1.236
- LOCA

Summary of Methods (1 of 2)

Ameren MISSOURI | Callaway Energy Center

Functional Area	Topical Report
Neutronics	ARCADIA (ANP-10297 Supplement 1P-A Revision 1)
Thermal–Hydraulic	XCOBRA-IIIC (XN-NF-82-21P-A and XN-NF-75-21P-A Revision 2), COBRA-FLX (ANP-10311P-A Revision 1)
Non-LOCA	S-RELAP5 (EMF-2310P-A Revision 1)
DNBR Correlation	GAIA (ANP-10341P-A)
Control Rod Ejection	AREA (ANP-10338P-A) GALILEO (ANP-10323P-A)
SB LOCA	S-RELAP5 (EMF-2328P-A and S1P-A)
LB LOCA	S-RELAP5 (EMF-2103P-A Revision 3)

Summary of Methods (2 of 2)

Functional Area	Topical Report
Fuel Performance Code	COPERNIC (BAW-10231P-A), CROV (BAW-10084PA Revision 3)
External Loads	ANP-10337P-A and Supplement 1P-A
GAIA Mechanical Design	ANP-10342P-A
Cladding	BAW-10240PA, BAW-10227P-A Rev 1
Statistical Setpoints	EMF-92-081P-A
Fuel Rod Bow	XN-75-32P-A
DNB Propagation	XN-NF-82-06P-A

Technical Specification Changes

- Tech Spec 2.1.1 – Reactor Core Safety Limits
  - Revise to add Framatome DNBR and FCM limits
- Tech Spec 3.2.1 – Heat Flux Hot Channel Factor (FQ(Z))
  - Revise to reflect ARCADIA based power distribution control
- Tech Spec 3.2.3 – Axial Flux Difference (AFD) (Relaxed Axial Offset Control Methodology, RAOC)
  - Revise to reflect ARCADIA based power distribution control
- Tech Spec 4.2.1- Reactor Core
  - Revise to refer to Zirconium clad
- Tech Spec 5.6.5 – Core Operating Limits Report (COLR)
  - Revise to add Framatome methods to list of methods used to support COLR
- *Tech Spec 3.7.16 – Fuel Storage Pool Boron Concentration;*
  Tech Spec 3.7.17 – Spent Fuel Assembly Storage;
  Tech Spec 4.3 – Fuel Storage
  - *Potentially impacted, an evaluation of the fuel storage rack subcriticality analysis is ongoing. Dependent upon the results of the evaluation of the analysis, these Tech Specs may require revision.*

Exemption Request

- M5 Cladding 10 CFR 50.46 and 10 CFR 50 Appendix K Exemption Request
- Similar to M5 cladding exemption requests for other plants

Schedule

- **LAR submittal** — **August 31, 2022**
  - Pre-submittal Meeting – May 2022
  - Ameren/Framatome can support NRC Audit, if requested
  - Including Rod Ejection Analysis

- **Requested NRC approval of LAR** — **September 30, 2023**
  - Supports Fuel Cycle 27, RFO begins October 2, 2023

*Note – Spent Fuel Pool – Criticality Safety Analysis LAR will be submitted in January 2022

Questions


Ameren
MISSOURI
Callaway
Energy Center