

# **Fuel Transition License Amendment Request Pre-Submittal Update Meeting**

Exelon Generation Company, LLC  
Dresden and Quad Cities Stations  
May 19, 2014



# Meeting Agenda

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- Objectives
- Background
- Licensing Approach
- August 27, 2013 Pre-Submittal Meeting Summary
- Technical Topics
- Schedule
- Summary
- Discussion

# Meeting Objectives

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- Describe the transition process from Westinghouse to AREVA fuel supply
- Communicate transition plan
- Address technical topics associated with the proposed transition
- Discuss licensing activities and schedule
- Obtain NRC/Exelon alignment on LAR content
- Obtain NRC input on the transition plan

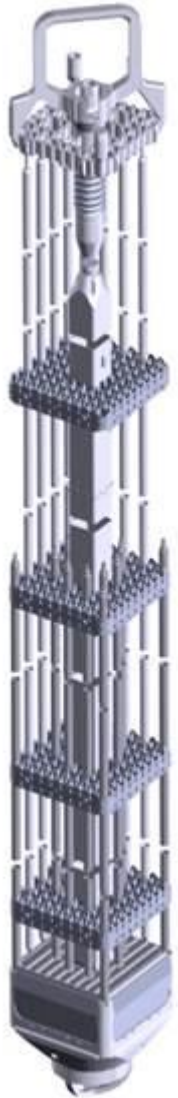
## Background

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- Dresden Nuclear Power Station (DNPS) and Quad Cities Nuclear Power Station (QCNPS) are both General Electric BWR/3 reactors with Mark I containments
- Current power levels
  - DNPS Units 2 and 3 – 2957 MWt
  - QCNPS Units 1 and 2 – 2957 MWt
- Renewed Operating License expires
  - DNPS Unit 2 – 12/22/2029
  - DNPS Unit 3 – 01/12/2031
  - QCNPS Units 1 and 2 – 12/14/2032
- DNPS and QCNPS fuel transition project began in December 2012 when AREVA was awarded a contract for fuel beginning in 2016
- April 2013 through present AREVA has been collecting and evaluating plant data needed for fuel transition
- In June 2013 fuel transition LAR planning activities began

# Background

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## AREVA ATRIUM 10XM Fuel – Key Features

- 10x10 lattice – 91 fuel rod locations
- 3 X 3 Square internal water channel
- 12 part length rods
- 9 grid spacers
- Debris filter lower tie plate
- 178 kgU
- Extensive operating experience

## Licensing Approach

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- Exelon will be asking for NRC review of the inclusion of AREVA approved generic methodologies as applicable to support licensing analyses and associated DNPS and QCNPS TS changes in support of the transition to AREVA ATRIUM 10XM fuel
- Current licensing basis will be retained for events not impacted by the change in fuel design
- Exelon will also be requesting a revision to the ATWS RPT steam dome pressure setpoint
  - help mitigate (lower) the peak reactor vessel pressure following an ATWS event during the short term phase of the event
  - reducing the setpoint provides additional margin by reducing the ATWS peak pressure without adversely impacting plant operation
  - analysis performed using approved AREVA methodologies

## Licensing Approach

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Revise TS and COLR to incorporate AREVA fuel analysis methods and setpoint changes as necessary

- Proposed TS changes will be provided with LAR
  - TS 3.3.4.1, Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation, Surveillance Requirement (SR) 3.3.4.1.4.b, Reactor Vessel Steam Dome Pressure-High , revised to reflect new setpoint
  - TS 5.6.5, Core Operating Limits Report (COLR), changed to add AREVA analytical methods and remove any legacy methodologies that are no longer applicable
  - Applicable TS bases will be revised as necessary
- Individual COLRs will be revised as part of the reload process

## Licensing Approach

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- LAR will provide AREVA proprietary reports for QCNPS
  - Mechanical Design Report
  - Fuel Rod Design Report
  - Thermal-Hydraulic Design Report
  - Fuel Cycle Design Report
  - Reload Safety Analysis Report
  - LOCA Break Spectrum Analysis Report
  - LOCA-ECCS Analysis MAPLHGR Limit Report
- AREVA will generate these reports for both DNPS and QCNPS, however, the LAR will only include the reports for QCNPS since the application of the methodologies is the same for both stations
- The reports for DNPS will be available prior to the first load of AREVA ATRIUM 10XM fuel at DNPS
- LAR will provide listing of current BWR Approved Topical Reports for DNPS and QCNPS that are still applicable



## Licensing Approach

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- Representative QCNPS Unit 2 Cycle Analysis Report will be provided to the NRC in support of their review of the LAR
  - This representative Cycle Analysis Report is intended to support the LAR review for DNPS Units 2 and 3 and QCNPS Units 1 and 2
- Purpose of representative analyses is to demonstrate the applicability of AREVA methodology to DNPS and QCNPS at current operating conditions
- The basis for ensuring that the analyses provided will be representative for both plants is that the plants are the same in many aspects (power, flow, core size, etc.)
- Approach supports the applicability of the LAR review for DNPS Units 2 and 3 and QCNPS Units 1 and 2

## August 27, 2013 Pre-Submittal Meeting Summary

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- Key Points Discussed
  - Exelon will utilize an established transition process followed by industry
  - One License Amendment Request will be submitted for both DNPS and QCNPS
- Follow-up Issues Raised During Meeting
  - Finalize approach on channel bow, verify it will be submitted as part of the LAR as a plant specific method, and come back with a proposed solution later as to how this needs to be addressed (i.e., license condition or SE summary)
    - Channel Bow evaluation will be performed using approved methodologies
    - The approach and results of the evaluation will be discussed in the LAR for plant specific application
    - This discussion is intended to support NRC review and resolution in the subsequent safety evaluation

## August 27, 2013 Pre-Submittal Meeting Summary

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- Follow-up Issues Raised During Meeting (continued)
  - Finalize approach to completing the Spent Fuel Pool (SFP) Criticality Safety Analysis (CSA) for DNPS and QCNPS (i.e., analysis for only one station and implementation under 50.59 at the other) and include as topic in future pre-submittal meetings
    - A separate LAR will be submitted to address SFP CSA for DNPS Units 2 and 3 only (submittal scheduled for August 2014)
    - QCNPS Units 1 and 2 criticality changes will be completed under 10 CFR 50.59 using the QCNPS rack insert application currently under review as a basis
    - DNPS SFP CSA analysis will follow the same methodology used in the QCNPS rack insert application currently under review
  - Status and schedule for release of the draft and final Standard Review Plan (SRP) revision for reactivity insertion accidents
    - Use of 230 cal/gram as the appropriate upper limit for coolability
    - LAR approach to be used depends on schedule for issuance of the revised SRP

## August 27, 2013 Pre-Submittal Meeting Summary

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- Follow-up Issues Raised During Meeting (continued)
  - Address any maneuvering restrictions associated with the new fuel and how those restrictions account for current Westinghouse fuel
    - Both Westinghouse fuel and ATRIUM 10XM fuel utilize barrier cladding
    - There will be no changes to Westinghouse maneuvering restrictions
    - Exelon intends to apply Westinghouse and AREVA specific fuel conditioning rules to Westinghouse and AREVA fuel respectively
  - AREVA Critical Power Evaluator (ACE)
    - Approved LTR uses an integrated peaking factor based on the local fuel rod peaking factors that could lead to non-conservative CPR predictions
    - Generic ACE supplement review completed by NRC and SE issued on March 31, 2014
    - Generic supplement will be used for DNPS and QCNPS fuel transition LAR submittal, Exelon specific ACE supplement will not be required

## AREVA Technical Topics

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### Application of Critical Power Correlation to Co-Resident Fuel

- Application of EMF-2245(P)(A) – *Application of Siemens Power Corporation's Critical Power Correlations to Co-Resident Fuel*
- Indirect method used in the QCNPS and DNPS application
- A best estimate process is used to develop additive constants over the range of applicability
  - Balanced approach to develop additive constants over the entire range of applicability
  - Evaluate results over ranges in inlet enthalpy, pressure and mass flux
  - ECPR is the major figure of merit
- Application of the process to OPTIMA2 fuel results in a significant trend at low mass fluxes using the AREVA correlation
- Conservative approach is applied at low mass fluxes to ensure appropriate CPR results for design, licensing and monitoring
- The conservative approach will be discussed in the LAR for plant specific application

# AREVA Technical Topics

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## Crud and Corrosion Aspects of Current Water Chemistry Programs

- The current coolant chemistry program and the addition of On-Line-Nobel-Chemistry (OLNC) may lead to elevated liftoff (crud and oxide)
  - Increased uncertainty in liftoff conditions
- AREVA is taking a proactive approach to evaluate liftoff conditions, define a Bounding Administrative Liftoff and assess the potential consequences on fuel related licensing analyses
  - Treatment of higher than normal liftoff is not explicitly described in all approved topical reports
  - The evaluation process is described here for plant specific application
- Utilize plant specific data from QCNPS and Plant A to establish a liftoff baseline
  - Plant A selected as a comparative reference based on similar feedwater chemistry, OLNC program, fuel rod performance, etc.
  - Data includes reactor coolant and feedwater chemistry, liftoff measurements, fuel rod power history, etc.

AREVA considers all available data to make judgments for a specific plant to support the license basis

# AREVA Technical Topics

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## Crud and Corrosion Aspects of Current Water Chemistry Programs

- Bounding Administrative Liftoff values are defined by applying conservative adjustments to the liftoff baseline
  - Conservative adjustments account for effects of OLNC and operational variations
- Bounding Administrative Liftoff must be defined for the limiting core location (Peak Liftoff) and an average fuel rod (Rod Average Liftoff)
  - Peak Liftoff is needed to assess fuel rod analysis criteria
  - Rod Average Liftoff is needed to assess the impact on other events/accidents
- Potential impact on fuel related licensing analysis
  - Fuel rod analysis
  - Neutronic safety analysis
  - Stability
  - Mechanical Design
  - Fast transients
  - Steady-State operation and slow transients
  - LOCA

AREVA has an on-going surveillance program at Plant A to assess the impact of OLNC

# AREVA Technical Topics

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## Crud and Corrosion Aspects of Current Water Chemistry Programs

- Preliminary evaluation results
  - Fuel rod analysis criteria are satisfied
  - Delta-CPR for fast transients is expected to increase by approximately 0.02
  - Explicitly incorporating a Bounding Administrative Liftoff in licensing analyses mitigates the risk of not establishing appropriate operating limits or exceeding established licensing limits
- The technique applied for fast transient evaluation and the evaluation results are consistent with the technique applied for an operability assessment performed in 2009 to address elevated liftoff
  - Administrative penalties were applied to the MCPR operating limit
- Treatment of higher than normal liftoff using Bounding Administrative Liftoff will be discussed in the LAR for plant specific application

Bounding Administrative Liftoff will be accounted for in all fast transient analyses until data becomes available that demonstrates liftoff conditions are within normal expectations.



# Fuel Transition LAR Schedule

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## Fuel Transition (Consistent with August 27, 2013 Meeting)

- LAR Submittal: February 2015
- Amendment Need Date: March 2016
- QCNPS Unit 2 implementation: March 2016
- DNPS Unit 3 implementation: November 2016
- QCNPS Unit 1 implementation: March 2017
- DNPS Unit 2 implementation: November 2017

# Fuel Transition LAR Schedule

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## Concurrent Reviews

- Spent Fuel Pool (SFP) Criticality Safety Analysis (CSA) LAR
  - SFP CSA for ATRIUM 10XM will follow the same methodology used in the QCNPS rack insert application currently under review
  - QCNPS SFP CSA for ATRIUM 10XM will be completed under 10 CFR 50.59
  - DNPS SFP CSA for ATRIUM 10XM will be submitted as a LAR (SFP CSA LAR)
    - Submittal scheduled for August 2014
  - Fuel Transition LAR does not depend on NRC approval of SFP CSA LAR
  - SFP CSA LAR does not depend on NRC approval of Fuel Transition LAR
- Alternative Source Term (AST)
  - If accident dose increases by more than 10% as a result of fuel transition, AST analysis will require revision and results will be included in the fuel transition LAR

## Summary

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- Exelon transitioning to AREVA ATRIUM 10XM fuel
- Established transition process followed by industry will be used
- NRC-approved methodologies will be used for the transition analyses
- Exelon will be asking for NRC review of the inclusion of AREVA approved generic methodologies as applicable to support licensing analyses and associated DNPS and QCNPS TS changes in support of the transition to AREVA ATRIUM 10XM fuel
- One license amendment request will address both DNPS and QCNPS
- LAR submittal will include QCNPS reports to support the NRC review of the LAR for DNPS and QCNPS
- Representative QCNPS Unit 2 Cycle Analysis Report will be provided to the NRC in support of their review of the DNPS and QCNPS LAR
- Exelon and AREVA are identifying and addressing technical issues to support the NRC's review

## DISCUSSION