PMNorthAnna3COLPEmails Resource

From: g9974@aol.com
Sent: Sunday, June 03, 2012 9:11 PM
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Cc: joseph.hegner@dom.com; john.waddill@dom.com; william.gallagher@dom.com; regina.borsh@dom.com
Subject: From Gina Borsh: Draft Slides for SCP Presentation
Attachments: 20120607 S-COLA Seismic Closure Plan Presentation R4.pdf

Chandu and Dennis,

Attached are the draft slides for our presentation of the Seismic Closure Plan on Thursday. We'll provide hard copies of the final slides at the meeting, and electronic versions of the final slides later.

If you have any feedback that you'd like to provide before our meeting, just let me know.

Thanks,

Gina

Hearing Identifier: NorthAnna3_Public_EX
Email Number: 1085

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Subject: From Gina Borsh: Draft Slides for SCP Presentation
Sent Date: 6/3/2012 9:11:00 PM
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From: g9974@aol.com

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North Anna 3

North Anna 3 COLA

DRAFT Seismic Closure Plan

June 7, 2012

Introduction and Agenda

- Introduction
- Purpose
- Background
- Overview of Seismic Closure Plan (SCP) Strategy
- Details of Significant Changes
- RAI Evaluation

Dominion

Presenters

- Purpose, Background, Overview: G. Borsh
- Mineral, VA Earthquake: D. Fenster
- Vibratory Ground Motion: J. Litehiser
- V_s Profiles: J. Davie
- FIRS: A. Hashemi
- Seismic Analyses: L. Todorovski
- RAI Evaluation: G. Borsh

Purpose of Meeting

- Provide NRC staff with overview of planned revisions to S-COLA resulting from SCP work
- Answer NRC questions
- Obtain NRC feedback

Background

- NRC requested seismic schedules for DCD, R-COLA, and S-COLA:
  - March 2012: MHI submitted latest DCD SCP
  - February 2012: Dominion submitted limited S-COLA SCP (FSAR 2.5, 2.5.1, 2.5.3)
  - April 2012: Luminant submitted R-COLA SCP
  - May 2012: Dominion submitted comprehensive S-COLA SCP

Dominion

Background

SCP addresses:

- US-APWR DCD seismic changes
- New CEUS models
- August 23, 2011 earthquake near North Anna site

Dominion

Overview of SCP Strategy

- Gather geologic information and perform field reconnaissance activities related to August 23, 2011 Mineral, VA earthquake
- Develop revised site-specific hard rock PSHA and GMRS
- Update Vs profiles for small-strain properties to reflect revised Unit 3 layout
- Develop revised FIRS and strain-compatible soil profiles for each seismic Cat I structure and for T/B and E/R

Overview of SCP Strategy (cont)

- Update designs and seismic analyses for:
  - Reactor Building (R/B) Complex (includes PCCV, R/B, A/B, and east and west PS/Bs)
  - UHSRS
  - PSFSVs
  - ESWPT
- Perform SSI analyses of T/B and E/R
- Update miscellaneous chapters impacted by seismic changes (e.g., FSAR Ch 8)
- Compare key equipment TRs to Unit 3 seismic results

Dominion

Details: Mineral, VA Earthquake

- M 5.8 Mineral, VA, earthquake on August 23, 2011 in Central Virginia Seismic Zone
- Geologic field reconnaissance in vicinity of site:
  - Compiled geologic maps
  - Obtained LiDAR data, derivative maps and photos
  - Discussions with VGS, USGS and others
  - Reviewed aftershock seismology data
  - Performed field study
- No evidence for surface faulting

Dominion

Details: Mineral, VA Earthquake (cont)

- Impact on Current COLA
  - Update information on Quaternary tectonic features in FSAR Section 2.5.1.1.4
  - Add a description of the event in a new FSAR Subsection 2.5.1.1.6
- Affected FSAR Sections
  - Geologic descriptions in Sections 2.5.1 and 2.5.3
  - Potential for impact on PSHA in Section 2.5.2

Overview: FSAR Section 2.5.2, Vibratory Ground Motion

SSAR Section 2.5.2 will be replaced:

- Expand ESP VAR 2.0-4 - Vibratory Ground Motion
- Use 2012 publication of the CEUS SSC report:
  - New seismicity catalog through 2008
  - New seismic source characterization [SSC] model
- Post CEUS SSC report information will consider:
  - Updated seismicity through mid-December 2011
  - Updated SSC, if needed: e.g., to incorporate implications of more recent seismicity (the 2011 Mineral, VA, earthquake) or additional regional or local source information
- Re-run PSHA using the new/updated SSC
- Develop GMRS based on RG 1.208 at the common basemat foundation elevation for the R/B Complex

Dominion

Overview: FSAR Section 2.5.2, Vibratory Ground Motion (cont)

- CEUS SSC, updated seismicity catalog, and Mineral EQ require a complete rewrite of Section 2.5.2
  - 2.5.2.1 Seismicity
  - 2.5.2.2 Geologic and Tectonic Characteristics of the Site and Region
  - 2.5.2.3 Correlation of Earthquake Activity with Seismic Sources
  - 2.5.2.4 Probabilistic Seismic Hazard Analyses and Controlling Earthquake
  - 2.5.2.5 Seismic Wave Transmission Characteristics of the Site
  - 2.5.2.6 Ground Motion Response Spectrum

Dominion

Details: FSAR Section 2.5.2.1

- CEUS SSC report (Chapter 3) presents a completely new seismicity catalog
  - From 1568 through 2008
  - Based on best estimate moment magnitude E[M], adjusted for uncertainties
  - Following same procedure as in the CEUS SSC report, seismicity will be updated for the entire CEUS SSC coverage area:
    - For 2009 to mid-December 2011, there were >>200 additional independent events of **M**2.9 and greater

Dominion

Details: FSAR Sections 2.5.2.2, 2.5.2.3

- CEUS SSC report presents a completely new seismic source characterization model
  - Regional source zones
    - **Mmax Zones** – 3 versions [Wide, Narrow, Study]
    - **Seismotectonic Zones** – 4 versions [Wide PEZ/RCGr, Wide PEZ/RCGm, Narrow PEZ/RCGr, Narrow PEZ/RCGm]
  - RLME [Repeated Large-Magnitude Earthquakes] sources
- Review new information and update CEUS SSC, if necessary
  - Seismicity update [after 2008]
  - Evaluation of hazard input regarding 2011 Mineral, VA, earthquake [SSHAC Level 2]

Dominion

Details: FSAR Section 2.5.2.4

- New SSC requires new PSHA
  - Same median GMPE – EPRI (2004)
  - Updated GMPE uncertainties – EPRI (2006)
  - M_{min} for PSHA = **M**5.0, no CAV
  - Logic tree branches to be trimmed or compressed [*see Chapter 9*], analogous to identification of 99%-hazard contribution EPRI-SOG sources

Dominion

Details: FSAR Section 2.5.2.5

- New PSHA requires re-evaluation of the site response [still follows NUREG/CR-6728 App. 2A]
  - Soil column is the same as for current S-COLA FSAR; no new soil profile simulation required
  - Slightly new GMRS horizon elevation may be defined
  - Explicitly following RG 1.208, site response will be run using different input rock motions than considered in the current S-COLA:
    - **Current S-COLA**: horizontal high-frequency [HF] and low-frequency [LF] deaggregated hard rock SSE response spectrum used as input to site response
    - **Planned S-COLA revision**: horizontal high-frequency [HF] and low-frequency [LF] deaggregated hard rock 10^{-4} and 10^{-5} uniform hazard response spectra (UHRS) used as input to site response

Dominion

Details: FSAR Section 2.5.2.6

- New PSHA and site response analysis requires new GMRS
  - Site response results in broadband 10^{-4} and 10^{-5} UHRS at the GMRS horizon
  - Reg. Guide 1.208 performance-based procedure results in horizontal GMRS
  - V/H from ESPA SSAR (and S-COLA) is used to develop vertical GMRS

Dominion

Details: FSAR Section 2.5.2.7

- FSAR Section 2.5.2.7
  - Will be deleted from S-COLA FSAR
  - Operating basis earthquake (OBE) is addressed in FSAR Section 3.7.1.1

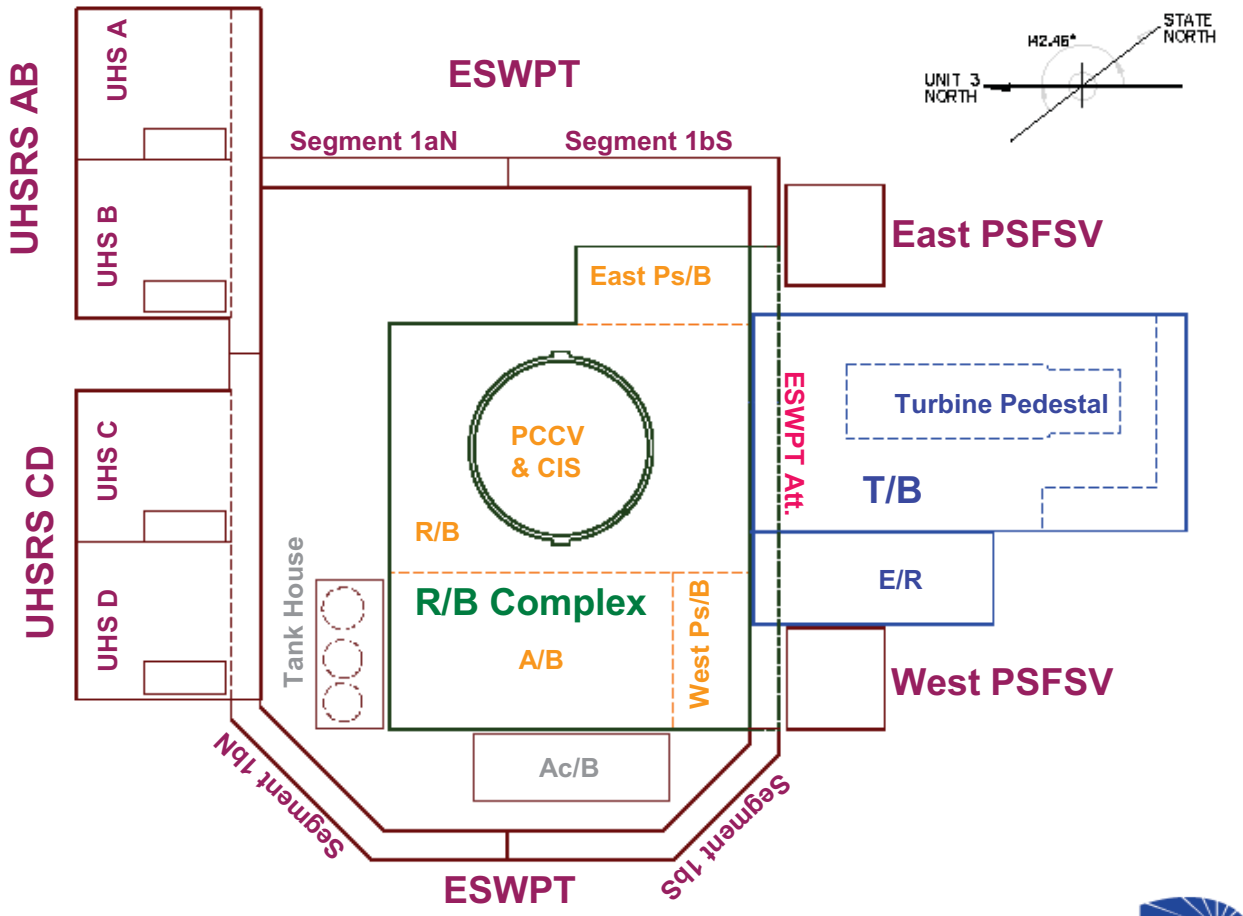
Dominion

Details: Shear Wave Velocity Profiles

- Update current shear wave velocity (V_s) profiles in FSAR Section 2.5.4 to address:
  - Revised Unit 3 layout with new configuration of US-APWR standard plant, and
  - Redesign of site-specific structures.
- Updates are outlined in the following slides.

Dominion

Details: V_s Profiles (cont)



Dominion

V_s Profile of R/B Complex

- V_s profile used for the previous R/B basemat configuration will be used for the enlarged common mat.
- V_s profile will reflect the changed average thickness of concrete fill under the enlarged mat.

Dominion

Details: V_s Profile of PSFSVs and T/B

- V_s profiles similar to the previous PSFSV profiles will be used:
  - Dimensions of each PSFSV in the revised configuration are similar to the previous design
  - Appropriate adjustments for concrete fill thickness
- V_s profile for the T/B will be developed:
  - Use three (3) power block Vs borings, and
  - Average soil/rock profiles beneath T/B mat.
  - Profile was not developed previously

Dominion

Details: V_s Profiles of UHSRS

- UHSRS A & B will now be placed on a common mat, as will UHSRS C & D
- V_s profile for UHSRS A & B will be similar to the previous profile
  - Some adjustments to zone thicknesses
- New V_s profile for UHSRS C & D
  - Based on the V_s borings closest to the common mat, and
  - Average soil/rock profiles beneath the mat.
- UHSRS Pipe Chase eliminated

Dominion

Details: V_s Profiles of ESWPT

- East and West ESWPTs will each be divided into two separate segments
- New V_s profile for each of the 4 segments:
  - Based on the V_s borings closest to each tunnel segment, and
  - Average soil/rock profile beneath each segment.
- Segment 2 of the ESWPT will use the same V_s profile as the R/B complex

Dominion

Details: Liquefaction, Slope Stability, Lateral Earth Pressure

- Determine if the peak ground acceleration (pga) increases based on the revised seismic analysis
- Revise analyses for liquefaction (FSAR 2.5.4.8), slope stability (FSAR 2.5.5) and dynamic lateral earth pressure (FSAR 2.5.4.10) if needed:
  - Factors of safety (FS) against liquefaction and slope failure for the existing pga are more than adequate
  - These FS should remain adequate even for an increased pga
  - Because dynamic lateral earth pressure is proportional to the pga, a revision in pga will result in an update in dynamic lateral earth pressure

Dominion

FSAR Chapter 2 Submittal Dates

- Section 2.0, Site Characteristics: February 2013
  - Revise tables and figures to reflect revised DCD and S-COLA seismic information
- Section 2.1, Geography and Demography: October 2012
  - Revise site plan to reflect new plant layout
- Section 2.4, Hydrology: November 2012
  - Revise Holdup Tank location and figure backgrounds

Dominion

FSAR Chapter 2 Submittal Dates (cont)

- Sections 2.5, Geology, Seismiology, and Geotechnical Engineering, 2.5.1, Basic Geologic and Seismic Information, and 2.5.3, Surface Faulting: July 2012
- Sections 2.5.2, Vibratory Ground Motion, and Section 2.5.4, Stability of Subsurface Materials and Foundations: January 2013
- Section 2.5.5, Slope Stability: February 2013

Details: FIRS, SSI Input Soil Profiles, and SSI Input Time-Histories

- Revision of Section 3.7.1 due to:
  - Updated hard rock motion based on new PSHA results (Section 2.5.2)
  - Updated soil and rock profiles and their variation due to plant layout changes (Section 2.5.4)
  - Revised licensing basis from RG 1.165 to RG 1.208
  - Addition of T/B and E/R to evaluate adequacy of gaps between Seismic Category II (SC-II) and Seismic Category I (SC-I) structures

Dominion

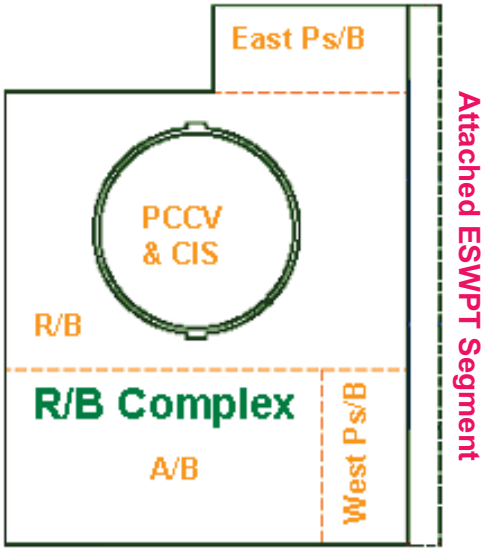
Details: FIRS, SSI Input Soil Profiles, and SSI Input Time-Histories: Analysis Methodology

- Step-by-step Methodology:
  - Soil Profile Simulation (No change)
  - Site Response Analysis (will be updated per RG 1.208)
  - Horizontal and Vertical FIRS Development (will be updated per RG 1.208)
  - SSI Soil Profile Development (will be updated per RG 1.208)
  - SSI Input Response Spectra Development
    - NEI Check (ISG-017), Upward Smoothing (No change)
    - Minimum Required Spectrum (per 10 CFR 50, App. S) (No change)
  - Time History Generation
    - Outcrop Time-Histories (Matched to SSI Input Response Spectra) (No change)
    - In-Column Time-Histories (for SSI Analysis as Embedded) (No change)

Dominion

Details: R/B Complex

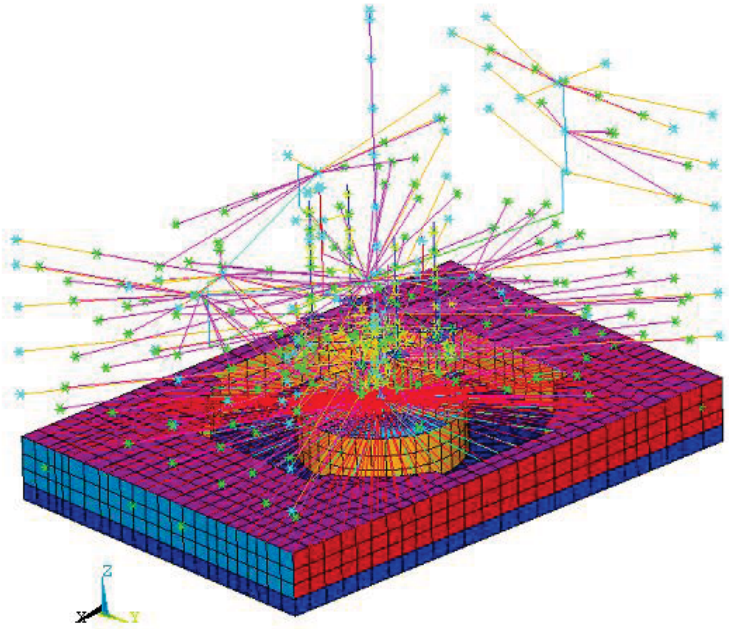
- Updated US-APWR Standard Plant Design includes a new configuration of the Reactor Building (R/B) Complex with common basemat supporting:
  - Pre-stressed Concrete Containment Vessel (PCCV)
  - Containment Internal Structure (CIS)
  - Reactor Building (R/B)
  - Auxiliary Building (A/B)
  - East and West Power Source Buildings (PS/Bs)
- North Anna Unit 3 Plant will have the south segment of ESWPT integrated to the R/B Complex basement



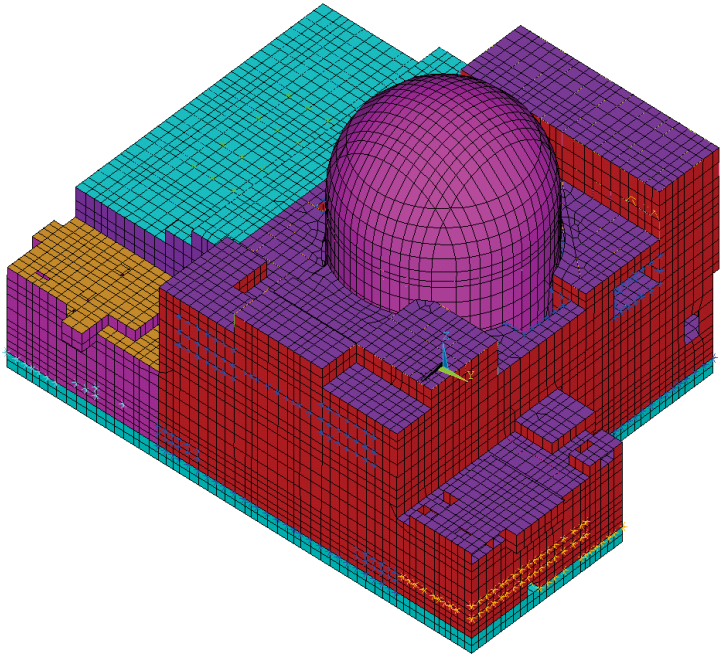
Dominion

Details: R/B Complex (cont)

- Site-specific seismic response analyses of R/B Complex will use the dynamic finite element model (FEM), documented in MHI Technical Report MUAP-10006(R3), with NA3 site-specific modifications



R/B Complex LMSM used for previous revisions of DCD and S-COLA



Updated Standard Plant Design Basis R/B Complex Dynamic FEM

Dominion

Details: R/B Complex (cont)

- Structural properties used for NA3 site-specific and standard design SSI analyses of R/B Complex

Structure	Structural Properties		DCD Standard Design		S-COLA (*)
	Stiffness	Damping	ISRS	SSE Loads	ISRS and SSE Loads
CIS	Full (uncracked)	4%	X	X	X
	Reduced (cracked)	5%	X	X	
PCCV	Full (uncracked)	3%	X	X	X
	Reduced (cracked)	5%	X	X	
R/B, A/B, PS/Bs	Full (uncracked)	4%	X		X (**)
	Reduced (cracked)	7%	X	X	

(*) Structural models with upper bound full (uncracked concrete) stiffness properties will provide higher responses due to high frequency content of NA3 site-specific motion

(**) SDOF oscillators are used to capture out-of-plane response of cracked slabs and walls

Dominion

Details: R/B Complex (cont)

- Types of site-specific soil-structure interaction (SSI) analyses to be performed on NA3 R/B Complex Dynamic FEM

Model	Input Profiles	Input Motion	Purpose
Surface Foundation	Truncated Column SLB, SBE, SUB	Coherent	Define design ISRS at lower frequencies where incoherency effects are insignificant and envelope responses to incorporates embedment amplifications.
Embedded Foundation	Full Column ELB, EBE, EUB	Coherent	
Surface Foundation	Truncated Column SLB, SBE, SUB	Incoherent	Define design ISRS at high frequencies where incoherency effects are significant
Embedded Foundation	Full Column EUB	Incoherent	Study to demonstrate that surface foundation analyses provide adequate design ISRS
Surface Foundation (*)	Truncated Column SLB, SBE, SUB	Coherent	Study to demonstrate that NA3 site-specific and standard design ISRS bound concrete cracking effects

(*) Structural model with reduced (cracked concrete) stiffness properties will be used

Dominion

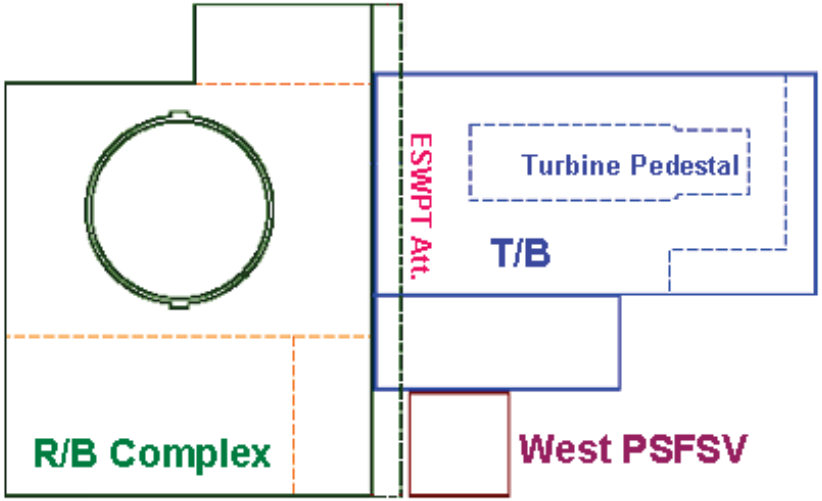
Details: R/B Complex (cont)

- SSI analyses of NA3 R/B Complex will be performed using:
  - SSI input motions compatible to envelope of minimum earthquake (1/3 of CSDRS) and revised site-specific FIRS based on the new CEUS model
  - Truncated and full column profiles of best estimate (BE), lower bound (LB), upper bound (UB) dynamic soil properties strain-compatible to revised site-specific ground motion
  - Updated Surface Foundation Dynamic FEMs capable of capturing responses with frequencies higher than 70 Hz
  - Cut-off frequency of 70 Hz for SSI analyses with SUB profile to capture energy of input motion at high frequencies
  - Updated Embedded Foundation Dynamic FEMs capable of capturing responses with frequencies up to 50 Hz for EUB profile that represent the actual site-specific configuration when modeling the contact of the basement walls with surrounding soil
  - Modified subtraction method (MSM) for embedded foundation SSI analyses (applicability of MSM will be demonstrated)

Dominion

Details: R/B Complex (cont)

- Structure-Soil-Structure Interaction (SSSI) effects:
  - Coherent surface foundation SSI analyses of stand alone R/B Complex Dynamic FEM will provide field responses at locations of nearby foundations
  - Field nodes acceleration response spectra will be compared to input ground motion spectra to assess general importance of SSSI for NA3 site
  - Responses obtained from coherent surface foundation analyses of combined model of R/B Complex, T/B, ESWPT, West PSFSV will be used to include SSSI effects into R/B Complex design basis



Dominion

Details: R/B Complex (cont)

- Seismic analyses for the R/B Complex will:
  - Demonstrate the acceptability of the site-specific seismic design basis by evaluating effects of revised ground motions on structural integrity
  - Confirm that standard plant structural design is bounding for North Anna Unit 3
  - Provide new site-specific design basis ISRS
  - Confirm stability and provide new dynamic bearing pressures

Dominion

Details: UHSRS

- Seismic analyses will incorporate enhanced design of UHSRS that includes:
  - UHSRS A and B (similarly UHSRS C and D) will be integrated into a single structure supported by common basemat in order to improve their stability
  - UHSRS Pipe Chase will be eliminated as separate structure by placing an expansion joint at the center and integrating each half with adjacent UHSRS
  - Top rim of UHS basins will be strengthened by reinforced concrete beams to address overstresed areas and to resist increased torsional loads

Dominion

Details: UHSRS (cont)

- Seismic response and static design analyses of UHSRS will use FEMs that:
  - Reflect updated configuration and design enhancements
  - Include field nodes at nearby ESWPT foundations
  - Use OBE structural damping and full (uncracked concrete) in-plane stiffness of walls and slabs that provide higher responses for high frequency NA3 site-specific design ground motion
  - Use best estimate out-of-plane stiffness of walls and slabs based on concrete cracking stress evaluation
  - Consider two bounding loading cases:
    1. AB with two basins full of water
    2. ABE with basin B being full and basin A empty
  - Consider impulsive and sloshing modes of vibration of basin water

Dominion

Details: UHSRS (cont)

- Types of SSI analyses to be performed for NA3 UHSRS

Model	Input Profiles	Input Motion	Purpose
Surface Foundation	Truncated Column SLBe, SLBw, SBEe, SBEw, SUBe, SUBw	Coherent	Develop design basis ISRS and SSE Loads and provide base reaction time histories
Surface Foundation (*)	Truncated Column SLBw	Coherent	Include concrete cracking effects into design basis ISRS
Embedded Foundation	Full Column EUBe	Coherent	Embedment study to demonstrate that surface foundation analyses provide adequate design basis
Surface Foundation (**)	Truncated Column SBEe	Coherent	Basin water fluctuation study to demonstrate that AB and ABE models provide bounding design

(*) AB structural model with reduced (cracked concrete) stiffness properties will be used

(**) Basin water fluctuation study model will consider UHS B full A and UHS A half full

Dominion

Details: UHSRS (cont)

- SSI analyses of NA3 UHSRS will be performed using:
  - SSI input motions compatible to envelope of minimum earthquake (1/3 of CSDRS) and revised site-specific FIRS based on new CEUS model
  - Truncated column profiles of east and west best estimate (Bee and BEw), lower bound (LBe and LBw), upper bound (Ube and UBw) dynamic soil properties strain-compatible to revised site-specific ground motion
  - Updated FEMs capable of capturing responses with frequencies at least 70 Hz for SUB and cut-off frequency of 70 Hz to capture energy of input motion at high frequencies
  - SSI models without symmetry conditions to capture responses of stand alone UHSRS AB and ABE as well as SSI models with symmetry conditions to capture possible SSSI effects between UHSRS AB and CD
  - Embedment study ABE FEM capable of capturing responses with frequencies up to 50 Hz using direct method for modeling embedment

Dominion

Details: UHSRS (cont)

- Seismic analyses for the UHSRS will:
  - Demonstrate the acceptability of the site- specific seismic design basis by evaluating the effects of the revised UHSRS design and ground motions on the structural integrity of the new combined UHSRS structure
  - Provide new site-specific design basis ISRS
  - Confirm stability and provide new dynamic bearing pressures

Dominion

Details: PSFSVs

- Seismic analyses will incorporate enhanced design of East and West PSFSV:
  - Segments of ESWPT that were previously integrated with PSFSV will be detached and integrated to R/B Complex
  - Design of critical reinforced concrete members will be enhanced to address overstress areas
- Seismic response and static design analyses will use revised FEMs that:
  - Reflect updated configuration and design enhancements
  - Use OBE structural damping and full (uncracked concrete) in-plane stiffness of walls and slabs that provide higher responses for high frequency NA3 site-specific design ground motion
  - Use best estimate out-of-plane stiffness of walls and slabs based on concrete cracking stress evaluation

Dominion

Details: PSFSVs (cont)

- Types of SSI analyses to be performed for NA3 PSFSVs

Model	Input Profiles	Input Motion	Purpose
Surface Foundation	Truncated Column SLB, SBEe, SBEw, SUB	Coherent	Develop design basis ISRS and SSE Loads and provide base reaction time histories
Embedded Foundation	Full Column ELB, EBEe, EBEw, EUB	Coherent	Include embedment effects into design basis ISRS and calculate dynamic earth pressures
Surface Foundation (*)	Truncated Column SLB	Coherent	Include concrete cracking effects into design basis ISRS

(*) Structural model with reduced (cracked concrete) stiffness properties will be used

Dominion

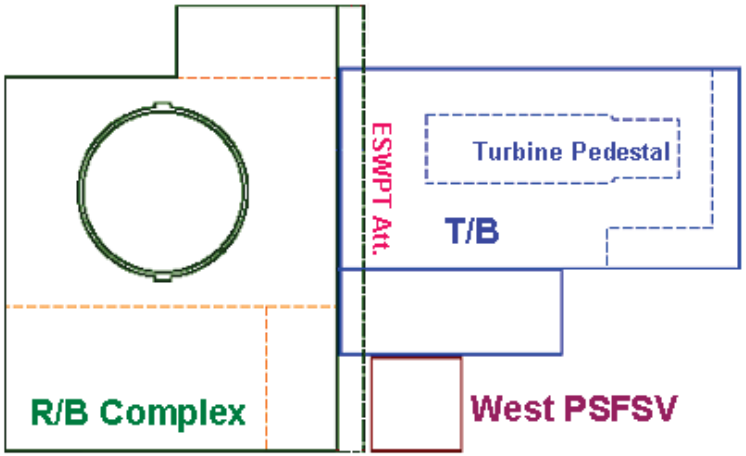
Details: PSFSVs (cont)

- SSI analyses of NA3 PSFSVs will be performed using:
  - SSI input motions compatible to envelope of minimum earthquake (1/3 of CSDRS) and revised site-specific FIRS based on the new CEUS model
  - Truncated and full column profiles of lower bound (LB), upper bound (UB) east and west best estimate (BE) dynamic soil properties strain-compatible to revised site-specific ground motion
  - Updated surface foundation FEMs capable of capturing responses with frequencies at least 70 Hz for SUB soil and cut-off frequency of 70 Hz to capture energy of input motion at high frequencies
  - Updated Embedded Foundation FEMs capable of capturing responses with frequencies up to 50 Hz for EUB profile that represent actual site-specific configuration when modeling contact of basement walls with surrounding soil
  - Modified subtraction method (MSM) for embedded foundation SSI analyses (applicability of MSM will be demonstrated)

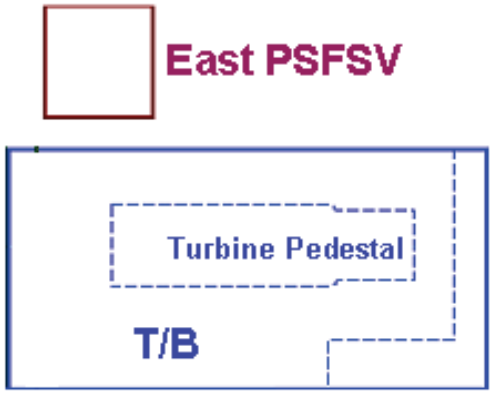
Dominion

Details: PSFSVs (cont)

- Structure-Soil-Structure Interaction (SSSI) effects on PSFSV design basis will be addressed by:
  1. Surface Foundation SSSI Analyses of Combined Model of ESWPT, West PSFSV, R/B Complex and T/B
  2. Embedded Foundation SSSI Analysis on Combined Model of East PSFSV and T/B



1. Surface Foundation SSSI Analysis



2. Embedded Foundation SSSI Analysis

Dominion

Details: PSFSVs (cont)

- Revised seismic analyses and structural evaluations for PSFSVs will:
  - Demonstrate acceptability of site-specific seismic design basis by evaluating effects of enhanced PSFSVs design and ground motions on structural integrity
  - Provide new site-specific design basis ISRS
  - Demonstrate stability and provide new dynamic bearing pressures

Dominion

Details: ESWPT

- SSI structural models will be updated for the redesign of different segments of the ESWPT:
  - Use Full (uncracked concrete) stiffness and OBE damping values
  - Refine mesh of SASSI models of buried ESWPT segments to be capable of transmitting frequencies up to 50 Hz for upper bound (EUB) soil case
  - SSI analyses for the redesigned ESWPT segments will use the revised site-specific FIRS and new SSI input motions which will be updated to reflect the new CEUS model
  - ESWPT analyses will also account for SSSI effects

Dominion

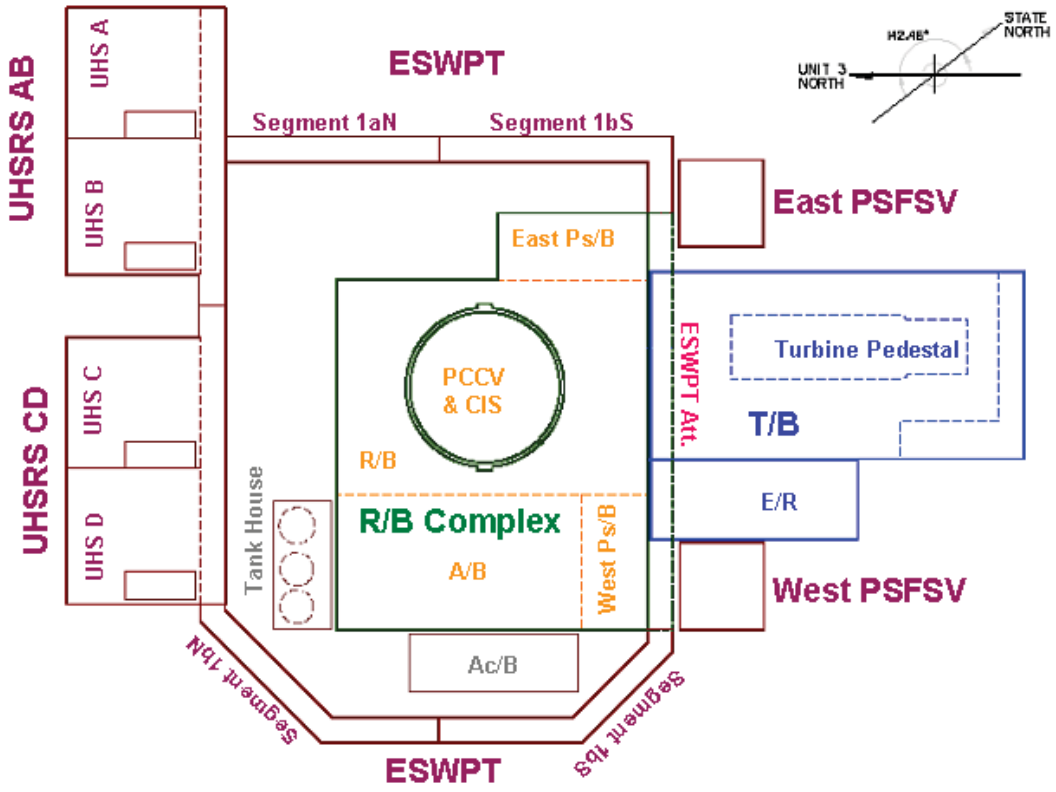
Details: ESWPT

- Revised FSAR will incorporate the enhanced design of ESWPT that includes:
  - The segment of ESWPT located along the south end of R/B Complex will be integrated to the R/B complex basement
  - The cross sections of ESWPT segments will be modified to reflect changes in essential water pipes configuration
  - The overpass tunnels connecting East PSFSV with East PSB will be integrated to ESWPT to address changes in R/B Complex standard plant configuration
  - The design of critical reinforced concrete members will be enhanced to address overstress areas

Dominion

Details: ESWPT (cont)

- Configuration of ESWPT segments



Dominion

Details: ESWPT (cont)

- Seismic response and static design analyses of ESWPT segments will use revised FEMs that:
  - Reflect the updated configuration and design enhancements of Segments 1a and 1b
  - Use OBE structural damping and two stiffness levels representing full (uncracked concrete) stiffness and reduced (cracked concrete) stiffness

Dominion

Details: ESWPT(cont)

- Types of SSI analyses to be performed for NA3 ESWPT

Model	Input Profiles	Input Motion	Purpose
Underground straight segment 1aN	Full Column ELB, EBEe, EUB	Coherent	Develop design basis ISRS and SSE Loads
Underground segment 1aS	Full Column ELB, EBEe, EUB	Coherent	
Underground skewed segment 1a	Full Column ELB, EBEw, EUB	Coherent	

Dominion

Details: ESWPT (cont)

- SSI analyses of NA3 ESWPT Segments will be performed using:
  - SSI input motions compatible to the envelope of minimum earthquake (1/3 of CSDRS) and revised site-specific FIRS based on the new CEUS model
  - Full column profiles of lower bound (LB), upper bound (UB) east and west best estimate (BE) dynamic soil properties strain-compatible to revised site-specific ground motion
  - Updated Embedded Foundation FEMs capable of capturing responses with frequencies up to 50 Hz for EUB profile that represent the actual site-specific configuration when modeling the contact of the tunnel walls and roof with surrounding soil
  - Modified subtraction method (MSM) for modeling SSI embedment (applicability of MSM will be demonstrated)
  - Input acceleration time histories compatible to the ground motion design response spectra that are amplified for SSSI effects based on field node responses obtained from SSI analyses of UHSRS

Dominion

Details: ESWPT (cont)

- Revised FSAR seismic analyses for the ESWPT segments will:
  - Demonstrate the acceptability of the site-specific seismic design basis by evaluating the effects of the revised designs of the ESWPT segments and ground motions on structural integrity
  - Provide new site-specific design basis ISRS
  - Confirm stability and provide new dynamic bearing pressures

Dominion

Details: T/B and E/R

- Purpose of performing the SSI analyses on the T/B and E/R (seismic Category II structures) is to ensure adequate gaps exist between seismic Category II structures and adjacent seismic Category I structures.
- SSI analysis will provide input for evaluating the stability of these buildings during a safe shutdown earthquake (SSE)
- T/B and E/R will be located on separate basemats (departure from DCD)
- Single set of representative FIRS for T/B and E/R
- Impacted S-COLA Section 1.2 - GA

Dominion

Details: T/B and E/R (cont)

- Structural models for the SSI analyses will use:
  - Stiffness properties: full (uncracked concrete) stiffness for foundation
  - Damping properties: OBE values
  - Site-specific design modifications that reflect departures from the standard plant design (e.g., foundation elevations, separate foundations
- SSI analyses for the T/B and E/R will use site-specific FIRS and SSI input based on the new CEUS model

Dominion

FSAR Chapter 3 Revisions and Submittal Schedule

- Section 3.5.1.6, Aircraft Hazards: November 2012
  - Revise total effective plant areas and accident probabilities to reflect new plant layout
- Section 3.7, Seismic Design: April 2013
  - Revise to reflect CEUS methodology, RG 1.208, new plant layout and use of OBE damping values
  - Revise to reflect common basemat for PS/Bs, CIS, PCCV, R/B and A/B, T/B SSI analyses, and use of OBE damping values to generate ISRS

FSAR Chapter 3 Revisions and Submittal Schedule (cont)

- Section 3.7 (cont)
  - Revise Sections 3.7.6, 3.7.2.3.2 - 3.7.2.3.4, 3.7.2.3.6.1, and 3.7.2.4 to incorporate the DCD by reference
  - Revise references to appropriate appendices for COL 3.7(3), 3.7(12) and 3.7(26).
  - Add NAPS DEP 10.4(1) from Part 11 and revise to address the departure from the GA and foundation of T/B and E/R from standard plant
  - Add and revise discussion, tables and figures for new T/B and PSFSV FIRS

Dominion

FSAR Chapter 3 Revisions and Submittal Schedule (cont)

- Section 3.8, Design of Category I Structures: May 2013
  - Revise GA of ESWPT, UHSRS and PSFSV to reflect new plant configuration
  - Revise discussion to reflect new ESWPT interfaces and analyses
  - Sections 3.8.4.4.2, 3.8.5.1.2 and 3.8.5.4.3: Incorporate the DCD text by reference
  - Revise to reflect common NI basemat, sliding/overturning analyses for R/B

FSAR Chapter 3 Revisions and Submittal Schedule (cont)

- Section 3.8 (cont)
  - Add sliding/overturning analyses for the T/B revise bearing pressures
- Appendix 3.OO: April 2013
  - Revise to reflect the new FIRS for the common R/B Complex basemat
- Appendix 3H: May 2013
  - Incorporate the DCD by reference

Dominion

FSAR Chapter 3 Revisions and Submittal Schedule (cont)

- Appendix 3KK: May 2013
  - Create new appendix to incorporate updated input ground motion, new model of combined foundations for UHS basins, SSI effects and revised analysis results of UHS
  - Reflect use of super-elements for UHSRS use of only SSI analyses and to assume full stiffness and OBE damping

Dominion

FSAR Chapter 3 Revisions and Submittal Schedule (cont)

- Appendix 3LL: May 2013
  - Revise to incorporate updated input ground motion, analysis results, methodology and SSI effects for ESWPT and reflect new plant arrangement
  - Update concrete minimum compressive strength
- Appendix 3MM: May 2013
  - Add new appendix to incorporate the updated input ground motion, analysis results and new plant arrangement for PSFSV

Dominion

FSAR Chapter 3 Revisions and Submittal Schedule (cont)

- Appendix 3MM (cont.)
  - Revise analysis to reflect use of super-elements for PSFSV, to be based only on SSI analyses, and to assume full stiffness and OBE damping
  - Revise PSFSV roof thickness and concrete minimum compressive strength
- Appendix 3NN
  - Revise to reflect common R/B Complex, interfaces with ESWPT, use full shear stiffness values for analysis of R/B Complex using OBE damping.

Dominion

FSAR Chapter 3 Revisions and Submittal Schedule (cont)

- Appendix 3NN (cont)
  - App 3NN.2: Revise based on properties from App 3OO and to reflect updated R/B Complex configuration
  - App 3NN.3.2: Incorporate the DCD by reference

Details: Other COLA Parts and FSAR Chapters

- FSAR Chapter 1, Introduction:
  - Sect 1.2 : Plot plan changes due to new plant layout and associated site specific changes
  - Sect 1.8 : Update of Departures
  - Sect 1.9: Add exception to RG 1.132 for borings and revise conformance evaluations for 1.208 and RG 1.65
  - Submittal Date: May 2013

Dominion

Details: Other COLA Parts and FSAR Chapters

- FSAR Section 6.4, Habitability Systems:
  - Revise Table 6.4-201 (MCR Toxic Gas Concentrations) to reflect changes in MCR Habitability analysis due to T/B moving south
  - Submittal Date: October 2012
- FSAR Chapter 8, Electric Power:
  - Revise Figure 8.2.-202 (Switchyard Arrangement) to reflect new standard plant layout and site specific changes
  - Revise ground grid and lightning protection systems in Section 8.3 to reflect new standard plant layout and site specific changes
  - Submittal Date: December 2012

Details: Other COLA Parts and FSAR Chapters

- FSAR Chapter 9, Auxiliary Systems:
  - Section 9.2.5:
    - Revise Figure 9.2.5-1R (UHS Flow Diagram) and text to reflect to eliminate the UHSRS Pipe Chase
  - Section 9.4:
    - Revise cooling and heating loads to reflect changes due to building size and equipment layout
  - Section 9.5:
    - Revise Figure 9.5-201, 9.5-204, 9A-13R, -14R, -20R and-27R (Fire zones and Arrangements) to reflect new plant layout
    - Update Fire Hazard Analysis Summary and Fire Zone/Fire Area interfaces
  - Submittal Date: November 2012

Dominion

Details: Other COLA Parts and FSAR Chapters

- FSAR Chapter 11, Radwaste Management System:
  - Revise Figures 11.5-2aR through -2kR (Radiation Monitor Locations) to reflect new plant layout
  - Submittal Date: December 2012
- FSAR Chapter 12, Radiation Protection:
  - Revise Figures 12.3-1R through -6R, and -11R (Radiation Zone Maps) to reflect building arrangement changes and new concrete wall thicknesses
  - Submittal Date: December 2012
- FSAR Chapter 19, PRA and Severe Accident Evaluation:
  - Revise seismic margins and external events PRA, if required.
  - Submittal Date: January 2013

Dominion

Details: Other COLA Parts and FSAR Chapters

- COLA Part 7, Departures
  - NAPS DEP 3.7(1): Delete section of departure associated with PS/B basemat design and update descriptions relating to interfaces with ESWPT
  - Delete NAPS DEP 3.7(2), 3.7(4), 3.7(5)
  - NAPS DEP 3.7(6): Add NAPS DEP 3.7(6) to describe differences in seismic methodologies
  - NAPS DEP 10.4(1): Revise to reflect departure from GA of T/B
  - NAPS ESP VAR 2.0-4: Revise variance to reflect new common R/B Complex basemat
  - Submittal date: May 2013

Dominion

Details: Other COLA Parts and FSAR Chapters

- SCOLA Part 8, Security:
  - Revise to reflect new plant layout
  - Submittal Date :PSP, LOLA: November 2012
  - Submittal Date: Supplements to HAE and Physical Security Element Review: January 2013
  - Submittal Date: PSPSR: February 2013
- SCOLA Part 10, Tier 1/ITAAC:
  - Revise figures to reflect new plant layout and update concrete wall thicknesses
  - Submittal Date: December 2012
- SCOLA Part 11
  - Delete Part 11
  - Submittal Date: May 2013

Dominion

RAI Evaluations

- Review submitted RAI responses to identify effects of seismic changes
- Review outstanding RAIs to identify effects of seismic changes
- Provide results of review and response schedule by September 30, 2012

Dominion

Questions?

Dominion