PMNorthAnna3COLPEmails Resource

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Sent: Tuesday, April 22, 2014 9:04 AM
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Subject: RAI Letter 116, RAI 7477, FSAR Section 2.5.1, North Anna 3 COLA (52-017)
Attachments: RAI Letter 116 RAI_7477.docx

By letter dated November 26, 2007, Dominion Virginia Power (Dominion) submitted a Combined License Application for North Anna, Unit 3, pursuant to Title 10 of the *Code of Regulations,* Part 52. The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this COLA.

The NRC staff has identified that additional information is needed to continue portions of the review and a Request for Additional Information (RAI), is enclosed. To support the review schedule, Dominion is requested to respond within 30 days of the date of this request. If the RAI response involves changes to the application documentation, Dominion is requested to include the associated revised documentation with the response.

Sincerely,
Chandu Patel
Lead Project Manager for NA3 COLA

Hearing Identifier: NorthAnna3_Public_EX
Email Number: 1158

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Subject: RAI Letter 116, RAI 7477, FSAR Section 2.5.1, North Anna 3 COLA (52-017)
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Request for Additional Information 116

Issue Date: 04/22/2014
Application Title: North Anna, Unit 3 - Docket Number 52-017
Operating Company: Dominion
Docket No. 52-017
Review Section: 02.05.01 - Basic Geologic and Seismic Information
Application Section:

QUESTIONS

02.05.01-1

In FSAR Section 2.5.1, Basic Geologic and Seismic Information, you state: In addition, relevant unpublished geologic literature, studies, and projects were identified by contacting the USGS, State geological survey organizations, and universities.

Staff notes that contacts and personal communications with other agencies, institutions, and scientists were not specifically detailed in this geologic update on the surface effects of Mineral earthquake in the COL FSAR. In support of 10 CFR 100.23, please provide further details regarding the results of research by others in the Mineral VA area, especially in conjunction with your own field work. Please explain how you have considered their findings and interpretations in your characterization of the Central Virginia Seismic Zone (CVSZ) and the effects of the Mineral earthquake, including differences of opinion.

02.05.01-2

In FSAR Section 2.5.1.1.4, Regional Tectonic Setting, you indicate that the following subsection (b) describes the orientation of tectonic stress (p2-264 and p2-265).

Staff notes that Mazzotti and Towend, 2010, determined from a re-evaluation of focal mechanisms that the principle horizontal stress direction in the CVSZ is essentially E-W. They found that, for the CVSZ, the orientation of the principle directions of stress are rotated 48 degrees clockwise from the regional stress directions. Please provide a discussion regarding the current local stress field, the focal mechanisms of the Mineral EQ and aftershocks and the impact on suitably or susceptibly oriented faults in the area.

02.05.01-3

On page 2-270, in a subsection on the Central Virginia Seismic Zone, you state that several liquefaction features were generated by the Mineral VA earthquake

and are described by researchers who investigated the epicentral area immediately following the earthquake.

Pursuant to 10 CFR 100.23, please provide additional details regarding these features. Please include a black and white, high resolution topographic map (scale of ~1:10,000) of the location where the liquefaction feature was found. What was the geomorphic setting at the location of these features?

In light of the location of the Mineral earthquake liquefaction features and the paleoliquefaction features investigated by Obermeier and McNulty, all within about 30 miles of NAPS, please evaluate the possible impact to the seismic source characterization of the eastern part of the CVSZ. Please discuss the new age determinations on the paleoliquefaction sites and how these new dates corroborate or modify the previous age determinations.

02.05.01-4

In FSAR Section 2.5.1.1.7, Information on the Mineral Earthquake, you state: The up-dip surface projection, as shown on Figure 2.5.1-203, approximates where the fault may intersect the ground surface. Constraining the approximate location of the Mineral earthquake rupture plane allows for comparisons with the surface geology and geomorphology to assess the potential for surface deformation. You also indicate that this simple projected line served as a guide for focus in your geologic reconnaissance field program.

a. Staff notes that there is uncertainty in the projection of a simple planar structure to the surface and then expressing that projected trace with the line of a ruler. Additionally, Horton et al. point out other clusters of aftershocks located further to the NE of the main cluster that might align with additional structures. Please comment on this uncertainty and indicate how you considered other possible interpretations to observe surface deformation, such as a fault plane that steepens or shallows out beyond the limits of aftershock data, or the case that deformation might be expressed as an uplifted area in the hanging wall of the Quail fault.

b. You indicate in the conclusions (and other sections in the FSAR) that the Chopawamsic fault is the nearest mapped structural surface to the projected surface expression of Quail fault on which a fault could be located and is a possible candidate for the causative fault for the Mineral earthquake. Staff notes that there are issues and recent changes to the mapped traces of faults in this area including the Chopawamsic fault. Hughes and Hibbard place the Chopawamsic fault further to the west than is indicated in your figures, placing it well beyond the aftershock data and surface projection. Please provide more details regarding the location of the Chopawamsic fault as reported by Hughes and Hibbard.

c. You indicate in several locations in the FSAR that the Long Branch fault as currently mapped is too far to the east of the surface projection of the fault

plane and thus dismiss it from consideration as an active structure in the Mineral earthquake.

Staff notes that there are issues and recent changes to the mapped traces of faults in this area including the southwest extension of the Long Branch fault. At least two groups of geoscientists have suggested the LBF might be an active structure in the Mineral EQ: Hughes and Hibbard 2012, and Harrison et al, 2011. The Long Branch fault is within the 5 mile radius of the site and fault 'a' and 'b' might be structurally linked to the LBF as indicated in SSAR figure 2.5-17.

Please discuss the relevance of the suggestions of other geologists regarding the SW extension of the Long Branch fault and the potential of Long Branch fault in conjunction with the geophysical data from the Mineral earthquake to have been active during this earthquake. Please discuss the significance of the exposure of locally constrained L-tectonites along the South Anna River as possible evidence to extend the mapped trace the Long Branch fault into the epicentral area. Please indicate on a detailed topographic map where this outcrop is located. Does LiDAR reveal the presence of this fault?

d. Please add details to Figure 2.5.1-203, including a depth scale, possible zone of uplift, known geologic faults mapped at surface, projection of aftershock cluster to the east of main cluster, and indication of uncertainty in the projected fault plane.

02.05.01-5

In FSAR Section 2.5.1.1.7(b), Geologic Reconnaissance, you indicated that your field reconnaissance program was focused to evaluate surface deformation associated with the Mineral earthquake; you describe acquisition of LiDAR, a special focus on the up dip projection of the Quail fault, examination of geomorphic features in the landscape, and additionally provided a field map with routes and waypoints.

Please provide additional details about specific areas of the study and analysis within this field reconnaissance program including:

a. Provide further explanation for what was examined at the waypoints indicated on your figure. Indicate the significance for each waypoint in support of your analyses and conclusions.

b. Provide high resolution, black and white, detailed (scale ~10,000) LiDAR maps for areas immediately west of NAPS where fault ‘a’ might be located, such as your waypoint sites 23, 24, and 25.

c. Provide a discussion of longitudinal stream profile analysis completed in the epicentral area. Include an index map of all stream profiles completed on high resolution, black and white, LiDAR panels with key geographic annotations. Discuss any anomalies revealed by this analysis that could indicate subtle tectonic deformation in the hanging wall of the Quail fault, such as gradient changes, offset stream terraces, elevated topography.

Include illustrations of stream profiles. Did you consider geomorphic features reported by Berti et al, 2012, and Harrison, 2012, of anomalous stream gradients and knick points?

d. Explain how you evaluated the Quaternary geology of the epicentral area and the distribution, correlation and elevation of river terraces on the South Anna River. Discuss any indication of subtle surface uplift in river terraces on the hanging wall of Quail fault that might indicate prolonged or repeated surface deformation. Include maps and illustrations.

e. Provide any details regarding assessment of interfluvial, remnant pediment surfaces in the epicentral area for evidence of prolonged or repeated surface deformation. Include maps or illustrations.

02.05.01-6

In FSAR Section 2.5.1.2.3, Site Area Stratigraphy, you state: The borings exhibit severely weathered and jointed intervals in the Zone III-IV and Zone IV rock. These intervals were encountered in several of the borings at varying elevations ranging from 150 ft. to 285 ft. The intervals ranged in thickness from 0.2 to 20 ft.

Farther on in this same section you state: In boring W-1 a micro-shear zone in the Zone III-IV rock was encountered at an elevation of about 210 ft. It is described in the boring log as a possible shear zone, 0.6 ft. thick comprising soft, yellow-brown clay with rock fragments.

Pursuant to 10 CFR 100.23, please address the following questions:

a. Staff notes that for Zone IV rock (slightly weathered to fresh rock), severely weathered and jointed intervals would be uncharacteristic. Since this severely weathered and jointed condition was encountered in several borings can it be mapped and does it indicate the presence of a geologic structure or shear zone that opened this rock to excessive jointing and weathering?

b. Is the Micro shear zone in boring W-1, in zone III-IV rock, structurally associated with the severely weather and jointed zone. Is the soft, yellow-brown clay with rock fragments indicative of fault gouge and brittle deformation? Is this micro shear structurally related to the previously identified fault ‘a’? Did you look for this shear zone in adjacent boreholes?

c. In FSAR Section 2.5.3.2.5, Unit 3 Subsurface Investigation, you state: Borehole data, from the supplemental subsurface investigation described in Section 2.5.4.3, were reviewed for evidence of Quaternary fault movement. No such evidence was exhibited by the borehole data. In support of 10 CFR 100.2, please explain how you determined evidence or lack of evidence for Quaternary faulting in borehole data targeted for geotechnical information.

d. The NAPS abandoned Units 3 & 4 excavations revealed the presence of fault 'a'. This fault traces across the ESP parameter envelope (SSAR

figure 2.5-18). Staff notes that Fault 'a' might be structurally associated with the Long Branch fault and the Long Branch fault is implicated by some geologists (Hughes and Hibbard, 2012; Harrison et al, 2011) as a possible active structure of the Mineral EQ. In support of 10 CFR 100.23, please explain: What evaluation have you completed to determine the potential for future surface deformation on fault ‘a’ in light of the Mineral EQ and structural links to the epicentral area? Provide a figure that shows fault 'a' in conjunction with the current construction lay out and recent boreholes using a high resolution, black and white topographic base.

02.05.01-7

In FSAR Section 2.5.1.2.4, Site Area Structural Geology, you state: None of these faults are considered capable tectonic sources, as defined in RG 1.208, Appendix A.

Staff notes that the capable tectonic source definition in RG 1.208 is not the sole criteria for staff’s safety finding for the site area (2.5.1.2) and for surface deformation (2.5.3). 10 CFR 100.23 (d) (2) specifically requires the potential for surface tectonic and non-tectonic deformation to be determined. Sufficient geological, seismological and geophysical data must be provided to clearly establish whether there is a potential for surface deformation. Staff also considers in general the evidence for youngest age of movement or deformation within the Quaternary period. As discussed in RG 1.208, a PSHA characterizes seismic potential through consideration of the historic and geologic record from the Quaternary Period.

Pursuant to 10 CFR 100.23 (d) (2), please describe the analysis that you completed to determine the potential for future surface deformation, tectonic and non-tectonic at the site. In addition, please state whether your findings have an impact on the PSHA for NAPS.