SECURITY-RELATED INFORMATION – WITHHOLD UNDER 10 CFR 2.390

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

October 11, 2010

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Serial No.: 10-114C
NAPS/MPW
Docket No.: 50-338
License No.: NPF-4

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNIT 1
RESUBMITTAL OF RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION FOR EXEMPTION REQUEST FOR THE RCP OIL COLLECTION SYSTEM

In an April 23, 2010 letter (Serial No. 10-114), Dominion requested an exemption from the requirements of 10 CFR 50, Appendix R, Section III.O, for Operating License NPF-4 for North Anna Unit 1. Section III.O requires that the Reactor Coolant Pumps (RCP) be equipped with an oil collection system if the containment is not inerted. In addition, Section III.O requires that collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the RCP lube oil system. In an E-mail dated August 19, 2010 from Dr. V. Sreenivas, the NRC requested additional information (RAI) to complete their review of the exemption request for Unit 1. In response to that request Dominion provided a partial response to the RAI on September 27, 2010 (Serial No. 10-114B). However, that letter contained improperly labeled security-related information. Therefore, Dominion is withdrawing the September 27, 2010 response in its entirety and resubmitting the requested information with proper labeling in the enclosed attachments.

Attachment 1 provides the requested information. Attachment 2 contains sketches and drawings of equipment locations that are considered Security-Related Information (SRI). Therefore, Dominion requests that Attachment 2 be withheld from public disclosure under 10 CFR 2.390(d)(1) in its entirety.

When the RAI was received, Dominion was preparing for a refueling outage and is currently in a refueling outage. In addition, significant engineering re-analysis is required to develop responses to several of the RAIs. Therefore, the attachment to this letter provides responses to questions 1, 2, 4, 6, 7, and 9. Dominion intends to submit response for the remaining requested information, questions 3, 5, and 8, as soon as practical after the current refueling outage, but no later than November 15, 2010.

ATTACHMENT 2 CONTAINS INFORMATION THAT IS BEING WITHHELD FROM PUBLIC DISCLOSURE UNDER 10 CFR 2.390. UPON SEPARATION THIS LETTER AND ATTACHMENT 1 ARE DECONTROLLED

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NRR

If you have any questions or require additional information, please contact Mr. Thomas Shaub at (804) 273-2763.

Sincerely,

Leslie N. Hartz
Vice President – Nuclear Support Services

Attachments

1. Response to Request for Additional Information Exemption Request for the RCP Oil Collection System
2. Sketches and Drawing of Equipment Locations in Containment (Withheld under 10 CFR 2.390)

Commitments contained in this letter:

Dominion intends to submit the remaining requested information as soon as practical after the current refueling outage, but no later than November 15, 2010.

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ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION EXEMPTION REQUEST FOR THE RCP OIL COLLECTION SYSTEM

NORTH ANNA POWER STATION (DOMINION)
UNIT 1

Response to Request for Additional Information

Background

By letter dated April 23, 2010, (Serial No. 10-114), Agencywide Documents Access and Management System (ADAMS), accession number ML101160376, the Virginia Electric and Power Company (Dominion) requested an exemption from the requirements of Title 10 of the *Code of Federal Regulations* Part 50 (10 CFR 50), Appendix R, Section III.O, for Operating Licenses NPF-4 and NPF-7 for North Anna Units 1 and 2. Section III.O requires that the Reactor Coolant Pumps (RCPs) be equipped with an oil collection system and that collection system be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites. The exemption request is intended to address verbatim compliance with 10 CFR 50 Appendix R as it applies to oil misting rather than oil leakage that is collectible. It was later determined that an exemption request was not an appropriate method to address this issue for North Anna Unit 2 based on the effective date of the regulation. Therefore, in letter dated May 13, 2010, ADAMS, accession number ML101380270, Dominion withdrew the exemption request for North Anna Unit 2 and will instead address the issue in accordance with the existing North Anna Unit 2 licensing condition 2.D. In the same letter, Dominion provided its documentation of special circumstances for consideration under 10 CFR 50.12 for North Anna Unit 1, for this exemption request.

In an August 19, 2010 E-mail from Dr. V. Sreenivas, the NRC requested additional information (RAI) to complete NRC review. As noted in the cover letter, the information provided below is a partial response to the RAI (Questions 1, 2, 4, 6, 7 and 9). The remaining information (Questions 3, 5, and 8) will be submitted as soon as practical after the current refueling outage, but no later than November 15, 2010. The following table provides the requested information. Attachment 2 includes the sketches and drawing (considered to be security related) that are referenced in Attachment 1.

NRC Question	Dominion response
Background RAI 1: Dominion's letter of April 23, 2010, states, "Indication of the RCS [reactor coolant system] hot leg temperature is provided in the Control Room by means of three Resistance Temperature Detectors (RTDs). These RTDs are located in the RCS piping in the RCP [reactor coolant pump] loop rooms. Their safe shutdown function is to provide temperature indication during core cool down. RTDs are also installed in the cold leg; however, only the hot leg RTDs are credited Appendix R equipment. "There is no credible means for minor oil misting to impact the safe shutdown function of the hot legs RTDs. Loss of the hot leg RTDs in one loop does not affect safe shutdown because redundant indication is provided by the other two loops, which are physically separated from one another. Further, the hot leg RTDs and associated instrument wiring are not in the vicinity of the previously-identified oil puddles. Thus, the potential for a fire caused by RCP oil misting that could impact the safe shutdown function of the hot leg RTDs is not deemed credible."	
1.1 Discuss the location of redundant Thot RTDs with respect to actual distance from identified oil puddles.	Refer to attached sketches 1 and 2. The site of minor oil puddling has been observed in the shallow trays supporting the RCP Stator Air Coolers (sketch 2, approximate elevation 267'). The hot and cold leg RTDs are located in the reactor coolant piping (sketch 1, approximate elevation 257'). The approximate distance from a puddling site to the closest redundant RTD located in another pump cubicle is 70 feet, separated by two concrete walls of 2 ft. thickness or greater.
1.2 Describe the barriers and distances of the safe shutdown components (from redundant components and cables) such as RTDs inside Fire Area (FA) 1-1.	See RAI 1.1. There has been no oil puddling observed outside of the RCP cubicles, therefore, safe shutdown components that are of concern are limited to the RTDs discussed in RAI 1.1.
1.3 Discuss defense in depth and describe how safe shutdown is assured if Thot temperature indication is lost due to fire or fire fighting activities.	Natural circulation cool down is accomplished by monitoring cold leg temperature. Pressurizer cool down is accomplished by monitoring hot leg temperature. This monitoring can be done in the Main Control Room (MCR) (where all three loop RCS Thot and Tcold temperatures are available) or in the Fuel Building (where A and B loop RCS Thot and Tcold temperatures are available on the Appendix R shutdown panel). All indication channels are routed in independent, separate raceways. If Thot /Tcold indication is not available on one leg, the other leg's indication can be used within the bounds of the procedure. This redundancy provides built-in defense in depth.

NRC Question	Dominion response
1.4 If North Anna's (NAs) Fire Protection Program (FPP) assumes the loss of the entire FA 1-1 for a credible fire, describe NAs capability for temperature indication during plant cool down and how safe shutdown is assured.	The North Anna fire protection program does not assume the loss of the entire FA 1-1 (Unit 1 Containment) or 1-2 (Unit 2 Containment) for a credible fire. The containments meet the requirements of 10CFR50 Appendix B, section III.G.2. Due to the physical separation and defense in depth measures discussed in RAIs 1.1, 1.2 and 1.3, a credible fire in one RCP cubicle would not affect RCS temperature indication from the other two loops.
Background RAI 2: Dominion's letter of April 23, 2010, states, "Prior to the modification of the OCS [oil collection system], some pooling / dripping of oil was observed on the RCP flange. Using industry fire modeling tools, it can be shown that if ignited, these small pools would result in fires of low heat release rates and small duration. In addition, there are no significant fire targets (additional combustibles or safe shutdown components) in the proximity of observed pooling that could be ignited or damaged."	
2.1 Discuss in detail the industry fire modeling tools Dominion used to determine the heat release rates and fire duration; include all assumptions and results of analysis.	The pooling on the pump flange observed was typically localized, and estimated to be bounded by 1 to 2 ft^2. Although the amount of pooled oil is not easily measured and had not been previously estimated, a conservative estimate of 16 to 32 ounces was used based on visual inspection. Using the Chapter 3 equation (Estimating Burning Characteristics of Liquid Pool Fire, Heat Release Rate, Burning Duration, and Flame Height) from NUREG-1805, Fire Dynamics Tools (FDT^s) Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program, for lube oil, the resulting heat release rates (HRR*) are low (< 100 kW) and burning duration short (< 2 minutes). This analysis was based on visual observations made prior to the modification to install collection troughs on the end of each stator cooler. Once the modifications are complete (Unit 2 was completed in April of 2010, Unit 1 to be completed in October of 2010), no pooling of oil is expected to occur on the pump flange. **HRR is defined in section 19 of NUREG-6850," EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities".*
2.2 Discuss in detail fire targets, other combustibles and how	Fire targets for the motor cubicles/loop rooms would consist of the cable routing in conduit for the Thot and Tcold leg indications. As previously discussed, the primary and alternate

NRC Question	Dominion response
Dominion controls transient combustibles during operations and while shutdown during outages when work is performed inside containment.	temperature elements and cable routing are located in separate cubicles. As a result, safe shutdown is assured. With the exception of the oil contained within the RCP motor, combustibles within each cubicle/loop room are negligible. Furthermore, containment is maintained subatmospheric and not routinely inhabited during operation. As a result, the introduction of transient combustibles into this area at power is negligible. During refueling outages, transient combustible permits are typically not issued for Containment. Operation's use of establishing boundaries around protected equipment (equipment required to protect the core, i.e. RHR) restricts maintenance in the area, minimizing any exposure to transient combustibles.
2.3 Describe in detail FA 1-1 including rated barriers and distances between RCP cubicles and loop rooms.	FA 1-1 and 1-2 are the primary containments for North Anna Power Station, Unit 1 and 2, respectively. Each area is a multi-level structure with floor elevations of 216'-11", 231'-6", 241'-0", 262'-10", and 291'-10". The boundary fire barriers for each containment are of heavy reinforced concrete construction with an inherent fire rating in excess of 3 hours. Access is gained into containment through a personnel access lock from the 291'-10" elevation of the Auxiliary Building. The RCP motor cubicles are located on elevation 262. The associated loop room is located directly below on elevation 241'-0". The floor to the motor cubicle consists of steel grating with multiple openings between the motor cubicle and loop room. The rooms are separated from the remainder of containment by heavy concrete shield walls (33 to 42 inch thick), with a personnel access door for each cubicle and loop room. There are multiple openings in the ceiling of the motor cubicles to the 291'-10"elevation above. Although not maintained as rated fire boundaries, the heavy shield walls provide a large degree of separation. Drawings are included for each elevation of Containment in attachment 2: (NA-DWG-000-11715-FAR-201 SH-001 through SH-004).
2.4 Describe the overflow path from a RCP OCS tank, include ignition sources in the drainage area and how safe shutdown is assured.	Each RCP oil collection system tank is located in the loop room (elevation 241') below the associated motor cubicle. Each motor's oil collection system has its own tank that is designed to contain the entire oil inventory of the motor. A vent and flame arrestor are provided on top of the tank. Operation procedures verify the oil collection tanks are empty prior to unit start-up from Mode 5. In addition, tank drain lines were extended in the mid-1990's to allow draining

NRC Question	Dominion response
	the tank from outside the loop rooms (lower radiation dose area). In the event that oil is required to be added to a motor while the Unit is operating, and the tank will not be drained, NAPS Technical Requirements Manual provides the following actions: • Monitor containment air temperature and RCP bearing temperatures for significant rise. • Review quantity of oil added to ensure oil added does not significantly impact combustible loading. • Stage foam suppression near the containment personnel hatch. • Drain tank to ensure tank capacity acceptable prior to entering Mode 2 from an outage to return the system to Functional status. The features discussed above are provided to ensure an overflow event does not occur, mitigate the consequences should an overflow event occur, and ensure safe shutdown is not impacted. If the tank were to overflow, the path would be out the vent and flame arrestor. The oil would flow down the tank and onto the loop room floor. There are no dikes, sumps, or drainage provided. The tanks are located along the outer wall of the loop rooms, away from most piping and equipment. As a result, a fire developing from an overflow event is not likely to occur. Refer to RAI 4.1 for a discussion of ignition sources in the RCP cubicles. It is shown that no credible ignition sources exist in these cubicles.
Background RAI 3: Dominion's letter dated April 23, 2010, states, "Additional defense in depth is achieved through the physical properties of the oil itself combined with the limited amount of ignition sources within the area. The flashpoint of the oil currently used is 374°F, with an auto-ignition temperature of 608°F. Nominal temperatures of the RCP motor and pump flange are approximately 220°F and 550°F, respectively. These temperatures would not be sufficient to cause auto-ignition of the oil. However, given the flashpoint of the oil, it is conceivable that the oil could be ignited in the presence of an ignition source."	
3.1 Discuss defense in depth and specifically, the physical properties of the RCP oil that provides additional defense in depth.	Provide in supplemental response.

NRC Question	Dominion response
3.2 Describe the physical properties of the oil when it is above the flashpoint of 374°F and the effect of chemical breakdown and subsequent lowering of auto-ignition temperature.	Provide in supplemental response.
3.3 Describe in detail the type of RCP oil used, include flash point, fire point, auto ignition temperature, and controls in place to assure RCP oil of different (more combustible) properties will not be used in the future.	Provide in supplemental response.
Background RAI 4: Dominion's letter of April 23, 2010, states, "A review of equipment in the area has identified one potential ignition source. The RCP is in close proximity to the cold leg Loop Stop Valve (LSV) Motor Operated Valve (MOV). Due to the size of the LSV MOV actuator motor, it could be considered an ignition source. However, the supply breakers to the cold leg LSVs are opened prior to start-up and administratively verified open throughout the cycle. "All other aspects reviewed were found to have negligible risk as an ignition source. Transient combustibles and hot work are non-existent within the RCP cubicle during power operations. Area heat trace electrical cabinets have been abandoned and de-energized. There are a number of solenoid operated valves, MOVs, trip valves, and hand control valves in these areas; however, they are low energy components and are not considered credible ignition sources. Cables within the motor cubicles and loop rooms are routed in conduit. No cable trays are routed through the areas. Therefore, no other credible ignition sources exist within these areas."	
4.1 Discuss the voltage, current and power rating of the circuits described in RAI 4.0.	The attached List 1 contains the electrical equipment located in a typical RCP cubicle inside the reactor containment. With the exception of the Control Rod Drive cooling fans and the RCP Cubicle cooling fan, this equipment is either low energy (≤10 watts), or the equipment is normally deenergized or the power is disconnected. The CRDM cooling fans (Sketch 4) are located 12 ft. above and 20 ft horizontally separated from the oil site (RCP Stator Air Coolers -

NRC Question	Dominion response
	Sketch 1) and are not considered to be an ignition source. Similarly, the Dome Air Recirculation fan (Sketch 5) is located 24 ft. above the oil site (RCP Stator Air Coolers - Sketch 1) and is not considered to be an ignition source.
4.2 Discuss what is meant by low energy and how that energy relates to the auto ignition temperature of the RCP oil.	As identified in the response to RAI 4.1 (shown on List 1), the only normally energized electrical components in the area that could be exposed to RCP motor oil are four solenoid operating valves in each of the cubicles. With a coil rating of 10 watts, these are considered low energy sources. A constantly energized SOV in an ambient temperature of 104°F will have a maximum internal coil temperature of 268°F in accordance with vendor information contained in Dominion Environmental Qualification (EQ) document QDR-N-35.1 reference 17. The outer housing of the coil is expected to be relatively cooler than the internal windings due to heat dissipation of the outer coil housing. Nonetheless, 268°F internal coil temperature is lower than the flash point temperature of the oil (374°F as stated in the exemption request). A search of NUREG-6850," EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities" did not yield a definition for "low energy" ignition sources, however, the best fit for these discrete SOV components would be in the lower range of Bin 1 as identified in Appendix E, table E-2 (0 to 25 kW HRR). The SOV components are fused with a 10 amp control fuse, and even under abnormal conditions, a 10 second fault would cause the fuse to clear after 18.7E3 joules were released. By this reasoning, the energized SOVs are considered to be low energy ignition sources that will not ignite oil under normal or abnormal operating conditions.
4.3 Discuss in detail the administrative controls used to verify the status of these circuits, include how abandoned circuits are controlled and verified de-energized.	Refer to List 1. MCC circuit breakers providing power to motor operated valves 1-RH-MOV-1700, 1-RC-MOV-1590, 1-RC-MOV-1591 and 1-RC-MOV-1585 are locked in the OFF position while the Unit is at power. The administrative control for these circuits is controlled by operating procedure 1-OP-26A. The above is true for the other MOVs in all other RCP cubicles. The controlling procedure for Unit 2 is 2-OP-26A. Abandoned heat trace power distribution cabinet 1-EP-CB-800A main power cable is physically disconnected at Motor Control Center 1-EP-MCC-1A1-1 cubicle B1 (as shown on station drawing 11715-FE-9CW). This is similarly true for the other heat trace power distribution cabinets contained in the other Unit 1 and Unit 2 RCP cubicles. The status of

NRC Question	Dominion response
	disconnected power cables for abandoned equipment is controlled by plant design and operating procedures. The Dominion Safety Policy prohibits changing plant status, such as valves and electrical circuits, without strictly following specific plant procedures. RCP oil lift pump 1-RC-P-1A1 is controlled by an oil pressure start permissive relay. During the first 3-4 minutes of RCP startup, the oil lift pump is allowed to operate. This pump is located within a stainless steel enclosure that is part of the Appendix R RCP oil collection system. After the first few minutes when the RCP is capable of maintaining its own oil pressure, the oil lift pump is deenergized. The oil lift pump is normally deenergized while the Unit is at power. RCP startup and shutdown is controlled by operating procedure 1-OP-5.2. The controlling procedure for Unit 2 is 2-OP-5.2. One of the two CRDM cooling fans in each cubicle is normally operating while the Unit is at power. These fan motors are located approximately 12 ft. above and 15 ft. horizontally from the closest oil site at the RCP air coolers (sketch #2). They are not considered to be an ignition source for the RCP oil. Their status is controlled by operating procedure 1-OP-21.1 for Unit 1 and 2-OP-21.1 for Unit 2. The SOVs discussed in RAI 4.2 are subcomponents automatically controlled by relays and do not have a specific controlling procedure. Normally deenergized SOVs 1-RC-SOV-1556 A and 1-RC-SOV-1557A are the loop fill and drain valve instrument air supply SOVs. They are controlled by procedure 1-OP-5.1, "Filling and Venting the Reactor Coolant System". This is similarly true for the other loop fill/drain SOVs in the other RCP cubicles. The controlling procedure for Unit 2 is 2-OP-5.1.
4.4 Discuss any normally de-energized equipment such as welding equipment or circuit breakers that are in the area around potential leakage sites or drain sights including sump areas.	There is a welding outlet RECP-25 in the lower elevation of Unit 1 loop room cubicle A (see sketch #3). This welding outlet has a sealed cap installed over the plug when it is not in use. It is located approximately 3 ft. above and 40 ft. horizontally from the RCP Oil Collection Tank drain site on elevation 241 ft. It is located approximately 24 ft. lower and 20 ft. horizontally from the closest oil site at the RCP air coolers (refer to sketch #2).
4.5 Describe other administrative controls used to protect safe	Fire Protection/Appendix R implementing procedures CM-AA-FPA 100, 101 and 102 provide administrative controls to protect safe shutdown equipment in all areas of the plant. Procedure

NRC Question	Dominion response
shutdown equipment in Fire Area 1-1 such as control of transient combustibles.	CM-AA-FPA-101 provides for control of combustible and flammable material. No transient combustible material is normally allowed in the containment while the unit is at power. This requirement is ensured by Unit 1 operations procedure 1-OP-1B (Containment Checklist) prior to placing a unit into operation. Likewise, 2-OP-1B controls the Unit 2 containment.
Background RAI 5: Dominion's letter of April 23, 2010, states, "Industry events have shown the most credible ignition source for RCP oil is hot RCS piping. Ignition has typically occurred due to the oil soaking combustible insulation. Combustible insulation is not used at North Anna; the intermediate leg and cold leg piping are insulated with reflective, non-combustible insulation."	
5.1 Describe in detail the type of insulation used on RCS piping including directly on the piping and describe any material that covers that layer of insulation such as reflective material.	Provide in supplemental response.
5.2 Discuss any properties of RCS piping insulation that could lead to reduced auto ignition temperature such as has been seen at other facilities and how NA ensures non-combustible fibrous insulation materials do not soak up oil.	Provide in supplemental response.
5.3 Discuss the expected temperatures on the RCS piping during normal power operations and shutdowns and outages including temperatures on reflective insulation coverings.	Provide in supplemental response.
Background RAI 6: Dominion's letter of April 23, 2010, states, "At normal operating conditions, no credible fire hazard from the oil misting would exist in	

NRC Question	Dominion response
the motor cubicles or loop rooms due to the RCS operating temperature being below the auto-ignition point of the oil. This is also true during all design basis accidents (DBAs), with the exception of one scenario. During a main feedline rupture event inside containment, which is an ANS [American National Standard] Condition IV event, the cold and intermediate legs reach a peak temperature of 639°F after approximately 126 minutes. Thereafter, RCS temperature will decrease slowly with auxiliary feedwater heat removal capacity exceeding core decay heat plus RCP heat. "Under these specific DBA conditions, the RCS piping would only present a fire hazard if the oil mist were to seep through the insulation and make contact with bare RCS piping. As stated above, no oil accumulation was identified on this RCS piping during previous walkdowns and insulation would be expected to remain in place during this DBA. In addition, containment spray systems would be in operation, which would further reduce the potential of a fire. Finally, combustible materials within the RCP cubicles and loop rooms are negligible and not sufficient to promote fire propagation. In aggregate, Dominion concludes that any postulated fire would be insignificant and bounded by those previously discussed above."	
6.1 Discuss in detail the ANS Condition IV event mentioned above, include all assumptions and definitions.	The event consists of a major rupture of a main feedwater pipe in containment. This is considered a Condition IV –Limiting Fault. Condition IV events are faults that are not expected to take place, but are postulated because their consequences would include the potential for the release of significant amounts of radioactive material. The main feedwater pipe break for this event is assumed to be large enough such that feedwater inventory in the steam generators cannot be maintained. The break is also assumed to be in a location that precludes the addition of auxiliary feedwater to the affected steam generator. Depending upon the size of the break and plant operating conditions at the time of the break, the break could cause either a reactor coolant system cooldown or heatup. For the discussion referenced above, a reactor coolant system heatup is assumed. A reactor trip and auxiliary feedwater supplied to one intact steam generator provide the necessary protection for the event (reactor core remains covered with water throughout the transient). The major assumptions associated with the event are as follows: 1. The reactor is initially operating at 2951 MWt. 2. Initial reactor coolant average temperature is 4°F above the nominal value, and the initial pressurizer pressure is 30 psi above its nominal value. 3. No credit is taken for the pressurizer power-operated relief valves or pressurizer spray. 4. Initial steam generator water level is at the nominal value +5% in the faulted steam generator and at the nominal -5% in the intact steam generator.

NRC Question	Dominion response
	5. No credit is taken for the high pressurizer pressure reactor trip. 6. Main feed to all steam generators is assumed to stop at the time the break occurs 7. The break was conservatively modeled at the bottom of the steam generator. 8. The reactor trip was assumed to be actuated when the water level in the faulted steam generator decreases to the 0.0% of narrow range span. 9. A break area of 0.717 ft^2 is assumed (corresponds to the total flow area of all of "J" tubes on the feedring). 10. No credit is taken for heat energy deposited in reactor coolant system metal during reactor coolant system heatup. 11. No credit is taken for charging or letdown. 12. Steam generator heat transfer area is assumed to decrease as the shell side liquid inventory decreases. 13. Conservative core residual heat generation is assumed based upon long term operation at the initial power level preceding the trip. 14. The auxiliary feedwater is assumed to be actuated by the low-low steam generator water level signals with the feed rate of 300 gpm (capacity of one motor driven auxiliary feedwater pump). A 60 second delay was assumed following the low-low level signal to allow time for start-up of standby diesel generators and auxiliary feedwater pumps. Only one auxiliary feedwater pump is assumed to operate delivering auxiliary feedwater to one intact steam generator. 15. The auxiliary feedwater pump aligned with the faulted steam generator is shutdown by operator action 30 minutes after the trip. This ensures adequate emergency condensate storage tank head to provide heat removal for the duration of the analysis. For a major rupture of a Main Feedwater line in containment, containment pressure will rise rapidly, initiating a Containment Depressurization Actuation, resulting in containment spray operation. As discussed in the exemption request, Reactor Coolant System intermediate legs reach a peak temperature of 639°F after approximately 126 minutes into the event.
6.2 Provide a description of the containment spray system and when it would be placed into	The Quench Spray system is a part of the Containment Depressurization System, and is designed to operate following a LOCA or steam line break in containment to maintain containment peak pressure below 45 psig, maintaining the structural integrity of containment.

NRC Question	Dominion response
operation for a postulated fire in FA 1-1.	The system consists of a water supply (Refueling Water Storage Tank), two pumps, and two spray rings in the upper area of the containment dome (100 feet above the operating floor). The spray rings discharge a fine mist of atomized water. The cooling spray removes heat from containment atmosphere and condenses the steam causing a reduction in containment pressure. Per the containment fire safe shutdown procedures (FCA – Fire Contingency Actions), the Quench Spray Systems can be used, if required, to reduce containment temperature below 120°F following a fire to allow for Operator access to perform cold shutdown activities (align the Residual Heat Removal system for service).
Background RAI 7: Dominion's letter dated April 23, 2010, states, "In summary, the modifications to the OCS scheduled to be installed during the next refueling outages will eliminate the potential for oil pooling to occur outside the OCS. The remaining oil sheen that may develop due to misting does not present a safety concern due to the small volume of oil, fire protection features such as automatic fire detection, manual suppression capability, the physical properties of the oil, and the limited presence of ignition sources within the area."	
7.1 Discuss in detail the NA automatic fire detection features in FA 1-1, including alarm set points, locations of detectors and annunciation circuit indications.	Fire detection within the Unit 1 and 2 Containments consist of linear heat detection on each Reactor Coolant Pump, smoke and heat detection within the Cable Penetration area of Containment, heat detection for the Residual Heat Removal Pumps, and duct smoke detection on the outlet of each Containment Air Recirculation Fans (3 for each unit). The RCP linear heat detection alarms at 575°F, and is located within the body of the insulation at the base of the pump. When temperature exceeds the setpoint, an alarm is received locally in Containment at the local control panel, on the Control Room Vertical Board (D-C8, SMOKE DET SYS SMOKE INDICATION TROUBLE), and on the Control Room Fire Detection Panel, 1-FP-CPU-IMS-1. System trouble conditions are annunciated similarly. As stated above, both smoke and heat detection is provided within the cable penetration area. The cable penetration area is on elevation 259'-6" of Containment, and consists of a concentration of cable trays. The fire detection in this area consists of 10 addressable smoke

NRC Question	Dominion response
	detectors and 9 addressable heat detectors. The smoke and heat detector locations are alternated throughout the area. The heat detectors are rated at 155°F. Heat detectors rated at 155°F are also located above the Residual Heat Removal Pumps located on elevation 231'-6". A total of 4 heat detectors are located in this area. The remaining fire detection in Containment consists of duct smoke detectors on the outlet of each Containment Air Recirculation Fan. The Fans are located on elevation 216' of Containment. Annunciation for the above devices is similar to the RCP linear heat detection. Alarms are received at the local control panel (located outside Containment in the Primary Cable Vault and Tunnel), on the Control Room Vertical Board (D-C8, SMOKE DET SYS SMOKE INDICATION TROUBLE), and on the Control Room Fire Detection Panel, 1-FP-CPU-IMS-1. System trouble conditions are annunciated similarly.
7.2 Discuss in detail manual fire suppression capability including CO_2 extinguisher's sufficiency to suppress a postulated RCP oil mist fire in FA 1-1. Include a description of the floor elevation relative to the postulated fire location.	Manual fire suppression equipment for Containment consists of a 100 lb wheeled CO2 unit on each floor of Containment, (3) CO2 and 1 dry chemical extinguishers at the personnel entrance to Containment (elevation 291'-10"), and a dry standpipe system with 2 hose stations on the top elevation (291'-10") and 3 hose stations on the level below (elevation 262'-10"). Hoses are not normally connected to the hose valve. A fire brigade equipment locker is provided outside of the personnel entrance to Containment. The locker contains 200 feet of 1-1/2" hose, one – 5 gallon can of foam, one foam eductor, two spanner wrenches, one – 1-1/2 inch nozzle, and two spare 1-1/2" hose coupling washers. The CO2 extinguishers and the dry chemical extinguisher are rated for a Class B fire (flammable and combustible liquids). The initial fire fighting attack can be made using either a CO2 or dry chemical extinguisher, followed by hose if needed. If required to extinguish the oil fire, foam can be used.
7.3 Discuss alternatives to CO_2 fire suppression capability.	As stated above, fire hose can be used if CO2 is ineffective or does not completely extinguish the fire. In addition, foam is available and can be applied if determined necessary by the fire brigade.

NRC Question	Dominion response
Background RAI 8: Dominion's letter dated May 13, 2010, states, "To reduce oil misting, which is common in Reactor Coolant Pump (RCP) motor designs, resetting of the labyrinth seal would be required each refueling cycle. Currently, industry standards for Westinghouse RCPs are taken from Technical Bulletin (TB)-04-5 'Westinghouse RCP Motor Recommended 1-Year, 5-Year, and 10-Year Inspection and Maintenance'."	
8.1 Discuss the actions NA has taken with regard to manufacturers recommendations and to recommendations from the Electrical Power Research Institute (EPRI) to eliminate or significantly reduce misting.	Provide in supplemental response.
Discuss RCP maintenance schedule with respect to the 1, 5 and 10 year manufacturers recommended maintenance. Specifically address such items as Flywheel Seal Upgrade, Top Oil Pot Cover Modification, Truncated Flow Chamber Modification, Viscosity Pump Upgrade and other manufacturer recommendations for maintenance items to reduce oil leaks and misting issues for each RCP. If the maintenance schedule is different from the manufacturers' recommended schedule, explain the differences and any impact on safe shutdown.	Provide in supplemental response.

NRC Question	Dominion response
Discuss post maintenance effectiveness of the modifications made and when the last time these RCPs have had these maintenance items performed on them, and controls in place to assure that 10 year manufactures recommended maintenance frequencies are not exceeded.	Provide in supplemental response.
Compare differences in maintenance schedules and leakage rates between RCPs A, B, and C.	Provide in supplemental response.
Discuss RCP oil spray sources such as from insufficient baffling of vents from upper oil enclosure for the lift pump, and unsealed penetrations for passage of conduit and actions NA is taking to address these apparent design issues.	Provide in supplemental response.
Background RAI 9: Dominion's letter dated April 23, 2010, discusses oil "sheen" on components.	
9.1 Discuss the effects on the efficiency of the coolers when coated with a sheen of oil.	As discussed within the exemption request, the pulling of oil vapor from the lower oil pot into the air flow path is a known condition for this motor design. There have been no indications of negative impacts on cooler performance as a result of this condition.

NRC Question	Dominion response
9.2 If the oil collection reservoir is on the bottom of the cooler, discuss the impact of the reservoir on the ventilation flowpath through the cooler.	The addition of an oil collection trough on the outlet of each stator cooler has no impact on the ventilation flowpath through the cooler. The collection trough is located approximately 3/32 to 1/8 inch below the outlet of the stator cooler. As a result, the trough does not interfere with the flow of air across the cooler.

List 1 (RAI 4.1)

List 1 - Typical electrical equipment located in reactor coolant pump cubicles

Mark #	Description	Voltage	Current	Power	Remarks
Unit 1 containment A cubicle, Elev. 241, drawing 11715-FE-46G (see sketch #3)					
1-RH-MOV-1700	RHR Inlet to Loop A hot leg	480V 3Φ	-	1.67 HP	Breaker locked OFF (re: 1-OP-26A)
1-CH-SOV-1460A	Letdown AOV inst. air SOV ASCO HT-831654	125VDC	0.08	10.5 watt	Normally energized
1-CH-SOV-1460B	Letdown AOV inst. air SOV ASCO HT-831654	125VDC	0.08	10.5 watt	Normally energized
1-SS-SOV-108A	SS AOV. inst. air SOV ASCO 8320-172	120VAC	0.08	10.1 watt	Normally energized
1-RC-SOV-1556A	RC Loop fill inst. air SOV ASCO 8316	125VDC	-	10.6 watt	Normally deenergized
1-RC-SOV-1557A	RC Loop drain inst. air SOV ASCO 8316	125VDC	-	10.6 watt	Normally deenergized
1-EP-CB-800A	Heat Trace breaker panel (abandoned)	-	-	-	Power supply cable disconnected at MCC
RECP-25	Welding outlet	480V 3Φ	-	-	Connected to 30 amp breaker @ MCC 1A1-1
Unit 1 containment A cubicle, Elev. 262, drawing 11715-FE-46D (see sketch #4)					
1-RC-MOV-1590	RC Hot Leg Isolation Valve	480V 3Φ	-	16.5 HP	Breaker locked OFF (re: 1-OP-26A)
1-RC-MOV-1591	RC Cold Leg Isolation Valve	480V 3Φ	-	16.5 HP	Breaker locked OFF (re: 1-OP-26A)
1-RC-MOV-1585	RC 8" bypass Isolation Valve	480V 3Φ	-	0.67 HP	Breaker locked OFF (re: 1-OP-26A)
1-HV-F-37A	CRDM Cooling Fan	480V 3Φ	90	75 HP	Only one fan normally running at a time. Located at Elev. 279
1-HV-F-37D	CRDM Cooling Fan	480V 3Φ	90	75 HP	Only one fan normally running at a time. Located at Elev. 279
1-RC-P-1A1	RCP 1A Oil Lift Pump	480V 3Φ	-	10 HP	Normally deenergized
Unit 1 containment A cubicle, Elev. 291, drawing 11715-FE-46b (see sketch #5)					
1-HV-F-92A	Dome Air Recirculation Cooling Fan	480V 3Φ	18	15 HP	Normally ON, Located at Elev. 291'