10 CFR 50.90

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

December 17, 2007

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No. 07-0803
NL&OS/ETS R0
Docket Nos. 50-338/339
License Nos. NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION)
NORTH ANNA POWER STATION UNITS 1 AND 2
PROPOSED LICENSE AMENDMENT REQUEST
ONE-TIME RISK-INFORMED EXTENSION TO THE COMPLETION TIME
FOR EDG FUEL OIL STORAGE TANK RECOATING

Pursuant to 10 CFR 50.90, Dominion requests amendments, in the form of changes to the Technical Specifications to Facility Operating License Numbers NPF-4 and NPF-7 for North Anna Power Station Units 1 and 2. The proposed change will permit a one-time extended 14-day completion time for each of the two underground diesel fuel oil storage tanks to permit removal of the current coating and recoating of the tanks in preparation for use of ultra-low sulfur diesel (ULSD) fuel oil.

Attachment 1 provides an evaluation of the proposed change. Attachment 2 provides the risk assessment for the proposed extended completion times. The marked-up and proposed Technical Specifications pages are provided in Attachments 3 and 4, respectively. The associated Bases changes are provided in Attachment 5 for information.

The proposed changes have been reviewed by the Facility Safety Review Committee.

To permit effective planning, Dominion requests approval of the proposed Technical Specification changes by June 30, 2009. Upon issuance, the amendment will be implemented within 30 days.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the appropriate designated officials of Virginia.

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

Very truly yours,

William R. Matthews
Senior Vice President – Nuclear Operations

Attachments

1. Evaluation of Proposed License Amendment
2. Probabilistic Risk Assessment
3. Marked-up Technical Specifications Page
4. Proposed Technical Specifications Page
5. Associated Bases Changes

Commitments made in this letter: None.

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by William R. Matthews, who is Senior Vice President – Nuclear Operations, of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 17th day of DECEMBER, 2007.

My Commission Expires: August 31, 2008.

(SEAL)

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Attachment 1

Evaluation of Proposed License Amendment

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

EVALUATION OF PROPOSED LICENSE AMENDMENT

1.0 INTRODUCTION

Pursuant to 10 CFR 50.90, Virginia Electric and Power Company (Dominion) requests a one-time change to Technical Specification 3.8.3, Diesel Fuel Oil and Starting Air, Condition A, to extend the Completion Time (CT) for a diesel fuel oil storage tank taken out of service for planned inspections and repairs. The proposed change will permit a one-time extended 14-day Completion Time for each of the two underground diesel fuel oil storage tanks to permit removal of the current coating and recoating of the tanks in preparation for use of ultra-low sulfur diesel (ULSD) fuel oil.

The proposed change has been reviewed and it has been determined that the change qualifies for categorical exclusion from an environmental assessment as set forth in 10 CFR 51.22(c)(9). Therefore, no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed change.

2.0 PROPOSED CHANGE

The current Completion Time for planned inspecting and repairing a fuel oil storage tank is 7 days. A note will be included in the Completion Time column for TS 3.8.3 Condition A that permits a one-time 14 day Completion Time for each fuel oil storage tank as follows:

---NOTE---

The Completion Time for cleaning and recoating each fuel oil storage tank in preparation for use of ultra-low sulfur diesel fuel oil is 14 days, to be used once per tank.

The associated Bases will be revised to address the extended Completion Time and include the associated Tier 2 restrictions. The Bases changes are provided for information.

3.0 BACKGROUND

3.1 System Description

Each Emergency Diesel Generator (EDG) engine has an independent 1000-gallon storage day tank with a capacity for at least one hour of full-load operation when filled to the minimum allowed capacity. These storage tanks are located inside seismic category I, missile-protected cubicles. These tanks are filled by pumping through two buried fuel oil lines from two underground fuel-oil storage tanks of 50,000-gallon capacity each. The fuel lines and the underground fuel-oil storage tanks are of seismic

category I design and are missile protected. The two underground tanks contain sufficient oil for 7 days continuous operation at full load for two diesel generators. They are fed by gravity from an above ground main fuel-oil storage tank of 5000-barrel (210,000-gallon) capacity. They could also be fed by gravity from the emergency, seismic category I, tornado, missile, and flood-protected truck fill line connections, in the event that the non-seismic above ground tank is not available.

Four sets of fuel oil pumps are provided, with each set consisting of two redundant pumps, one called the ready pump and the other the standby pump. Each pump in a set takes suction from a different underground storage tank and has separate suction and discharge lines from the underground tank to the appropriate diesel generator day tank. Each set of pumps is powered from the emergency bus associated with the diesel to which the pumps supply fuel oil. The pumps are of seismic category I design.

The ready and standby fuel oil pumps are installed in an above ground seismic category I structure designed to protect the pumping facilities from tornado missiles. Separate spaces, divided by a 3-hour fire wall, are provided for the ready fuel oil pumps and the standby fuel-oil pumps. The piping associated with one pump is in one space and does not enter any other space. This physical separation satisfies the single-failure criterion. Each space is provided with an independent, automatic, non-electric carbon dioxide total flooding system as well as an ionization type smoke detection system.

Should additional fuel oil be required over the amount stored in the tanks, sufficient quantities are available from an offsite supplier. Each underground fuel oil tank is equipped with an oil/water interface detector, which alarms in the main control room if a significant amount of water should be in the tank. In addition, moisture sensors, which alarm in the main control room, are provided in the discharge line from each underground fuel oil storage tank to detect the presence of water in the fuel oil and enable the operator to take the appropriate action to ensure a supply of fuel to the diesel generators.

In the event that the 5000 barrel above ground fuel oil tank and one underground fuel oil tank are not available, the remaining underground tank can keep two diesels running for approximately 4.5 days. During this period, fuel oil delivery trucks will be scheduled to provide fuel as required. Trucks will be able to supply oil as follows:

1. The underground tanks can be filled from a truck through the seismic class I fill line connections.

2. Each 1000-gallon day tank can be filled through existing connections.

3.2 Need for Extended Completion Time

In January 2001 and in June 2004, the U.S. Environmental Protection Agency (EPA) finalized the Clean Diesel Trucks and Buses Rule and the Clean Non-road Diesel Rule, respectively, with more stringent standards for new diesel engines and fuels. The EPA rules require a reduction in the sulfur content of highway diesel fuel from its current level of 500 parts per million (ppm) low sulfur diesel (LSD) to 15 ppm ultra low sulfur diesel (ULSD). The EPA requires sulfur reductions for land based non-road diesel fuel to be accomplished in two steps, with an interim step from currently uncontrolled levels to a 500 ppm cap starting in June 2007 and the final step to 15 ppm in June 2010.

There are several diesel fuel properties other than sulfur concentration that change as a result of moving to ULSD that may adversely affect the engine performance including: energy content, fuel particulate build-up increases, fuel system seal leaks, compatibility with lubricating oil, microbial growth, incompatible metals, etc.

The current fuel oil storage tanks' coating (Carbo Zinc II) contains materials that are incompatible with the ULSD fuel oil. Specifically, Zinc is incompatible with ULSD because it is an oxidative catalyst that will accelerate the formation of sediments, gels, and soaps (American Society for Testing and Materials (ASTM) D975, Appendix X2.7.2). Although the incompatibility has been identified, Dominion is planning to test the existing fuel oil storage tank coating to evaluate the current coating's performance with ULSD fuel oil. If the coating performs as expected in the ULSD environment, the current fuel oil storage tank coating will have to be removed and the tanks recoated prior to using the ULSD fuel oil.

Since both fuel oil storage tanks are the source of fuel oil for both units' EDGs, a dual-unit outage would be required in order to provide the necessary time to complete the required maintenance activity to remove, repair as necessary, and recoat the fuel oil storage tanks. It is estimated that the required draining, inspecting/cleaning, and re-filling an underground fuel oil storage tank will take 7 to 10 days. The requested 14 day Completion Time provides margin should the evolution take longer than expected and eliminates the burden of a dual unit outage to accomplish the required inspections.

3.3 Basis for Change

Stored diesel fuel oil is required to have sufficient supply for 7 days of full load operation for two EDGs. This requirement, in conjunction with an ability to obtain replacement supplies within 2 days, supports the availability of EDGs required to shut down the reactor and to maintain it in a safe condition for an anticipated operational occurrence (AOO) or a postulated DBA with loss of offsite power.

The DBA and transient analyses assume the operation of one EDG associated with the unit on which an accident is postulated to occur and the operation of one EDG on the

unit which is unaffected by the accident to support shared systems. LCO 3.8.1 requires two EDGs to be operable and one EDG from the other unit to be operable. However, only sufficient fuel oil to operate one EDG on each unit is required to satisfy the assumptions of the DBA and transient analysis and to support EDG operability.

Consistent with the current Required Actions and Completion Time for inspection and repair of the fuel oil storage tank (TS 3.8.3, Condition A), the same actions will be met to ensure an adequate supply of fuel oil is available to meet the EDG mission time for a DBA for the extended Completion Time. Prior to and during the entry into Condition A for planned maintenance on the fuel oil storage tanks, the following actions (currently required by TS) are taken to ensure adequate fuel oil is available to ensure the EDG mission times can be satisfied:

- Verify 50,000 gallons of replacement fuel oil is available offsite and transportation is available to deliver that volume of fuel oil within 48 hours.
- Restrictions are placed on the remaining underground fuel oil storage tank (>45,000 gallons) and the 210,000-gallon above ground tank (≥100,000 gallons).
- In this Condition, verification of the redundant fuel oil tank is required to confirm the required minimum amount of diesel fuel oil. In addition, the above ground tank, used to supply make up to the underground tanks, is required to be verified to be at or above the minimum level. Verifications of onsite fuel oil are required on a 12 hour frequency to ensure an adequate source of fuel oil to the EDGs remains available.

4.0 TECHNICAL ANALYSIS

4.1 Plant Specific Risk Assessment for the One-Time Extended Fuel Oil Storage Tank Completion Times

Method of Analysis

A three-tiered approach was used to evaluate the risk associated with the extended Completion Time for each fuel oil storage tank. The tiers evaluated the risk impact of a single fuel oil storage tank (Tier 1), the risk impact of concurrent equipment availability (Tier 2), and the availability of a Configuration Risk Management Program (Tier 3).

Tier 1, Method of Tier 1 Analysis

The Tier 1 analysis was completed consistent with RG 1.174 and RG 1.177 and included Internal Event and Flooding, Common Cause Issues, Fire, Seismic, and Tornado Analyses.

Tier 2, Avoidance of Risk Significant Plant Configurations

The incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP) limits of RG 1.177 were used as the criteria to identify potentially risk significant configurations. The results of the analysis identified several components that should not be scheduled for planned maintenance during the one-time extended Completion Time. The systems/components include: Reserve Station Service Transformers, Transfer Buses, switchyard transformers, isolation breakers, EDGs, Charging Pumps, and Emergency Switchgear Air Handlers. The specific components or combination of components are identified in Attachment 2.

Tier 3, Risk- Informed Plant Configuration Control Management

The North Anna (a)(4) program performs full PRA analyses of all planned maintenance configurations in advance. Configurations that approach or exceed the NUMARC 93-01 risk limits [1E-6 for core damage probability (CDP)] are avoided or addressed by compensatory measures.

Conclusion

Based on the three tiered approach, the following conclusions were made regarding the plant risk associated with a one-time extension of the Completion Time for planned inspection and repair of the diesel fuel oil storage tanks:

- RG 1.174 provides guidance for determining the risk impact of plant-specific changes to the licensing basis. RG 1.174 defines very small changes in risk as resulting in increases of core damage frequency (CDF) below 10E-6/yr and increases in large early release frequency (LERF) below 10E-7/yr. The average annual CDF and LERF impacts for the two 14-day Completion times are 5.6E-8/yr and 8.4E-10/yr, which are defined as "very small" by RG 1.174.

- RG 1.177 provides the guidance for determining the risk impact of plant-specific changes to the licensing basis. The incremental conditional core damage and incremental large early release probabilities are within the acceptance criteria. The ICCDP and ICLERP impact for each 14-day Completion time is 2.8E-8 and 4.2E-10, which are defined as "small" by RG 1.177.

The risk assessment for the extended Completion Times for the cleaning and recoating of the fuel oil storage tanks is included as Attachment 2.

4.2 Defense-in-Depth Assessment

The proposed extended Completion Time for the fuel oil storage tank maintains the system redundancy, independence, and diversity commensurate with the expected challenges to system operation. There are no proposed changes to the design or operation of the affected systems. The Work Management Program, Maintenance Rule (a)(4) Program and Corrective Action Program provide additional controls and assessments to preclude the possibility of simultaneous outages of redundant trains and ensure system reliability. The proposed extended Completion Time will not alter the assumptions relative to the causes or mitigation of an accident. The risk impacts of the changes are also consistent with the acceptance criteria in RG 1.174 and RG 1.177. Therefore, there are no defense-in-depth impacts from the proposed change. The defense-in-depth philosophy is maintained since:

- A reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation.

  The proposed extended one-time Completion Time maintains the balance between prevention and mitigation. An extension of the existing Completion Time does not increase the likelihood of any accident, nor create the probability of any new accident. Mitigation capability is maintained because an adequate supply of fuel oil is required to be available prior to and during the planned inspection and repair activities. The proposed Completion Time extension is a minor adjustment below the level of risk significance, as demonstrated by compliance with the numerical RG 1.174/1.177 risk limits.

- Over reliance on programmatic activities to compensate for weaknesses in plant design associated with the affected systems.

  North Anna was designed with significant and appropriate layers of defense-in-depth. This is demonstrated in the low overall plant risk (nominal CDF approximately 5E-6/yr) and the scarcity of highly risk-significant components. While programmatic protection plays an important role in maintaining low plant risk, North Anna does not rely excessively upon any program for protection. In the case of the diesel fuel oil storage, planned programmatic protection is currently included in the design and operation of the fuel oil storage system. The historical maintenance unavailability of the EDG and associated fuel oil storage tanks has been below the Maintenance Rule performance criteria set for this system.

- System redundancy, independence, and diversity are preserved commensurate with the expected frequency, consequences of challenges to the systems, and uncertainties (e.g., no risk outliers).

Technical Specifications already limit the outages of redundant trains of safety-related equipment. In addition, the Dominion 10 CFR 50.65(a)(4) compliance program quantitatively evaluates all maintenance configurations to ensure that risk is adequately managed. This evaluation addresses redundant trains and all risk significant dependencies. Historically, the North Anna units have been shown to consistently operate below the NUMARC 93-01 risk levels where compensatory measures are required. Consistent with the Tier 2 evaluation, several electrical distribution system components will not be scheduled for maintenance during the extended one-time Completion Times.

- Defenses against potential common cause failures (CCF) are maintained and the potential for the introduction of new common cause failure mechanisms is assessed.

  No new CCF vulnerabilities are expected. These proposed TS changes have been requested to reduce the potential number of plant transients (i.e., shutdowns and restarts) when maintenance requires more than seven days. The changes will allow the plant staff to continue to operate at a steady state 100% while maintenance is being completed.

- The independence of fission product barriers is not affected.

  No physical barriers will be degraded by the proposed TS change. The EDGs will remain operable with an adequate supply of fuel oil to provide emergency power to the emergency core cooling system (ECCS) and containment cooling systems during a DBA.

- Defenses against human errors are preserved.

  The operator actions associated with the extended one-time Completion Times are no different than what is required for the existing 7-day Completion Time. No additional compensatory actions have been identified as necessary. However, consistent with the Tier 2 evaluation, electrical system distribution components and station equipment or combinations of equipment (e.g., Reserve Station Service Transformers, Transfer Buses, switchyard transformers, isolation breakers, EDGs, Emergency Switchgear Room Fans, and Charging Pumps) will not be scheduled for maintenance during each of the extended one-time Completion Times. This will afford ensure maximum electrical distribution system availability. The risk analyses have shown that the RG 1.174 and 1.177 limits are satisfied without the use of any compensatory measures, even if actual unavailability increases in proportion to the proposed Completion Time extension. Specific plant equipment will not be made inoperable during the extended Completion Times to maintain maximum electrical distribution system availability.

- The intent of the General Design Criteria in Appendix A to 10 CFR Part 50 is maintained.

  The intent of the General Design Criteria is fully satisfied by the existing Technical Specifications Completion Times. The proposed extensions are only slight perturbations of the risk associated with these Completion Times, offset by the reduction in shutdown/restart transient risk, and therefore do not affect compliance with Appendix A.

4.3 Safety Margin Assessment

The overall margin of safety is not decreased due to the increased one-time Completion Times for inoperable fuel oil storage tank since the fuel oil storage and supply system design and operation are not altered by the proposed increase in completion time. The risk impacts of the changes are also consistent with the acceptance criteria in RG 1.174 and RG 1.177.

For the proposed increased Completion Time, the following safety margin attributes from RG 1.174 were reviewed to ensure no change in safety margin:

- Codes and standards or their alternatives approved for use by the NRC are met.

  Codes and standards (i.e., American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronic Engineers (IEEE) or alternatives approved for use by the NRC are met. North Anna will continue to meet the appropriate codes and standards during the extended Completion Time for the fuel oil storage tanks.

- Safety analysis acceptance criteria in the licensing basis (e.g., FSAR, supporting analyses) are met. The change does not affect the safety analysis or supporting analysis. As discussed above, sufficient fuel oil will be available to ensure that the required EDGs can perform their intended safety function for the duration of their mission time.

- The proposed change does not involve a change to the methods used to respond to plant transients. There is no alteration to the parameters within which the plant is normally operated or in the setpoints, which initiate protective or mitigating actions. With the proposed one-time extended Completion Times, the risk impact of the proposed TS change is small and within industry acceptance guidelines provided in RG 1.177.

4.4 Summary

This risk evaluation supports a one-time 14-day Completion Time for each underground fuel oil storage tank. The increase in annual Core Damage and Large Early Release Frequencies associated with the proposed change in the Technical Specification

completion times are characterized as "very small changes" by Regulatory Guide 1.174. The incremental conditional core damage and large, early release probabilities associated with the proposed Technical Specification allowed outage time are within the acceptance criteria in Regulatory Guide 1.177.

5.0 EVALUATION OF SIGNIFICANT HAZARDS CONSIDERATION

The proposed revision to Technical Specifications (TS) permits a one-time extension of the Completion Time for planned inspection and repair of each Emergency Diesel Generator (EDG) fuel oil storage tank. In accordance with the requirements of 10 CFR 50.92, the enclosed application is judged to involve no significant hazards based upon the following information:

1. Does the proposed license amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   The proposed extension of the Completion Time for the EDG fuel oil storage tanks does not increase the probability of an accident previously evaluated since extension of the Completion Time does not physically modify the plant in a manner that could alter the probability of accident occurrence nor, is an activity or modification by itself that could lead to equipment failure or accident initiation. TS currently permit this planned inspection and repair activity and provide the appropriate actions to ensure an adequate supply of fuel oil is available during the planned maintenance activity. Therefore, the probability of an accident previously evaluated is not affected by the extended Completion Time.

   The proposed extension of the Completion Time for the planned maintenance activities on the fuel oil storage tanks does not result in a significant increase in the consequences of an accident since adequate fuel oil remains available to permit EDG operation during a DBA.

2. Does the proposed license amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   The proposed revision to North Anna TS permits one-time extension of the current 7-day Completion Time to 14-day for each fuel oil storage tank for planned maintenance activities. This proposed extension does not create the possibility of a new or different type of accident since there are no physical changes being made to the plant and there are no changes to the operation of the plant that could introduce a new failure. The existing TS actions ensure an adequate supply of fuel oil is available prior to the maintenance to support EDG operation during a design basis accident (DBA).

3. Does the proposed amendment involve a significant reduction in a margin of safety?

   The proposed revision to North Anna Technical Specifications, which only permits a one-time extension to the current 7-day Completion Time for an inoperable fuel oil storage tank to 14 days, will not significantly reduce the margin of safety. RG 1.174 provides guidance for determining the risk impact of plant-specific changes to the licensing basis. The average annual increase in core damage frequency (CDF) and large early release frequency (LERF) resulting from the extended Completion Times for planned maintenance activities on the fuel oil storage tanks is 5.6E-8/yr and 8.4E-10/yr, respectively. RG 1.174 states that when the calculated increase in CDF and LERF is below 1E-5/yr and 1E-6/yr, respectively, applications will be considered when the total CDF and LERF are less than 1E-4/yr and 1E-5/yr, respectively. Since the total CDF and LERF for the proposed extended Completion Times meet these criteria for a permanent plant change, the change is considered small and not a significant reduction in margin. The one-time extension for planned maintenance activities on each fuel oil storage tank is, therefore, considered non-risk significant and will not significantly reduce the margin of safety.

6.0 IMPLEMENTATION OF THE PROPOSED CHANGE

This amendment request meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) as follows:

(i) The amendment involves no significant hazards consideration.

As described in Section 6.0 of this evaluation, the proposed change involves no significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite. The proposed change does not involve the installation of any new equipment, or the modification of any equipment that may affect the types or amounts of effluents that may be released offsite. Therefore, there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

(iii) There is no significant increase in individual or cumulative occupation radiation exposure.

The proposed change does not involve plant physical changes, or introduce any new mode of plant operation that would increase occupational radiation exposure. Therefore, there is no significant increase in individual or cumulative occupational radiation exposure.

Based on the above, Dominion concludes that the proposed changes meet the criteria specified in 10 CFR 51.22 for a categorical exclusion from the requirements of 10 CFR 51.22 relative to requiring a specific environmental assessment by the Commission.

7.0 CONCLUSION

The proposed one-time change will not alter assumptions relative to the mitigation of an accident or transient event and will not adversely affect normal plant operation and testing. The proposed change is consistent with the current safety analysis assumptions and with the Technical Specifications. Based upon the above, no question of safety exists.

RG 1.174 provides guidance for determining the risk impact of plant-specific changes to the licensing basis. When a plant's baseline CDF and LERF are below 1E-4/yr and 1E-5/yr, respectively, a proposed licensing change will be considered if the associated risk increase is less than 1E-5/yr (CDF) and 1E-6/yr (LERF). The proposed one-time extension to the Completion Time will result in an average annual increase of 5.6E-8/yr (CDF) and 8.4E-10/yr (LERF) and meets these criteria. The one-time extension for planned maintenance activities on each fuel oil storage tank is, therefore, considered non-risk significant and will not significantly reduce the margin of safety.

The Facility Safety Review Committee (FSRC) has reviewed this proposed change to the Technical Specifications and has concluded that it does not involve a significant hazards consideration and will not endanger the health and safety of the public.

8.0 REFERENCES

1. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment In Risk Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated July 1998.

2. IN 2006-22, "New Ultra-Low-Sulfur Diesel Fuel Oil Could Adversely Impact Diesel Engine performance," dated October 12, 2006.

3. North Anna Power Station Probabilistic Risk Assessment Notebook, "PRA Input to the EDG Underground Fuel Oil Storage Tank One-Time 14-Day AOT Technical Specification Change" Revision 2, dated November 2007.

Attachment 2

Probabilistic Risk Assessment
Five Year Type Extension for North Anna Unit 2

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

North Anna Power Station
Probabilistic Risk Assessment Notebook

Part V PRA Risk Analysis

Volume RA.LI.6

PRA Input to the EDG Underground Fuel Oil Storage Tank One-Time 14-day AOT Technical Specification Change

Revision No. 2
Effective Date: November, 2007

Purpose:
To utilize the North Anna Probabilistic Risk Assessment (PRA) to evaluate the impact on *Core Damage Frequency* (CDF) and *Large, Early Release Frequency* (LERF) for a proposed Technical Specifications Change Request. Using risk measures prescribed in Reg. Guides 1.174 and 1.177, this analysis evaluates the risk of the Emergency Diesel Generator Underground Fuel Oil Storage Tanks being out of service for a one-time fourteen day period each, to allow conversion to ultra-low sulfur fuel.

Conclusion:
The increase in risk associated with an Emergency Diesel Generator (EDG) underground fuel oil storage tank Technical Specification (TS) one time allowed outage of fourteen days each is acceptable based on Reg. Guides 1.174 and 1.177 standards.

Prepared By:	**Signature**	**Date**
Reviewed By:	**Signature**	**Date**
Approved By:	**Signature**	**Date**

Table of Contents

SUMMARY OF CHANGES

Revision	Author	Summary
0	[redacted]	Initial issuance.
1	[redacted]	Editorial revision
2	[redacted]	Calculation revised to reflect AOT time of fourteen days

1.0 PURPOSE

This PRA notebook documents the required analyses to support a proposed *Technical Specifications Change Request* (TSCR) for the North Anna Power Station (NAPS). NAPS Licensing has requested PRA support to justify a one-time 14-day Allowed Outage Time (AOT) for each of the Underground Fuel Oil Storage Tanks (UGFOST) that provide makeup to the emergency diesel generator (EDG) day tanks. The AOT extension will be used to support conversion to ultra-low sulfur fuel.

The current North Anna PRA model N105a [NB 01] will be used to evaluate the impact on *Core Damage Frequency* (CDF) and *Large Early Release Frequency* (LERF) for the proposed Technical Specifications Change Request.

2.0 INTRODUCTION

The N105A model contains complete and updated logic for the risk assessment of internal events and flooding. External events, including fire, seismic and tornado risk, are included with an initiating event frequency and a conservative assumption of conditional core damage probability due to redundant underground tank failure.

This notebook documents the analyses necessary to meet the requirements of Regulatory Guides 1.174 [RG 01] and 1.177 [RG 02]. RG 1.174 evaluates an average annual increase in CDF/LERF risk due to a single *Allowed Outage Time* (AOT) entry of fourteen days for each underground tank. RG 1.177 evaluates the incremental conditional core damage and large early release probability (ICCDP/ICLERP) risk for a single one-time 14 day AOT.

As required by [RG 01] and [RG 02], a three-tiered approach has been developed to evaluate the risk associated with the proposed Technical Specifications *Allowed Outage Time* (AOT). These tiers evaluate the risk impact of a single fuel oil tank outage, the risk impact of other equipment unavailability concurrent with a single UGFOST outage, and the availability of a *Configuration Risk Management Program*. These requirements are addressed in detail in Sections 3.5, 3.6 and 3.7.

3.0 ANALYSIS

3.1 Inputs

The North Anna PRA internal events and flooding model N105a was developed in [NB 01]. Fire, seismic and tornado analysis have also been performed. The external event analyses are intended for use primarily in providing risk insights for the AOT extension, and reflect a greater degree of uncertainty (e.g., in scope of initiating events, values of initiating event frequencies and human error probabilities, etc.).

3.2 Assumptions

The PRA analysis was performed using the at-power North Anna PRA model, which includes internal flooding and external events. The fire and seismic analyses have made use of the Independent Plant Examination-External Events (IPEEE) information. The proposed TSCR is being developed for an at-power tank lining replacement, eliminating the need for evaluation of other operating modes.

3.3 PRA Model Applicability and Quality

The latest N105a PRA model has been used to analyze the risk of the proposed TSCR. The N105a model, which evaluates internal events and flooding, was released in March, 2007. The PRA model is maintained and updated under the PRA configuration control program in accordance with Dominion procedures. Plant changes, including physical and procedural modifications as well as changes in performance data, are reviewed for applicability and the PRA is updated to reflect such changes on a regular schedule by qualified personnel, with independent reviews and approvals.

In order to verify and improve the quality of the North Anna PRA model, an independent review of the NAPS internal events at power was performed in 2001 by the Westinghouse Owner's Group (WOG). The peer review is documented in the Westinghouse PRA peer review report [REPORT 03]. All of the "A" and "B" Findings and Observations (F&O's) have either been resolved or found to have no impact upon the proposed Technical Specification (TS) change. Documentation of the resolution of the B-significance F&Os is provided in PRA Notebook volume [NB 04].

The North Anna PRA model has already been used to support an increase in the Allowed Outage Time for the Emergency Diesel Generators from three days to 14 days (TSCR #318b). Changes Made to the PRA for Use in the TS Change Evaluation

No changes or modifications to the North Anna N105A PRA model were required for it to be used for this application.

3.4 Method of Tier 1 Analysis

Regulatory Guide 1.174 [RG 01] and Regulatory Guide 1.177 [RG 02] are the applicable regulatory guides for preparation of the risk assessment.

Regulatory Guide 1.174, the "parent" regulatory guide of all risk-informed regulatory guides, provides guidance on developing a risk-informed licensing submittal. This document classifies potential increases in *Core Damage Frequency* (ΔCDF) and *Large, Early Release Frequency* (ΔLERF). For North Anna, the internal events baseline CDF is less than 1E-5 and the LERF is less than 1E-6/yr. If the ΔCDF is less than 1E-6 and ΔLERF is less than 1E-7/yr, then RG 1.174 characterizes a change as "very small."

Regulatory Guide 1.177, a "daughter" regulatory guide to Regulatory Guide 1.174, provides additional guidance specific to risk-informed Technical Specification changes. This Regulatory Guide provides guidance on the acceptable *Incremental Conditional Core Damage Probability* (ICCDP) and *Incremental Conditional Large, Early Release Probability* (ICLERP). These risk metrics are the result when a risk increase, defined as the frequency of core damage or large radionuclide release per year, are integrated over the time of the proposed Technical Specifications *Allowed Outage Time* (AOT). The thresholds for ICCDP and ICLERP in Regulatory Guide 1.177 are 5E-7 and 5E-8, respectively. Regulatory Guide 1.177 is applicable for a single AOT entry.

3.4.1 Internal Events and Flooding Analysis

This analysis uses the results of the average-maintenance N105a model as its base case. Additional analyses were performed with each tank out of service, one at a time, to determine which was the most limiting. The following results were obtained for the two underground tanks 1-EG-TK-2A & B:

Table 1
Internal Events and Flooding Results
Baseline and with one UGFOST Unavailable

Case	CDF	LERF
Baseline	5.366E-6/yr	8.193E-7/yr
1-EG-TK-2A out of service	5.909E-6/yr (18945 cutsets)	8.306E-7/yr
1-EG-TK-2B out of service	5.909E-6/yr (18953 cutsets)	8.306E-7/yr

As expected, there is no significant difference between the two tanks, to four digits of significant figures. The "B" tank generates more cutsets but the impact of the additional cutsets is negligibly small.

3.4.2 Common Cause Issues

The EDG fuel oil system model was reviewed for potential *common cause fault* (CCF) concerns. The model includes common cause failure terms for the EDG's, the fuel oil transfer pumps and the pump discharge check valves. However, there are no common cause terms for the tanks. This omission was deliberate, since any common cause effect for the tanks would already be modeled by the pump CCF (e.g., a plugging fault) or the diesel CCF (e.g., due to bad fuel). In addition, the methodology for calculating the CCF point estimate typically generates a term that is much smaller than the tank failure rate, which is already low at ~1E-5. The CCF point estimate would be even smaller and would therefore be negligible.

[REPORT 06] also addresses common cause events. For purposes of CCF analysis, it explicitly grouped (p. 3-8) the fuel oil storage tank effects with the EDG's. Therefore no CCF terms for the tanks were recommended.

3.4.3 Fire Analysis

1-EG-TK-2A and B are needed only in the mitigation of a Loss-of-Offsite-Power (LOOP) event that lasts more than several hours, i.e., long enough to exhaust the day tank reserves in each EDG room. If a potential fire does not cause a LOOP or causes a LOOP that is restored prior to day tank depletion, then the event will be unaffected by the unavailability of one of the underground storage tanks.

[REPORT 02] documented the original IPEEE fire analysis for North Anna. It screened out all but the following four areas as insignificant contributors to core damage risk.

Cable Vault & Tunnel (CVT). The limiting cutsets for the CVT fire scenarios typically included fire damage to one train of decay heat removal (auxiliary feedwater (AFW) and/or main feedwater (MFW)), accompanied by random failures of the opposite train. These scenarios do not include a LOOP event. The cables bringing offsite power from the transfer buses to the Emergency Switch Gear (ESGR) pass through the CVT, so that a CVT fire can pose a LOOP risk. Such a severe fire would probably also damage the cables to the affected equipment and render their power supplies irrelevant. Nevertheless, the CDF due to a CVT fire may be estimated as follows:

- CVT fire frequency = 3.49E-3/yr (IPEEE, p. 4-44)
- Failure rate for remaining underground fuel oil storage tank (UGFOST) = 1.148E-5 (1EGTNK-LU-EGTK2B, from the current NAPS model, using generic data for the tank failure rate)

The product of these terms is 4.01E-8/yr. This calculation assumes a "selective" fire that destroys the incoming cables with offsite power but not the bus output cables. In addition, no credit is taken for fire suppression or any recovery.

Emergency Switchgear (ESGR). An ESGR fire can affect equipment powered by the EDG's if a LOOP event is underway. However, a fire and a LOOP event are independent and may be screened out as concurrent events. However, an ESGR fire could damage the cables bringing in offsite power to the emergency buses. If the fire does not damage the lines carrying power to the emergency loads,

then the unavailability of one underground tank could conceivably have a risk impact. This scenario may be analyzed as follows.

If a "selective" ESGR fire destroys the supply from offsite power but leaves intact the cables bringing power from the EDG's to the emergency buses, and also the cables carrying power to the various loads, then an underground tank would be needed when the day tank is depleted a few hours after the fire. (Each EDG has its own dedicated day tank, with several hours of fuel; the two underground tanks provide makeup to all of the day tanks.) If one underground tank is out of service and the second underground tank fails, then the station will be in a blackout after just a few hours, without prospect for near-term power recovery.

The ESGR fire CDF for this AOT is conservatively estimated as follows:

- ESGR fire frequency = 1.27E-2/yr ([REPORT 02], p. 4-47).
- Failure rate for remaining UGFOST = 1.148E-5 (from current NAPS model)

The product of these terms is 1.46E-7/yr. This calculation assumes the fire selectively destroys the offsite power feeds but leaves the other key cables intact. The margin in this conservatism has not been quantified. Further, no credit is taken for fire suppression or any recovery.

Auxiliary Building (AB). An AB fire can neither cause a LOOP event nor impact its duration. It may be screened out as a negligible risk contributor during an outage of an UGFOST.

Main Control Room (MCR). A MCR fire can neither cause a LOOP event nor impact its duration. It may be screened out as a negligible risk contributor during an outage of an UGFOST.

Normal Switchgear Room (NSGR). NSGR fire risk was not quantified in [REPORT 02].

These calculations consider fire risk based upon the 24-hour mission time for PRA analyses, which provides a reasonable credit for recovery by operations and maintenance staff given the available time for recovery, with the single UGFOST available, is several days or more.

The combined fire risk may therefore be conservatively estimated as

$$CDF_{fire} = 1.46E\text{-}7/yr\ (ESGR) + 4.01E\text{-}8/yr\ (CVT) + 0\ (AB) + 0\ (MCR) = 1.86E\text{-}7/yr$$

The fire CDF will be shown to be a minor contributor in Section 4.0. Since an underground tank outage does not directly impact the potential for containment bypass, the fire LERF is not calculated because LERF impact is typically comparable to, or less limiting than, CDF impact. LERF is therefore also expected to be a minor contributor to the proposed AOT risk.

3.4.4 Seismic Analysis

The North Anna IPEEE did not perform seismic risk calculations. The North Anna IPEEE used a seismic margins evaluation based upon a *Review Level Earthquake* (RLE) with a peak ground acceleration of 0.3g [REPORT 03, p. 2-1]. The frequency of this event may be estimated from the EPRI Mean Seismic Hazard Curve for Surry.

The seismic CDF associated with an underground storage tank tagout may be estimated as follows. First, the seismic event is assumed to destroy the switchyard, resulting in a long-term loss of offsite power. After a few hours, the day tanks are depleted and require makeup from the in-service underground tank. If it fails, then the units are assumed to go directly to core damage. The underground tanks were walked down and evaluated during the IPEEE, but their HCLPF (*high confidence in low probability of failure*) thresholds were greater than 0.3 g. Therefore they may be expected to survive a 0.3 g seismic event. The frequency of this sequence is

- Seismic event frequency = 4.9E-5/yr ([REPORT 04], p. A-10, *mean* value at 0.3 g = 300 cm/sec^2).
- Failure rate for remaining UGFOST = 1.148E-5 (from current NAPS model)

1.

The product of these terms is 5.6E-10/yr. This contribution is negligibly small relative to the other contributors and may be screened out. Also, the additional margin shown in this analysis is sufficient to compensate for the uncertainty inherent in the use of the Surry seismic event information. For the same reason, no seismic LERF calculations have been performed in support of this proposed TS change.

3.4.5 Tornado Analysis

A tornado strike is likely to produce a long-term LOOP that is not readily recovered, due to potential severe damage in the switchyard; therefore the underground tanks would probably be needed. With one underground tank unavailable for maintenance, the station would go into a blackout if a tornado strikes and the only available underground tank is lost. In that case, a bounding CDF calculation may be performed as follows:

- Tornado frequency = 1.9E-4/yr (IPEEE, p. 5-8). This number is the calculated annual frequency of tornado strikes on site at North Anna.
- Failure rate for remaining UGFOST = 1.148E-5 (from current NAPS model)

The product of these terms is 2.2E-9/yr, which is two orders of magnitude smaller than the internal events contribution and may be neglected. This assessment takes no credit for any long-term power recovery or alternate sources for fuel oil.

3.5 RG 1.177 Tier 2: Avoidance of Risk Significant Plant Configurations

In order to avoid risk significant plant equipment outage configurations during the extended allowed outage time of an underground tank, the impact of having other equipment unavailable was evaluated. The ICCDP and ICLERP limits in RG 1.177 are used as the criteria to identify potentially risk significant configurations. Consistent with the guidance in RG 1.177, the results of this initial bounding calculation were reviewed to identify the risk contributions of out-of-service equipment events to define operational restrictions for protecting such equipment during the proposed AOT configuration.

Where a planned configuration permitted by the TS for continued power operation could occur, the configuration was evaluated to determine what outages of other single system trains concurrent with an underground fuel oil tank would potentially exceed the ICCDP and ICLERP limits in RG 1.177 (5E-7 and 5E-8, respectively). Since the assessment only considered a single system train out of service concurrent with an underground tank, combinations of multiple system trains out of service concurrent with a tank were not evaluated and, therefore, will not be planned.

3.6 Tier 3 Risk-Informed Plant Configuration Control and Management

Dominion's 10 CFR 50.65(a)(4) program fully satisfies the requirements of Regulatory Guide 1.177 Tier 3. RG 1.177 Section 2.3 states that "The licensee should develop a program that ensures that the risk impact of out-of-service equipment is appropriately evaluated prior to performing any maintenance activity. A viable program would be one that is able to uncover risk-significant plant equipment outage configurations in a timely manner during normal plant operation."

The Dominion (a)(4) program performs full PRA analyses of all planned maintenance configurations in advance. Configurations that approach or exceed the NUMARC 93-01 risk limits (1.0E-6 for CDP) are avoided or addressed by compensatory measures. Historically, North Anna rarely approaches these limits. Emergent configurations are identified and analyzed by the on-shift staff for prompt determination of whether risk management actions are needed. The configuration analysis and risk management processes are fully proceduralized in compliance with the requirements of (a)(4).

North Anna's 10 CFR 50.65(a)(4) compliance program requires analysis and management of all configuration risks. The diesel fuel oil system is included in the (a)(4) scope and any component unavailability is monitored, analyzed and managed. When a configuration approaches the (a)(4) risk limits, plant procedures direct the implementation of risk management actions in compliance with the regulation. If the configuration is planned, these steps are taken in advance.

Individually, a single underground fuel oil storage tank (UGFOST) outage does not approach the required risk management thresholds of the (a)(4) regulation. While combinations of unavailable equipment and/or evolutions, including an UGFOST outage, may approach the limits and even require risk management actions, the risks arising from these configurations will be dominated by factors other than the fuel oil tank. As a result, the risk significance of the UGFOST does not warrant limitations upon other equipment.

Regulatory Guide 1.177 also refers to the Tier 3 program as a *Configuration Risk Management Program.*

4.0 RESULTS

4.1 Summary of the Risk Measures (RG 1.174 & 1.177 Tier 1)

The baseline *Core Damage Frequency* (CDF) and *Large Early Release Frequency* (LERF), from the N105A internal events and flooding, average-maintenance model, are CDF = 5.366E-6/year and LERF = 8.193E-7/year.

The North Anna N105a model includes both internal events and flooding. The fire and seismic risks have been analyzed as well. The tornado CDF was quantified at 2.2E-9/yr and is negligible. These tables provide the combined CDF's and LERF's in detail.

Table 2
CDF and LERF Summary for Tier 1 Analysis

	CDF (yr^{-1})				LERF (yr^{-1})			
	Internal Events & flooding	**Fire**	**Seismic**	**Total**	**Internal Events & flooding**	**Fire**	**Seismic**	**Total**
Baseline	5.366E-6	0	0	5.366E-6	8.193E-7	0	0	8.193E-7
One UGFOST out of service	5.909E-6	1.86E-7	0	6.095E-6	8.306E-7	0	0	8.306E-7

Table 3
Results of Tier 1 Analyses

	Core Damage Risk	**Large Early Release Risk**
Baseline Risk	CDF = 5.37E-6/yr	LERF = 8.19E-7/yr
Risk with one tank OOS	CDF = 6.10E-6/yr	8.31E-7/yr
Risk increase	ΔCDF = 7.3E-7/yr	1.1E-8/yr
Risk increase per AOT entry (14 days)	ICCDP = 2.8E-8	ICLERP = 4.2E-10
RG 1.177 classification	"Small" *	"Small" *
CDF impact with each tank OOS for fourteen days	5.6E-8/yr	8.4E-10/yr
RG 1.174 classification	"Very Small"	"Very Small"
* RG 1.177 classifies a change as "Small" when the ICCDP is < 5E-7 and the ICLERP is <5E-8.		

These results are based upon critical years, rather than calendar years per the ASME PRA Standard [STD 01, 02 & 03]. Therefore the results based on calendar years would be approximately 10% lower.

There have been five previously approved, risk-informed Technical Specifications changes at North Anna. These changes and their cumulative risk impacts are tabled below, in addition to the currently proposed TS change.

Table 4
Summary of Approved NAPS Risk-Informed Technical Specifications Changes

Risk-informed TS Change	Reference	Annual CDF Increase	Annual LERF Increase
14-day underground fuel oil storage tank AOT (proposed)	NAPS.RA.LI.6	5.6E-8/yr	8.4E-10/yr
RPS and ESF actuation system analog channel surveillance test internal extensions from monthly to quarterly and allowed outage time extensions	TSCR #N-038 (ET NAF 98-0200, Rev. 0)	3E-07/yr (1% of baseline risk)	Not quantified
Supplemental RPS/ESFAS functions	TSCR #N-038 supplemental (SM-1317 Table 1 & SM-1290, Rev. 0)	3E-09/yr	3E-10/yr
7-day inverter allowed outage time extension	TSCR #N-012 (SM-1360)	8.1E-08/yr	4.6E-10/yr
14-day Emergency Diesel Generator (EDG) AOT	TSCR #318B (SM-0969, Rev. 0)	1.3E-06/yr	1.3E-07/yr *
14-day N2 backup supply for PORV's	TSCR #323 (ET NAF 95-0018, Rev. 0 & ET NAF 98-0202, Rev. 0)	Not quantified	Not quantified
Total		1.74E-6/yr	1.32E-07/yr

* Not quantified. LERF was conservatively estimated as 10% of the CDF change.

The cumulative ΔCDF of the proposed and previously approved TS changes is 1.7E-6/yr and the cumulative ΔLERF is 1.3E-7. According to RG 1.177, the cumulative annual increase in CDF and LERF are still small.

4.2 Summary of Tier 2 Restrictions

The components listed in Table 5 should not be scheduled for planned maintenance during the AOT for the underground fuel oil storage tanks unless corrective maintenance is to be performed. If corrective maintenance is required then it must be within the component's associated Technical Specifications AOT. Corrective maintenance does not affect the Tier 2 risk analysis for the 14-day AOT; instead it will be controlled via the Tier 3 configuration risk management program to ensure that the overall risk profile for the plant is appropriately managed.

Since the ICCDP with a single UGFOST unavailable for fourteen days is 2.8E-8 and the RG 1.177 ICCDP threshold for classification as "small" is 5E-7, a proportional risk increase of (5E-7/2.8E-8) = 18 would cause the configuration risk to exceed 5E-7. In order to identify components that should be classified as restricted during a UGFOST outage, the *importance* file from the WinNUPRA run, with one UGFOST out of service, was reviewed. Table 5 lists all components with a *Risk Achievement Worth* (RAW) of at least 18, whose unavailability is not already prohibited by Technical Specifications.

Table 5
TIER 2 RESTRICTED EQUIPMENT

System	Components	Descriptions	Restrictions on Planned Maintenance
RSST's	1-EP-ST-2A	"A" Reserve Station Transformer	See note 1
	1-EP-ST-2B	"B" Reserve Station Transformer	See note 1
	1-EP-ST-2C	"C" Reserve Station Transformer	See note 1
Major Switchyard Components	Bus #1	Normal supply to SWYD bus #3	See note 1
	Bus #2	Normal supply to SWYD bus #4	See note 1
	Transformer #1	Bus #1 to Bus #3 transformer	See note 1
	Transformer #2	Bus #2 to Bus #4 transformer	See note 1
	L102 breaker	Bus #1 to bus #3 isolation	See note 1
	L202 breaker	Bus #2 to bus #4 isolation	See note 1
Transfer Buses	1-EP-SW-1D	Transfer bus "D"	See note 1
	1-EP-SW-1E	Transfer bus "E"	See note 1
	1-EP-SW-1F	Transfer bus "F"	See note 1
EDGs	1(2)-EE-EG-1(2) H/J	Emergency Diesel Generators	See note 1
Emergency Switch Gear Fans	1(2)-HV-AC-6/7	ESGR Air Handlers	See note 1
Charging Pumps	1(2)-CH-P-1A/B/C	Two charging pumps on the same Unit out of service concurrently	See note 1

Note:
(1) Planned maintenance will not be scheduled.

The Turbine Building-to-ESGR dike (1-BLD-FLW-2) has been omitted from this list. While its unavailability will cause a risk increase of 1E-6 in less than fourteen days, its risk significance is not elevated by the availability of either or both underground fuel oil storage tanks.

4.3 Assessment of Key Uncertainties

This section evaluates (qualitatively or quantitatively) the key areas of the modeling uncertainty, termed "epistemic uncertainty" in [RG 01], in the fuel oil system analyses.

EDG Fuel Supply

The underground fuel oil storage tanks are required to provide EDG fuel in a LOOP event that lasts more than a few hours (i.e., long enough to deplete the day tanks in the EDG rooms). The modeled LOOP frequency is based upon industry data and has been quantified at 3.74E-2/yr. This figure is considered conservatively high for North Anna, as North Anna has never experienced a LOOP event of any duration, at either unit, in nearly thirty years of operation. In addition, the plant has multiple connections to the grid, so that a total loss of offsite power is less likely than at other nuclear units. The fuel oil transfer system is simple and highly reliable, and the PRA model accurately reflects its configuration, including the power supplies. Both of the underground tanks are modeled but the above-ground storage tank (5000 barrel capacity, or ~250,000 gallons when full) is conservatively NOT modeled. While the above-ground tank is neither seismically designed nor missile protected, and might not survive an earthquake or a tornado, the results of the analysis indicate that internal event risks dominate, and this tank would be available in internal events, so that some measure of unquantified benefit exists from the above-ground tank.

Similarly, the model does not credit the cross-tie between the underground tanks. Each EDG has two dedicated fuel oil transfer pumps to provide makeup to its day tank. Each pump is normally lined up to one underground tank. The PRA model does not credit the cross-tie, although it allows either transfer pump to replenish the day tank from either underground tank. Thus, when one underground tank is unavailable, there will be two transfer pumps available for makeup, although the model only credits the normally aligned pump. This credit has also not been quantified.

External Events

While the uncertainty associated with the external events is larger than internal events, the results of the external event calculations indicate significant increases in the external events risk could occur without any impact on the risk metrics.

Overall Uncertainty

Even with conservative assumptions on external events, the combined risk impact of all initiating events was a factor of 18 below the applicable RG 1.177 threshold for classification as "small." A single UGFOST unavailable for fourteen days results in an ICCDP of 2.8E-8. The RG 1.177 ICCDP threshold for classification as "small" is 5E-7. A proportional risk increase of (5E-7/2.8E-8) = 18 would cause the configuration risk to exceed 5E-7. Therefore the impact of all uncertainties is negligible for this proposed Technical Specifications change.

5.0 CONCLUSIONS

This risk evaluation supports a one-time 14-day Allowed Outage Time for each underground fuel oil storage tank. The increase in annual *Core Damage* and *Large Early Release Frequencies* associated with the proposed change in the Technical Specification allowed outage time are characterized as "small changes" by Regulatory Guide 1.174. The *incremental conditional core damage* and *large, early release probabilities* associated with the proposed Technical Specification allowed outage time are within the acceptance criteria in Regulatory Guide 1.177.

The sensitivity calculations confirm that the criteria in Regulatory Guides 1.174 and 1.177 are met when considering the uncertainty in key attributes of the model impacting the importance of the tanks.

The Regulatory Guide 1.174 requirement to "Track Cumulative Impacts" for "small changes" is satisfied by the Dominion model maintenance program procedures.

This evaluation also identifies configurations that could occur during an outage of an underground tank that would require Tier 2 restrictions per Regulatory Guide 1.177.

6.0 REFERENCES

[CODE 01] WinNUPRA, Version 3.0, Software Document File

[NB 01] "North Anna Power Station Units 1 And 2 Probabilistic Risk Assessment Model Notebook Part III, PRA Model Development Category QU - Quantification Volume QU.2, Model Quantification Results," Revision 2 North Anna N105a Model, March 2007.

[NB 02] "North Anna Power Station Units 1 And 2 Probabilistic Risk Assessment Model Notebook Part IV, Appendix A, PRA Quality Summary Notebook," Revision 0 for N105a model, August 2007.

[REPORT 01] WinNUPRA User's Manual, Version 2.1, Scientech, Inc., April 2001.

[REPORT 02] "Individual Plant Examination Of Non-Seismic External Events And Fires - North Anna Power Station Units 1 And 2," Virginia Electric And Power Company, 1994.

[REPORT 03] "North Anna Power Station Units 1 and 2 Report on Individual Plant Examination of External Events (IPEEE) – Seismic Prepared in Response to USNRC Generic Letter 88-20 Supplements 4 and 5," May 1997.

[REPORT 04] NUREG-1488, "Revised Livermore Seismic Hazard Estimates for Sixty-Nine Nuclear Power Plant Sites East of the Rocky Mountains," April 1994.

[REPORT 05] North Anna Power Station Probabilistic Safety Assessment Peer Review Certification Report, July, 2001

[REPORT 06] WCAP-15674, Rev. 0, "Common Cause Failure Analysis Improvements Project," April, 2001

[RG 01] Regulatory Guide 1.174, Revision 1, "An Approach For Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes To The Licensing Basis," November 2002.

[RG 02] Regulatory Guide 1.177, Revision 0, "An Approach For Plant-Specific, Risk-Informed Decision Making: Technical Specifications," August 1998.

[STD 01] ASME RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," April 2002.

[STD 02] ASME RA-Sa-2003, "Addenda to ASME RA-S-2002 Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," December 2003.

[STD 03] ASME RA-Sb-2005, "Addenda to ASME RA-S-2002 Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," December 2005.

Attachment A – Justification of Volume Change

None required for initial issuance.

Revision 1, editiorial changes for clarification made prior to release to NRC with Licensing package.

Revision 2, Calculation revised to reflect a 14 day AOT as requested by North Anna Operations management

Attachment B – Reviewer Comments / Resolutions

Comment Number	Section/Page	Review Comment	Response to Review Comment
1	Various	I have reviewed the changes and verified they are correct. The results are consistent with what would be expected due to the changes. I verified the calculations of the delta CDF and LERF and the ICCDPs and ICLERPs. I found some minor typographical errors that were corrected by the Preparer.	All reviewer comments have been addressed.
2		The clarifications and enhancements of the editorial review have been reviewed. All changes have been verified to accurately reflect the original documentation.	All reviewer comments have been addressed
3		The changes for a 14 day AOT have been reviewed for accuracy	All reviewer comments have been addressed

Attachment C – Summary of North Anna Internal Events PRA

PRA Quality Summary

The North Anna PRA model quality has been addressed in detail in [NB 02].

The forms for the B significance F&Os from the peer review report are provided at the end of this attachment. The "Plant Response or Resolution" section of the form includes a discussion of how the F&O has been addressed.

The North Anna WOG Peer Review A and B F&Os were reviewed to identify any potential impact on the proposed TS change. All open F&O's were reviewed. While one item addressed ventilation in the Emergency Switchgear Room, there were no items that would be affected by a 14-day AOT for the underground fuel oils storage tanks.

IPEEE External Event Analysis Used in this Application

The IPEEE fire analysis developed initiating event frequencies for fires in a number of key plant areas. No credit was taken for suppression. In this application for an underground FOST AOT, these areas were evaluated to determine which could suffer fires that would be impacted by the unavailability of an underground tank. Unaffected areas were screened out. For the remaining areas, a conservative assumption was made that the fire, if accompanied by a failure of the underground tank, would lead to core damage.

The IPEEE included a seismic margins analysis at the time of its development in 1992. The present analysis assumed that a seismic event would cause a long term loop. Subsequently, the analysis then assumed that failure of the in-service tank would lead to core damage.

A tornado was assumed to cause a long-term LOOP. Similar to the seismic analysis, the tornado analysis also assumed that failure of the in-service tank would lead to core damage.

Both the seismic and tornado analyses bounded uncertainties with conservative assumptions.

Attachment 3

Marked-up Technical Specification Page

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

3.8 ELECTRICAL POWER SYSTEMS

3.8.3 Diesel Fuel Oil and Starting Air

LCO 3.8.3 The stored diesel fuel oil and starting air subsystem shall be within limits for each required emergency diesel generator (EDG).

APPLICABILITY: When associated EDG(s) is required to be OPERABLE.

ACTIONS

NOTE

Separate Condition entry is allowed for each EDG.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One fuel oil storage tank inoperable to perform an inspection or repairs.	A.1 Verify replacement fuel oil is available.	Prior to removing tank from service
	AND	
	A.2 Verify remaining fuel oil storage tank contains ≥ 45,000 gal.	Once per 12 hours
	AND	
	A.3 Verify above ground fuel oil tank contains ≥ 100,000 gal.	Once per 12 hours
	AND	(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.4 Restore fuel oil storage tank to within limits.	------NOTE------ The Completion Time for cleaning and recoating each fuel oil storage tank in preparation for use of ultra low sulfur diesel fuel oil is 14 days, to be used once per tank ---------- 7 days
B. One or more EDGs with fuel oil inventory < 90,000 gal and > 77,200 gal for reasons other than Condition A.	B.1 Restore fuel oil inventory to within limits.	48 hours
C. One or more EDGs with stored fuel oil total particulates not within limit.	C.1 Restore fuel oil total particulates within limit.	7 days
D. One or more EDGs with new fuel oil properties not within limits.	D.1 Restore stored fuel oil properties to within limits.	30 days
E. One or more EDGs with the required starting air receiver pressure < 175 psig and ≥ 150 psig.	E.1 Restore starting air receiver pressure to ≥ 175 psig.	48 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time not met. OR One or more EDGs diesel fuel oil or starting air subsystem not within limits for reasons other than Condition A, B, C, D, or E.	F.1 Declare associated EDG(s) inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.3.1	Verify fuel oil inventory ≥ 90,000 gal.	31 days
SR 3.8.3.2	Verify fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within the limits of, the Diesel Fuel Oil Testing Program.	In accordance with the Diesel Fuel Oil Testing Program
SR 3.8.3.3	Verify each EDG air start receiver pressure is ≥ 175 psig.	31 days
SR 3.8.3.4	Check for and remove accumulated water from each stored fuel oil storage tank.	92 days

Attachment 4

Proposed Technical Specifications Pages

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

3.8 ELECTRICAL POWER SYSTEMS

3.8.3 Diesel Fuel Oil and Starting Air

LCO 3.8.3 The stored diesel fuel oil and starting air subsystem shall be within limits for each required emergency diesel generator (EDG).

APPLICABILITY: When associated EDG(s) is required to be OPERABLE.

ACTIONS

NOTE

Separate Condition entry is allowed for each EDG.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One fuel oil storage tank inoperable to perform an inspection or repairs.	A.1 Verify replacement fuel oil is available.	Prior to removing tank from service
	AND	
	A.2 Verify remaining fuel oil storage tank contains ≥ 45,000 gal.	Once per 12 hours
	AND	
	A.3 Verify above ground fuel oil tank contains ≥ 100,000 gal.	Once per 12 hours
	AND	(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.4 Restore fuel oil storage tank to within limits.	------NOTE------ The Completion Time for cleaning and recoating each fuel oil storage tank in preparation for use of ultra low sulfur diesel fuel oil is 14 days, to be used once per tank ---------- 7 days
B. One or more EDGs with fuel oil inventory < 90,000 gal and > 77,200 gal for reasons other than Condition A.	B.1 Restore fuel oil inventory to within limits.	48 hours
C. One or more EDGs with stored fuel oil total particulates not within limit.	C.1 Restore fuel oil total particulates within limit.	7 days
D. One or more EDGs with new fuel oil properties not within limits.	D.1 Restore stored fuel oil properties to within limits.	30 days
E. One or more EDGs with the required starting air receiver pressure < 175 psig and ≥ 150 psig.	E.1 Restore starting air receiver pressure to ≥ 175 psig.	48 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time not met. OR One or more EDGs diesel fuel oil or starting air subsystem not within limits for reasons other than Condition A, B, C, D, or E.	F.1 Declare associated EDG(s) inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.3.1	Verify fuel oil inventory ≥ 90,000 gal.	31 days
SR 3.8.3.2	Verify fuel oil properties of new and stored fuel oil are tested in accordance with, and maintained within the limits of, the Diesel Fuel Oil Testing Program.	In accordance with the Diesel Fuel Oil Testing Program
SR 3.8.3.3	Verify each EDG air start receiver pressure is ≥ 175 psig.	31 days
SR 3.8.3.4	Check for and remove accumulated water from each stored fuel oil storage tank.	92 days

Attachment 5

Associated Bases Changes

North Anna Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

BASES

APPLICABILITY (continued)

after an AOO or a postulated DBA. Since stored diesel fuel oil and the starting air subsystem support LCO 3.8.1 and LCO 3.8.2, stored diesel fuel oil and starting air are required to be within limits when the EDG(s) is required to be OPERABLE.

All four EDGs (two per unit) are normally associated with both tanks which make up the fuel oil storage system. All EDGs that are required to be OPERABLE are associated with the fuel oil storage system. The determination of which EDGs are required to be OPERABLE is based on the requirements of LCO 3.8.1, "AC Sources–Operating," and LCO 3.8.2, "AC Sources–Shutdown."

A note is provided which permits a one-time extension of the 7-day Completion Time to 14 days for each fuel oil storage tank. To extend the Completion Time from 7 to 14 days, the Incremental Conditional Core Damage Probability and incremental conditional large early release probability limits of RG 1.177 were used as the criteria to identify potentially risk significant configurations. The results of the analysis identified several components that should not be scheduled for planned maintenance during the one-time extended Completion Time. The following components will not be scheduled for planned maintenance during the extended Completion Time nor will the 14-day Completion Time be entered with any of the following components out of service:

- Reserve Station Service Transformers 1-EP-ST 2A, 2B, and 2C
- Transfer Buses D, E, and F
- Buses 1 and 2
- Transformers 1 and 2
- Breakers L102 and L202
- Emergency Diesel Generators 1/2 EE-EG-1/2 H and J
- Emergency Switchgear Air Handlers 1/2 HV-AV-6/7
- Charging Pumps 1/2 CH-P-1A/B/C (two pumps on the same unit)

(continued)

BASES

APPLICABILITY (continued)

In the event one of the components above become inoperable during the extended Completion Time the risk will be managed in accordance with the Tier 3, Risk-Informed Plant Configuration Control Management practices.

ACTIONS

The ACTIONS Table is modified by a Note indicating that separate Condition entry is allowed for each EDG. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable EDG subsystem. Complying with the Required Actions for one inoperable EDG subsystem may allow for continued operation, and subsequent inoperable EDG subsystem(s) are governed by separate Condition entry and application of associated Required Actions.

A.1, A.2, A.3, and A.4

In this Condition, an underground fuel oil storage tank is not within limits for the purpose of tank repair or inspection. Every ten years each fuel oil tank must be inspected. Because both tanks are the source of fuel oil for all EDGs on both units, a dual unit outage would be required in order to provide the necessary time to complete the required maintenance or inspection. Prior to removal of the tank for repairs or inspection, verify 50,000 gallons of replacement fuel oil is available offsite and transportation is available to deliver that volume of fuel oil within 48 hours. Restrictions are placed on the remaining fuel oil storage tank and the 210,000-gallon above ground tank. Under this Condition, verification of the redundant fuel oil tank is required to confirm the required minimum amount of diesel fuel oil. In addition, the above ground tank, used to supply make up to the underground tanks, is required to be verified to contain the minimum level corresponding to 100,000 gallons. Verifications of onsite fuel oil are required on a 12 hour frequency to ensure an adequate source of fuel oil to the EDGs remains available. The underground fuel oil tank that is being inspected or repaired must be restored within limits in 7 days. This time is considered reasonable based on the required maintenance and the requirements provided by the Required Actions.