VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

November 19, 2018

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No.: 18-360
NRA/RAP: Rev. 0
Docket Nos.: 50-338/339
License Nos.: NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION ENERGY VIRGINIA)
NORTH ANNA POWER STATION UNITS 1 AND 2
AMENDMENT FOR FLOOD PROTECTION DIKE MODIFICATION

Pursuant of 10 CFR 50.90, Dominion Energy Virginia requests an amendment to Facility Operating License Numbers NPF-4/7 for North Anna Power Station (NAPS) Units 1 and 2. The proposed amendment would revise the NAPS current licensing basis (CLB) regarding a flood protection dike.

In 2013, two non safety-related water headers (fire protection and domestic water) were installed within the safety-related flood protection dike west of the Unit 2 Turbine Building. The modification that implemented this change was evaluated per the criteria specified in 10 CFR 50.59 and was determined to not require prior NRC approval. During a recent NRC inspection one aspect of the 2013 modification was determined to have required prior NRC approval.

The proposed amendment seeks NRC approval for the change that was implemented in 2013. As documented in this amendment, analyses have concluded that the existing (changed) configuration will not endanger the health and safety of the public.

NRC approval is also requested for an associated Updated Final Safety Analysis Report (UFSAR) change that describes the non safety-related water headers installed within the safety-related flood protection dike.

Attachment 1 to this letter contains a description, technical analysis, significant hazards determination, and environmental considerations evaluation for the proposed amendment.

The proposed amendment has been evaluated and has been determined to not involve a significant hazards consideration as defined in 10 CFR 50.92. The basis for this determination is included in Attachment 1. It has also been determined that operation with the proposed change will not result in any significant increase in the amount of effluents that may be released offsite or any significant increase in individual or cumulative occupational radiation exposure. Therefore, the proposed amendment is eligible for categorical exclusion from an environmental assessment as set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed change. The proposed amendment has been reviewed and approved by the NAPS Facility Safety Review Committee.

Dominion Energy Virginia requests approval of the proposed amendment by November 1, 2019, with the amendment being implemented within 60 days.

ADD1
NRR

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

If you have any questions or require additional information, please contact Ms. Diane Aitken at (804) 273-2694.

Very truly yours,

Mark D. Sartain
Vice President – Nuclear Engineering and Fleet Support

Attachments
1. Discussion of Change
2. UFSAR Change NAPS-UCR-2013-004

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 M. D. Sartain who is Vice President - Nuclear Engineering and Fleet Support 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 19th day of November, 2018.

My Commission Expires: 12/31/20.

Notary Public

CRAIG D SLY
Notary Public
Commonwealth of Virginia
Reg. # 7518653
My Commission Expires December 31, 2020

cc: U.S. Nuclear Regulatory Commission
Region II
Marquis One Tower
245 Peachtree Center Avenue, NE
Suite 1200
Atlanta, GA 30303

NRC Senior Resident Inspector
North Anna Power Station

State Health Commissioner
Virginia Department of Health
James Madison Building – 7th floor
109 Governor Street
Suite 730
Richmond, Virginia 23219

Mr. J. R. Hall
NRC Project Manager – North Anna
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop O8 B1-A
Rockville, MD 20852-2738

Mr. M. Harris (w/out attachment)
Old Dominion Electric Cooperative
Innsbrook Corporate Center
Suite 300
4201 Dominion Blvd.
Glen Allen, VA 23060

ATTACHMENT 1

Discussion of Change

VIRGINIA ELECTRIC AND POWER COMPANY
DOMINION ENERGY VIRGINIA
NORTH ANNA POWER STATION UNITS 1 AND 2

1.0 Summary Description

Pursuant to Title 10 of the Code of Federal Regulations (10 CFR) 50.90, Dominion Energy is requesting NRC approval of a change to the facility as described in the UFSAR. This change involved installation of two non safety-related water headers (fire protection and domestic water) within the safety-related flood protection dike west of the Unit 2 Turbine Building (TB).

Additionally, this license amendment request (LAR) requests approval of a proposed change to the Updated Final Safety Analysis Report (UFSAR) that describes the non safety-related water headers installed within the safety-related flood protection dike, for which NRC approval is also requested.

There are no Technical Specification changes associated with this request.

2.0 Proposed Change

2.1 Background

In 2013, a Design Change (DC) implemented at North Anna installed two non safety-related water headers (fire protection and domestic water) within the safety-related flood protection dike west of the Unit 2 Turbine Building (TB). The 50.59 evaluation to support the DC concluded that prior NRC approval was not required based on an evaluation that the dike would not fail as a result of leakage or a pipe break. A subsequent review identified that a license amendment was required because the change resulted in a more than minimal increase in the likelihood of occurrence of a malfunction of the safety-related dike.

2.2 System Design and Operation

Flood Protection Dike

The safety-related flood protection dike is described in UFSAR section 3.8.6. As described in the UFSAR, the flood protection dike is located west of the Unit 2 Turbine and Service Buildings, and provides flood protection to those buildings if Lake Anna reaches the Probable Maximum Flood (PMF) level. The flood protection dike was built to a crest elevation of approximately 271 feet, with a side slope that is 2.5 horizontal to 1 vertical, except for a small section where the side slope is 2 horizontal to 1 vertical. The width of the flood protection dike is approximately 30 feet at the crest and 130 feet at its base. The length of the dike is approximately 350 feet. In order to provide storm drainage to the area between the flood protection dike and Unit 2 Turbine Building, a drainpipe is installed within the flood protection dike. Technical Requirements Manual (TRM) Section 3.7.16, Flood Protection, requires closure of the valve in this drainpipe when the Lake Anna level exceeds elevation 252 feet. Valve closure ensures

there is no leakage path through the flood protection dike during flood conditions that could challenge in-plant flood control measures.
The original analysis performed for construction of the dike determined the stability of the upstream and downstream slopes, including during the condition when water level on the outside of the flood protection dike has reached the probable maximum flood (PMF) lake level (elevation 264.2). The analysis found construction of the flood protection dike had adequate factors of safety.

Underground Fire Protection System Piping

The fire protection system is described in UFSAR Section 9.5.1. The underground fire protection system piping consists of a 12-inch diameter yard loop, with yard hydrants strategically placed around this loop. Branch lines from this loop serve the interior fire protection systems. The loop has a minimum ground cover of 5 feet for missile protection. All of the fire protection systems piping and valves, including the supply lines from the fire pumps to the yard loop and the branch piping from the yard loop to the building walls, are designed to Seismic Category I requirements.

The fire protection loop is fed by two, 100% capacity fire pumps. The motor-driven fire pump takes suction from the North Anna Reservoir and the diesel-driven fire pump takes suction from the Service Water Reservoir. Each pump is designed to maintain 100 psig at its rated flow (2500 gpm) in the yard hydrant piping loop. The motor-driven, vertical-turbine fire pump is located in the fire-pump house over the screenwall. The diesel-driven fire pump is located in the missile-protected Service Water Pump House (SWPH). The motor-driven fire pump is equipped with automatic control starting at 90 psi on decreasing line pressure. The diesel-driven fire pump is equipped with automatic control starting at 52 psi on decreasing line pressure at the elevation of the SWPH, which is equivalent to a loop pressure of 80 psig. Each pump delivers 2500 gpm at its designed discharge pressure (330 ft. for motor-driven and 270 ft. for diesel-driven), which varies because of the 66-foot elevation difference between the Service Water Reservoir and North Anna Reservoir. System pressure is normally maintained continuously between 105 and 115 psig by a pressure maintenance system consisting of a jockey pump, a hydropneumatic tank with an air compressor, and related controls and accessories.

Domestic Water System

The domestic water system is described in UFSAR Section 9.2.3. The domestic water system consists of ground wells dug at various locations on site. Periodic samples are collected at the discharge of each well pump to ensure that the wells provide a safe and approved potable water supply to the station facilities. Each well has its own structure, hydropneumatic tank, pump, and compressor. Pressure is sustained in the domestic water system by maintaining the proper water to air ratio in the individual hydropneumatic tank via pressure and level controllers. Well pumps are sized to provide adequate make-up to the domestic

water system without excessive draw down to its respective well. As an added protection, well level is ensured via level switches, to mitigate the chances of pumping a well dry and damaging the submersible pump. Water is supplied from each well to its respective hydropneumatic tank, which acts as a surge volume and pressure source for the header. Each hydropneumatic tank discharges to a common header. For maintenance evolutions, each hydropneumatic tank is isolable and bypassable to allow service directly from the well pump. The common underground piping is regionally isolable to allow for isolation of any well house from the domestic water system without isolating water supply to the facilities in that area. The domestic water system supplies cold water for all domestic applications in the plant from toilets and sinks to drinking fountains and eyewash stations. The water is heated electrically and is not interconnected to any potentially radioactively contaminated systems.

2.3 Current Requirements

There are no Technical Specification requirements associated with the flood protection dike, the fire protection system piping or the domestic water system. Operability/functionality requirements for both the flood protection dike and the fire protection system are controlled by the North Anna TRM. TRM Section 3.7.16 (Flood Protection) requires the valve located in the drainpipe routed through the flood protection dike be closed when the level of Lake Anna exceeds elevation 252 feet. In addition, when Lake Anna exceeds a level of 256 feet, the units are required to be in Mode 3 in 6 hours and Mode 5 in 36 hours.

As described in UFSAR Section 2.4.10, Flood Protection Requirements, the design of Lake Anna precludes any possibility of flooding the station because its maximum high-water level, including wave run-up, is below ground grade at the station site and the crest of the flood protection dike to the west. As a result, the flood protection dike (with a crest at an approximate elevation of 271 ft.) is required to maintain a height and stability to ensure maximum high-water level, including wave run-up of elevation 267.3 ft., to preclude impact to safety-related equipment.

Fire Suppression Water Systems requirements are listed under TRM Section 7.1.1. Loss of fire suppression water system features may require establishing a backup fire suppression water system via a cross-tie valve. TRM Section 7.1.8, Fire Suppression System Impairments and Balance of Plant Fire Suppression, provides actions for the individual fire suppression systems and components rendered non-functional.

2.4 Reason for Proposed Change

A design change to facilitate the potential future addition of North Anna Unit 3 made changes to the Units 1 & 2 fire protection and domestic water systems. Underground fire protection and domestic water systems piping was abandoned west of Units 1 and 2, and new piping installed, including piping within the safety-related flood protection dike. NRC Inspection Report 2017007, NRC Evaluation of Changes, Tests, and Experiments, dated June 2, 2017, identified a violation of 10 CFR 50.59(c)(2) for failure to obtain a license amendment prior to implementing this design change because the change was determined to have increased the likelihood of a malfunction of the safety-related flood protection dike. As a result, this license amendment requests approval of the design change that installed two non safety-related water headers within the safety-related flood protection dike west of the Unit 2 Turbine Building (TB). Additionally, approval of the associated UFSAR change that describes the existing plant configuration with the non safety-related water headers installed within the safety-related flood protection dike is requested.

2.5 UFSAR Revision

The safety-related flood protection dike, located west of the Unit 2 Turbine Building, was modified by the installation of two non safety-related piping systems within the safety-related flood protection dike. The installed piping systems are the 12-inch diameter, ductile iron fire protection system piping, and the 2-inch diameter, high density polyethylene (HDPE) domestic water system piping. These pipes were routed within the western edge of the flood protection dike, along its entire length.

The installed ductile iron fire protection system piping is cement-lined with an asphaltic exterior coating, and has a polyethylene encasement wrap for corrosion protection. The pressure rating of the piping is 350 psi and it is connected using restrained mechanical joints. The underground fire protection system piping is seismically qualified (Category I) and protected from tornado missiles.

The 2-inch domestic water system piping consists of butt or electrofusion welded, HDPE. The piping and fittings consist of a standard dimension ratio (SDR) 11, and are rated for 160 psig at 73°F.

The UFSAR change, which describes the modification to the safety-related flood protection dike, includes the following revisions:

- Section 3.11.3, Corrosion Prevention for Underground Piping, shows the addition of cement-lined ductile iron fire protection system piping. Previously, only cast iron material was used for fire protection system piping.
- Table 9.2-10, Domestic Water Supply Component Design Data, deletes of an abandoned well.

- Section 9.5.1.1, Design Basis, no longer refers to the Site Construction Office Building North (SCOBN) Sprinkler System. The SCOBN building has been abandoned, and the underground fire protection supply piping to the SCOBN was abandoned with that modification.
- Section 9.5.1.2.1, Fire Protection Water Systems, removes the reference to the underground fire protection loop going around the area formerly for Unit 3. The underground fire protection system piping in this area was abandoned by the modification.
- Figure 9.5-1, Fire Protection System Arrangement, depicts the new routing of the underground fire protection system piping.

3.0 Technical Evaluation

The safety-related flood protection dike, located west of the Unit 2 Turbine Building, was changed by a modification that installed two non safety-related piping systems within the flood protection dike. To facilitate the buried piping installation, a 10 ft. wide, 4.5 ft. deep trench on the western side of the flood protection dike was excavated. A smaller trench within the larger cutout was excavated for the pipes, and was 3 ft. wide by 3 ft. deep, extending the entire length of the dike. The fire protection system piping was installed to Seismic Category 1 standards at an elevation of approximately 264 feet with at least 5 feet of soil above it for tornado missile and freeze protection. Following installation of the piping, the flood protection dike was restored to its original dimensions.

The fire protection system piping within the flood protection dike can be isolated by post indicator valves, which are accessible above the PMF elevation. The domestic water system piping can also be isolated by accessible valves above the PMF elevation.

A Slope Stability Analysis for the flood protection dike was performed that includes an evaluation of the flood protection dike during construction and in its final configuration. As shown in Figure 1, a 3 ft. wide by 3 ft. deep trench was excavated from the western slope and part of the crest of the dike to allow installation of the 12-inch pipe and 2-inch pipe during installation. The elevation of the domestic water system piping varies from 4 to 6 feet below the top of the flood protection dike.

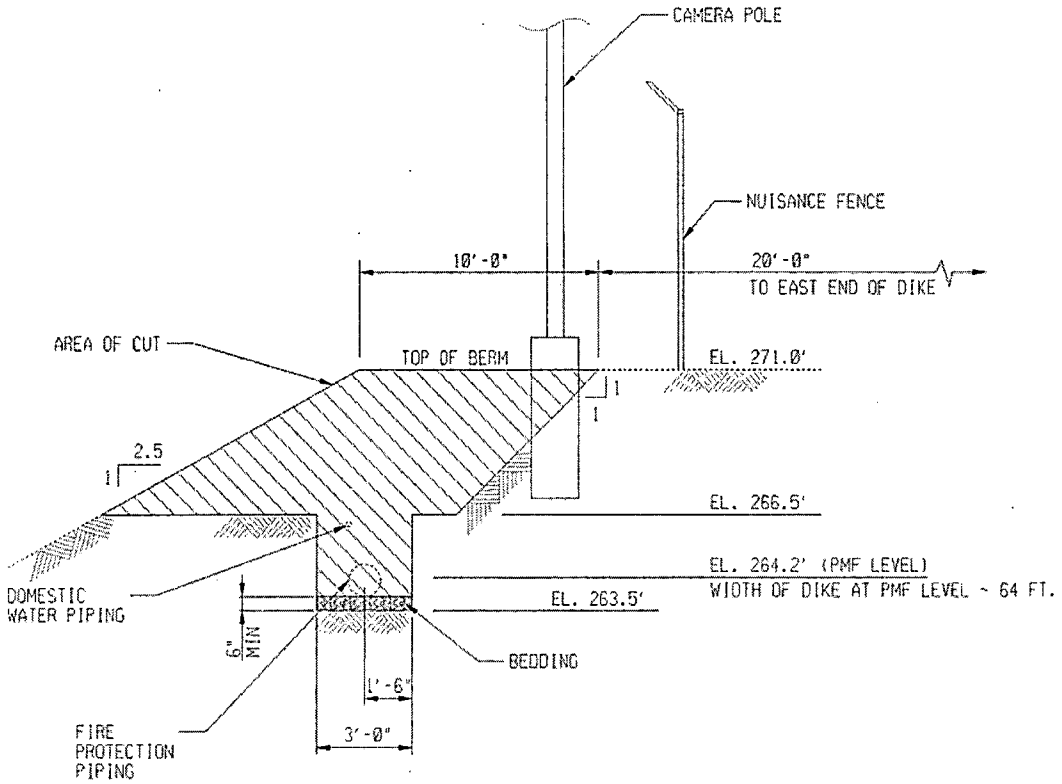

Figure 1: Trench Detail for FPS and DWS Installation in Flood Protection Dike

The Slope Stability Analysis also examined small and large leak scenarios. In either case, the water from a break is expected to follow the path of least resistance – toward the western, upstream face of the flood protection dike. The PMF event was used in analyzing different failure modes of the flood protection dike, including washout of the original excavation for the fire protection system and domestic water system piping. In each case, the flood protection function of the safety-related flood protection dike was determined to be unaffected. Additionally, a Probabilistic Risk Assessment (PRA) Risk Analysis was conducted to characterize the impact of installed pressurized water sources within the external flood protection dike west of the Turbine Building on the reliability of the flood protection dike to perform its external flood protection function.

The following assumptions were used in the PRA Analysis:

- A double-ended break in the domestic water system piping would not result in a failure of the safety-related flood protection dike to provide flood protection.
- A large break in fire protection system piping would be identified and isolated in a timely manner. There is no external flooding consequence to

the station if the fire protection system piping ruptures while storm runoff conditions are not present.

- The section of external flood protection dike of concern is about 350 feet long.
- If a fire protection system pipe failure occurs within seven days of a significant rainfall event, then the rupture will not be detected because of standing water in the vicinity of the break. It is assumed that the flood protection dike will fail to perform its intended flood protection function in this scenario. This assumption has conservative bias.
- For the purposes of this evaluation, a "significant rainfall event" is considered to be an event where at least 15-inches of rain falls in less than 72 hours. It is assumed that if less than this amount of precipitation occurs, then there will be no external flooding consequence in the event of a fire protection system pipe rupture. This assumption has conservative bias.

Risk Analysis

Consistent with the defined assumptions, a dimensional analysis reliability calculation was performed to determine the likelihood of failure of the flood protection dike due to a fire protection system pipe rupture during a "significant rainfall event". A "significant rainfall event" was used in lieu of a PMF. A PMF is the theoretical maximum amount of precipitation that can fall under ideal "perfect storm" meteorological conditions. The frequency of a PMF is highly uncertain and assumed to be rare, given that PMF conditions have never been recorded at North Anna. The dimensional analysis makes this assumption in order to simplify the problem so that a precipitation frequency may be generated using the data available: a substantial amount of storm runoff water, but less than PMF runoff, is sufficient coincident with a fire protection system pipe rupture to fail the flood protection dike.

The frequency of a "significant rainfall event" is estimated to be 1E-3/yr., or 1 in every 1000 years. This value was based on point precipitation frequency estimates for Louisa, Virginia performed by the National Oceanic and Atmospheric Administration (NOAA). This data source is referred in NRC Risk Assessment of Operational Events (RASP) Handbook. A graph depicting the precipitation depth-duration-frequency curves that was used to derive the precipitation frequency is shown below in Figure 1.

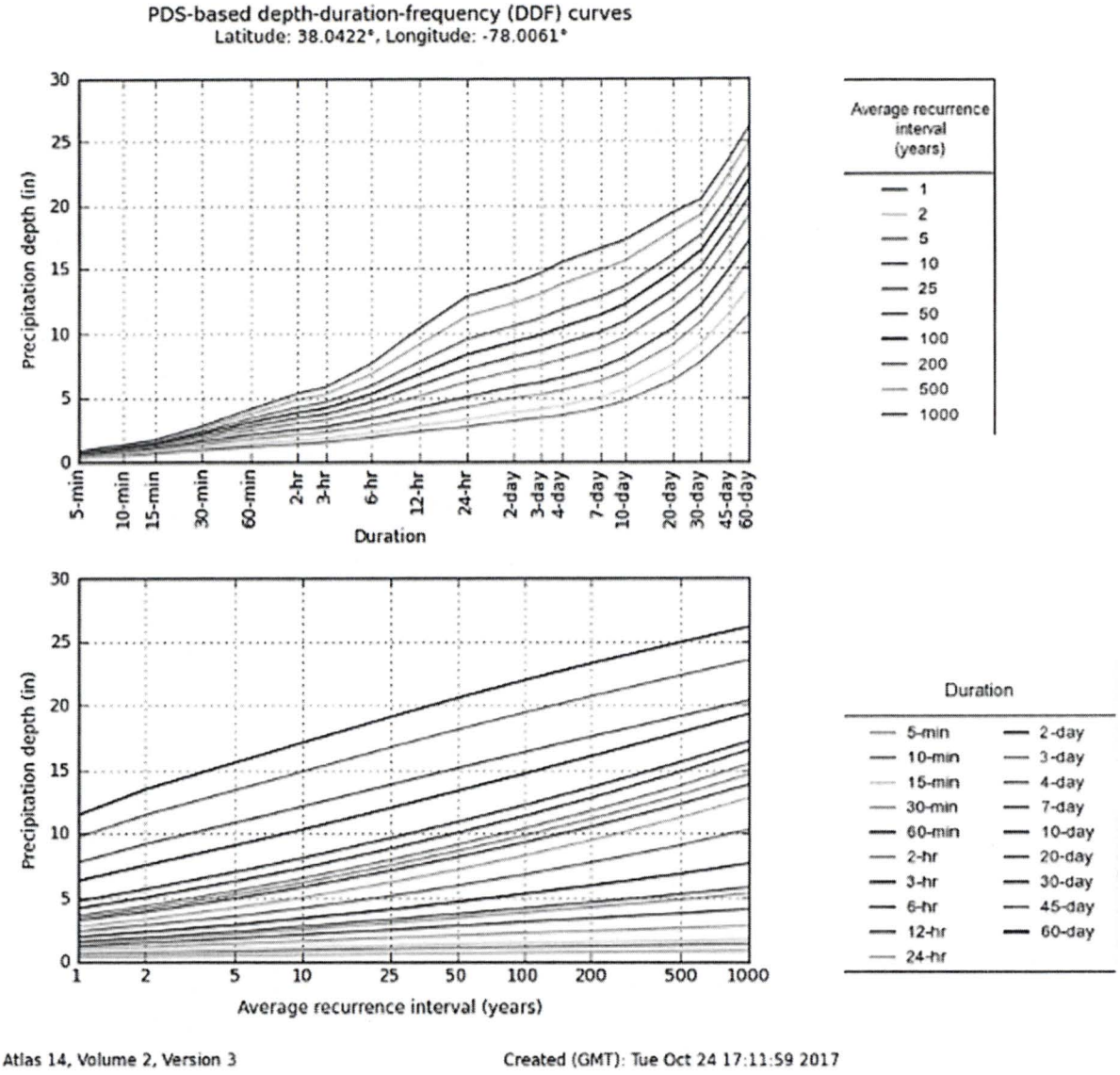

Figure 1: NOAA Precipitation Depth-Duration-Frequency Curves for Louisa, VA

The pipe rupture frequency within the flood protection dike was then calculated using dimensional analysis. NRC Inspection Report 2017007 referenced a study performed by Utah State University which provided a generic failure frequency of ductile iron (DI) pipe to be 14 failures per 100 /mile*year. In order to determine the pipe rupture frequency within the North Anna flood protection dike, the length of pipe/flood protection dike protecting the Turbine Building from propagating flood waters had to be determined. Based on the flood protection dike drawing, the length of pipe of interest is approximately 350 feet long. The new failure probability with the length of pipe taken into consideration then had to be assessed for the seven day mission time.

The following dimensional analysis was then performed to determine the pipe failure frequency:

0.14	1	year	7	days	1	mile	350	feet
mile*year	365.25	days			5280	feet		

In equation form, this looks like:

$$\frac{0.14\ failures}{mile * year} * \left(\left(\frac{1\ year}{365.25\ days}\right) * \left(\frac{7\ days}{1}\right) * \left(\frac{1\ mile}{5280\ feet}\right) * \left(\frac{350\ feet\ of\ pipe}{1}\right)\right) = 1.78E-04$$

The probability of the significant flood event and pipe failure occurring at the same time, leading to a flood protection dike failure and flood waters propagating the Turbine Building is shown in the calculation below:

$$Dike\ failure\ frequency\ (yr-1) = Storm\ Frequency\ (yr-1) * Pipe\ Rupture\ Probability\ (no\ units)\ (7\ day\ Mission\ Time)$$

$$1.78E-04 * 1.00E-03 = 1.78E-07\ per\ year$$

Given the calculated pipe failure rate within the flood protection dike and the significant rainfall event frequency, the likelihood of the flood protection dike failing due to pipe rupture is very low.

External Flood Mitigation Strategies

If a pipe was to leak or rupture within the flood protection dike, the leak would be detected since a small leak would cause the face of the flood protection dike to dampen and a pipe rupture would cause visible seepage and possible soil erosion. Since the domestic water system pipe is 2-inch, a rupture would not wash out the flood protection dike, but the failure would quickly become apparent, and the rupture would be detected and repaired before a flood protection dike failure would occur.

If the 12-inch fire protection system pipe was to rupture, considerable damage to the flood protection dike would occur if the rupture continued undetected. However, this is very unlikely since North Anna has the following methods of detecting a fire protection system pipe break or leak and plant personnel would be able to isolate the break in a timely fashion:

- Security would notice significant differences (wetness or pooling) in the appearance of the flood protection dike during routine patrols performed several times each day.
- The flood protection dike is landscaped at least twice a year.
- Small leaks of both pipe sizes would be detected during the annual flood protection dike inspection.

- A fire protection system piping leak or rupture would result in increased cycling of the fire protection hydropneumatic tank level and pressure, which are monitored daily by Operations. Furthermore, the pressure maintenance pump would be cycling to maintain the dropping tank pressure.

  Significant leakage (>30 gpm) would auto start a main fire pump and alert the operators in the control room, triggering an investigation.
- Operators perform quarterly and annual periodic tests which cycle the fire protection system valves at the ends of the flood protection dike, which provides an additional opportunity to observe signs of leakage on the western bank of the flood dike.
- The domestic water system usage is monitored monthly under a chemistry procedure and is trended by a System Engineer. A leak investigation would commence if the usage exceeds 600,000 gallons monthly (estimated to be equivalent to a 14 gpm leak based on normal usage).

In addition, a North Anna abnormal procedure is in place and contains requirements for site response to storm/hurricane warnings. The procedure includes instructions for securing items around the site, monitoring wind speed and storm surge, and preparing and monitoring for possible localized flooding.

Risk Analysis Results and Conclusion

The installed pressurized water sources have a very small impact on the reliability of the flood protection dike to perform its external flood protection function. The probability of the flood protection dike's inability to provide flood protection due to a pressurized pipe rupture is very low, and is conservatively estimated to be approximately 1.78E-07.

As discussed in the PRA Risk Analysis, significant damage to the flood protection dike due to a pipe rupture is unlikely to occur prior to detection

In conclusion, the current configuration of the flood protection dike with the 12-inch fire protection system piping and 2-inch domestic water system piping routed within the western edge is acceptable. This conclusion is based on the following, 1) North Anna has ample observers, periodic tests, alarms, readings and other indicators to detect a major break in either of the two non safety-related pipes in the safety-related flood protection dike, (2) isolation valves are provided for the piping within the flood protection dike to allow isolation in the event of a leak, and these valves will remain accessible during a PMF, (3) the Slope Stability Analysis and PRA analysis determined that the probability of the flood protection dike losing its flood protection function due to a pressurized pipe rupture is extremely low, (4) no known code or standard prohibits the pipe installation, and (5) General Design Criteria 3 and 4 are satisfied through identification and isolation.

4.0 Regulatory Evaluation

4.1 Applicable Regulatory Requirements/Criteria

The following NRC requirements and guidance documents are applicable to the proposed change.

10 CFR 50, Appendix A:

General Design Criterion 3 - Fire protection. In part, GDC 3 states, *Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components.*

Compliance with GDC 3 is discussed in North Anna's UFSAR. The focus of the discussion is for aboveground fire protection systems. As stated in the UFSAR Section 3.1.3 (Fire Protection, Criterion 3), *the fire protection system is designed so that a failure of any component will not cause a nuclear accident or significantly impair the capability of safety-related structures, systems, and components.* A further discussion of how this is accomplished is discussed in UFSAR Section 9.5.1, Fire Protection System. As stated under Section 9.5.1.3.6, Inadvertent Operation of Water Systems, *the operator will become aware of a fire protection system pipe break or leak in various ways, any of which would be a reason for the operator to initiate action for a visual inspection to establish the location of the break/leak, thus enabling further action to isolate faulty sections.*

Although the underground fire protection system piping is not specifically addressed within the discussion for GDC 3, the technical evaluation concludes that compliance with GDC 3 is achieved for the underground piping in a manner that is consistent with the aboveground piping. The underground fire protection loop is provided with sectionalizing valves that can be closed to isolate sections of the loop in the event of a pipe leak or break. Provisions are in place, as discussed within the technical evaluation, to identify leaks or breaks.

10 CFR 50, Appendix A:

General Design Criterion 4 - Environmental and dynamic effects design bases. *Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit. However, dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the*

probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping.

Compliance with GDC 4 is accomplished by ensuring leaks are identified and isolated, thereby preventing a failure of the flood protection dike. North Anna 1 Units 1 and 2 continue to meet the applicable regulations and requirements with implementation of the modification to the safety-related flood protection dike.

4.2 Precedent

No applicable precedent has been identified.

4.3 No Significant Hazards Consideration Analysis

The safety-related flood protection dike, located west of the Unit 2 Turbine Building, was modified by installing two non safety-related piping systems within the flood protection dike. 12-inch diameter ductile iron fire protection system piping and 2-inch diameter HDPE domestic water system piping have been installed within the flood protection dike (along the western edge). The flood protection dike provides flood protection for safety-related equipment located in the lower level of the Service Building from the effects of a PMF.

Dominion Energy has evaluated whether a significant hazards consideration is involved with the proposed change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No. The change revises the UFSAR to reflect the addition of non safety-related, underground, fire protection and domestic water system piping within the safety-related flood protection dike west of the Unit 2 Turbine Building. Failure of non safety-related piping within the flood protection dike or failure of the flood protection dike is not an initiator of any accident previously evaluated. The modification does not significantly increase the probability of a failure to the flood protection dike. The technical evaluation for the change shows that slope stability for the flood protection dike is maintained in the event of a non safety-related piping failure. In addition, existing inspections and surveillances are adequate to identify piping leaks or breaks prior to failure of the flood protection dike. In the event a piping break causes a failure of the flood protection dike, a risk review indicates that the probability of this occurring with consequences to be low (not significant).

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

Response: No. The change revises the UFSAR to reflect the addition of non safety-related, underground, fire protection and domestic water system piping

within the safety-related flood protection dike. The flood protection dike is located west of the Unit 2 Turbine and Service Buildings, and provides flood protection to those buildings if Lake Anna reached the PMF level. The addition of the non safety-related piping within the flood protection dike does not change the design function or operation of the flood protection dike. A failure of the flood protection dike is not an accident initiator. Failure of the non safety-related piping could potentially degrade the safety-related flood protection dike; however, it does not introduce a new or different kind of accident from any accident previously evaluated.

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

Response: No. The change has no significant impact on margins of safety. The installation of the non safety-related piping does not result in a reduction of a peak flood protection dike height. An analysis demonstrated that slope stability is maintained and factors of safety are well within acceptable limits during installation and following installation, including in the event of a pipe break. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Dominion Energy concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusion

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed license amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed license amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed license amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental

impact statement or environmental assessment need be prepared in connection with the proposed change.

6.0 REFERENCES

1. NRC Inspection Report 2017007, "NRC Evaluation of Changes, Tests, and Experiments," dated June 2, 2017
2. U.S. Code of Federal Regulations, Appendix A, "General Design Criteria."
3. ETE-NA-2017-0068, "Evaluation for License Amendment Request of Fire Protection and Domestic Water Piping Installed in Flood Protection Dike," North Anna Power Station, Units 1 & 2, Dominion Energy
4. North Anna Power Station Probabilistic Risk Assessment Notebook, PRA Risk Analysis NOTEBK-PRA-NAPS-RA.044, Reliability Study of External Flood Protection Dike, Rev.0, Dominion Energy
5. DCP -07-016, Fire Protection and Domestic Water System Modifications, North Anna Power Station, Units 1 & 2, Dominion Energy
6. Calculation 25161-G-060, Slope Stability Analysis for Flood Protection Dike, Rev.1, Bechtel Power Corp.
7. North Anna Power Station, Technical Requirements Manual Sections 3.7.16, Flood Protection and 7.1.1, Fire Suppression Water Systems, 7.1.8, Fire Suppression System Impairments and Balance of Plant Fire Suppression
8. North Anna Power Station, Abnormal Operating Procedure, 0-AP-41, "Severe Weather Conditions"
9. North Anna Power Station, Chemistry Procedure, CH-88.101, "Monthly Integrator Readings"
10. North Anna Power Station, Updated Final Safety Analysis Report (UFSAR), Sections 3.8.6, Flood Protection Dike, 3.11.3, Corrosion Prevention for Underground Piping, 9.5.1, Fire Protection System, and 9.2.3.1, Domestic Water System
11. NRC Risk Assessment of Operational Events (RASP) Handbook, Volume 2 – External Events, Rev. 1.01
12. NOAA Atlas 14 Point Precipitation Frequency Estimates : VA, <https://hdsc.nws.noaa.gov/hdsc/pfds/pfds—map—cont.html?bkmrk=va>

ATTACHMENT 2

Flood Protection Dike Modification
UFSAR Change NAPS-UCR-2013-004

VIRGINIA ELECTRIC AND POWER COMPANY
DOMINION ENERGY VIRGINIA
NORTH ANNA POWER STATION UNITS 1 AND 2

Dominion

DCP 07-016
APPENDIX 1-1
PAGE 1 OF 7

SAR Change Request FC #7

CM-AA-SAR-101 ATTACHMENT 3 Page 1 of 2

1. Applicable Station	2. Applicable Unit	3. Change Number
☐ Kewaunee ☐ Millstone ☒ North Anna ☐ Surry	☒ Unit 1 ☒ Unit 2 ☐ Unit 3 ☐ ISFSI	NAPS-UCR-2013-004

4. SAR Chapter/Sections/Figures/Tables Affected

UFSAR Chapter 3 / Section 3.11.3, *Corrosion Prevention for Underground Piping*
UFSAR Chapter 9 / Table 9.2.10, *Domestic Water Supply Component Design Data;* Section 9.5.1.1, *Design Basis;* Section 9.5.1.2.1, *Fire Protection Water Systems;* Figure 9.5-1, *Fire Protection System Arrangement*

5. ☒ Updating the SAR
☐ Modifying the SAR

6. Source of Change:
DCP 07-016 "Fire Protection and Domestic Water System Modifications/NAPS/Units 1 & 2"

7. Description of Change

UFSAR Section 3.11.3, *Corrosion Prevention for Underground Piping,* requires revision to reflect the addition of cement-lined ductile iron fire main pipe.

UFSAR Table 9.2-10, *Domestic Water Supply Component Design Data,* requires revision to delete reference to Well No. 4, which is being abandoned and will add reference to Well No. 8 instead.

UFSAR Section 9.5.1.1, *Design Basis,* requires revision to remove reference to the *Site Construction Office Building North (SCOBN) Sprinkler System.*

UFSAR Section 9.5.1.2.1, *Fire Protection Water Systems,* requires revision to remove reference of the FPS loop going around the area formerly for Unit 3.

UFSAR Figure 9.5-1, *Fire Protection System Arrangement,* requires revision due to the new fire main configuration along the west of Unit 2. Figure is also revised to remove depictions of Unit 3 structures which do not exist.

cwf 7/16/13

8. ☒ Phased Change-Bounding Configuration-Requires "Yes" in Block 21
☐ Phased Change-Interim Configuration
☑ Not Applicable cwf 7/16/13

9. Basis for Change

Per DCP 07-016, the current Seismic Category I fire protection pipe for the Units 1 & 2 loop will be cut/capped and abandoned in place and rerouted and replaced by cement-lined ductile iron piping so as to not interfere with the Unit 3 excavation activities. And DCP 07-016 also abandons (in place) Well No. 4, which is in the Unit 3 excavation area, while Well No. 8 will be added to replace Well No. 4.

This SAR change supersedes SAR changes NAPS-UCR-2009-003 (which was originally included with DCP 07-016), SAR change NAPS-UCR-2011-013 (originated as part of DCP 07-016 FC 3 to allow a phased implementation of the SAR Changes associated with DCP 07-016) and SAR change NAPS-UCR-2012-014 (which revised Figure 9.5-1 to reflect the piping configuration at the southwest corner as issued in FC #6). SAR change NAPS-UCR-2013-004 will include the addition of Well 8 to Table 9.2-10 in the SAR changes required for DCP 07-016 and makes a minor change to Figure 9.5-1 for clarity.

10. Supporting 50.59/72.48 Review

☐ Not applicable per Applicability Determination

☒ Is contained in DCP 07-016 (List Governing Document and attach 50.59/72.48)

☐ Is attached

Phase change bounded by 50.59/72.48 Review for _____ (Governing Document).

COMPLETED

SAR Change Request FC #7

11. Other Supporting Documents

Safety Review and 50.59/72.48 Regulatory Screen for DCP 07-016
Design Change Drawings:
N-07016-0-1FB2A, Sh. 1, "Fire Protection Arrgt Sh-1 North Anna Power Station"
N-07016-0-1FB41D, Sh. 2, 3, and 5, "Flow/Valve Operating Numbers Diagram Domestic Water System North Anna Power Station Units 1 & 2"
N-07016-0-1FB101C, Sh. 1, "Valve Operating Numbers Underground Fire Protection Sys. Sh. 3 Units 3 & 4 Construction Area North Anna Power Station – Unit 1"

12. Change Originator (Print Name) [redacted]	Change Originator (Signature) [redacted]	Date 4/30/2013
13. Technical Reviewer (Print Name) [redacted] Kewaunee, North Anna and Surry - Attachment 4 Millstone Unit 1 – Attachment 5 Millstone Unit 2 – Attachment 6 Millstone Unit 3 – Attachment 7	Technical Reviewer (Signature) [redacted]	Date 6-12-2013
14. Additional Technical Reviewer (Print Name) [redacted]	Additional Technical Reviewer (Signature)	Date
15. Additional Technical Reviewer (Print Name) [redacted]	Additional Technical Reviewer (Signature) [redacted]	Date 13 JUNE 13
16. Additional Technical Reviewer (Print Name) [redacted]	Additional Technical Reviewer (Signature) [redacted]	Date 6/13/13
17. Responsible Dominion Supervisor Approval (Print Name) [redacted]	Responsible Dominion Supervisor Approval (Signature) [redacted]	Date 6/13/13
18. SAR Coordinator (Print Name) [redacted]	SAR Coordinator (Signature) [redacted]	Date 6-13-13
19. Cognizant Manager (Print Name) [redacted]	Cognizant Manager (Signature) [redacted]	Date 6/13/13
20. Cognizant Nuclear Director (Print Name) [redacted]	Cognizant Nuclear Director (Signature) [redacted]	Date 6/13/13
21. FSRC Approval (Signature) [redacted]	Subsequent phased changes permitted w/o FSRC approval? ☑ Yes 7-16-13 ☑ No	Date 7-16-13

22. SAR Change Request

☐ Can be implemented

☒ Implementation is being tracked by DCP-07-016.

23. Change Originator (Print Name) [redacted]	Change Originator (Signature) [redacted]	Date 7-30-13

Forwarded approved SAR Change Request Package to SAR Coordinator. ☒

Key: FSRC-Facility Safety Review Committee; ISFSI-Independent Spent Fuel Storage Installation

subjected to a harsh environment will meet or exceed its performance requirements during and following a Design Basis Event (DBE) throughout its installed life.

The qualification of electrical equipment is the result of the issuance of IE Bulletin 79-01B in January 1980. Subsequently, on January 21, 1983, the NRC issued the EQ Rule (10 CFR 50.49).

As identified in IE Bulletin 79-01B, Supplement 2, all reactors with operating licences as of May 23, 1980, will be evaluated against the DOR Guidelines (included with IEB 79-01B). Those plants with a construction permit granted after July 1, 1974 and operating license granted after May 23, 1980, the equipment will be qualified to the requirements of NUREG 0588, Category II. Therefore, the equipment qualification basis is IEB 79-01B for Unit 1 and NUREG 0588, Category II for Unit 2. The results of Virginia Power's review of IEB 79-01B and NUREG 0588 were reported in References 33 and 34, respectively.

Paragraph (k) of 10 CFR 50.49 grandfathered the qualification basis such that the utility did not have to re-qualify the equipment if it was previously qualified to the DOR Guidelines or NUREG 0588. However, paragraph (1) of 10 CFR 50.49 requires the replacement equipment of that grandfathered be upgraded to the requirements of the EQ Rule unless there are sound reasons to the contrary.

The electrical equipment qualified to the requirements of 10 CFR 50.49 is identified on the Equipment Qualification Master List (EQML). There is an EQML for each unit at North Anna.

3.11.3 Corrosion Prevention for Underground Piping

The following portions of systems, and components within these systems, are located underground and are required to attain a safe shutdown:

1. Service water system - underground piping, carbon steel.
2. Quench spray system - underground piping, stainless steel.
3. Safety injection system - underground piping, stainless steel.
4. Fuel-oil system - underground fuel tank, carbon steel; underground piping, carbon steel.
5. Fire main - underground piping, cast iron, and ductile iron. DCP 07-016
6. Condensate piping - underground piping, carbon steel.

The protective steps and measures taken are in accordance with National Association of Corrosion Engineers (NACE) Recommended Practice RP-01-69. All underground steel pipelines and tanks are coated and wrapped in accordance with Section 5, Coatings, of the above standard. The standard does not address itself to stainless steel piping. Analysis indicates that no protective coating is required.

DCP 07-016
APPENDIX 1-1
PAGE 3 OF 7

Table 9.2-10

DOMESTIC WATER SUPPLY COMPONENT DESIGN DATA

Parameter	Data
Hydropneumatic Tank	
Number	1
Type	Cylindrical, horizontal
Capacity	4000 gal
Design pressure	100 psig
Design temperature	100°F
Material	Carbon steel
Design code	ASME VIII-1968
Water Booster Pump	
Number	2
Type	Centrifugal, in-line
Motor horsepower	20
Capacity	300 gpm
Head at rated capacity	139 ft
Design pressure	135 psig
Design temperature	250°F
Seal	Packing
Material	
Pump	Cast iron
Shaft	SS 416
Impeller	Bronze
Air Compressor	
Number	1
Capacity	8.11 scfm.
Discharge pressure	60 psig
Discharge temperature	380°F

DCP 07-016

Well Pumps	Well No. 7	Well No. ~~7~~ 8	Well No. 6
Type	Submersible	Submersible	Submersible
Motor horsepower	15 hp	10 hp	10 hp
Capacity	40 gpm	50 gpm	50 gpm
Design pressure	925 ft TDH	527~~500~~ ft TDH	500 ft TDH
Well depth	730 ft	400~~305~~ ft	375 ft

DCP 07-016
APPENDIX 1-1
PAGE 4 OF 7

FC #7

All of the fire protection water systems piping and valves, including the supply lines from the fire pumps to the yard loop and the branch piping from the yard loop to the building walls, are designed to Seismic Category I requirements.

All fire protection water lines in the auxiliary and fuel buildings are designed to Seismic Category I requirements.

Carbon dioxide and Halon 1301 fire protection systems are not designed to Seismic Category I requirements.

Carbon dioxide and Halon piping supports in safety-related areas are located to ensure that piping will not damage safety-related equipment.

As previously stated, part of the regulatory criterion is compliance with Appendix A to BTP APCSB 9.5-1. Section F to Appendix A, Guidelines for Specific Plant Areas identifies the specific areas of the plant that require fire suppression systems. Section F.17, Cooling Towers, states "Cooling Towers should be of non-combustible construction or so located that a fire will not adversely affect any safety related systems or equipment." Section F.18, *Miscellaneous Areas*, states "Miscellaneous areas such as records storage areas, shops, warehouses, and auxiliary boiler rooms should be so located that a fire or effects of a fire, including smoke will not adversely affect any safety related systems or equipment." These sections do not require a fire suppression system but rely on building location to protect safety-related systems and equipment. The following fire suppression systems are not required for compliance to regulatory criterion since the areas they protect meet Section F.17 or F.18 and do not adversely affect safety-related structures, systems and components or affect safe shutdown equipment in the event of a fire.

Fuel Oil Storage Tank Foam System
Local Emergency Operating Facility (LEOF) Sprinkler System
North Anna Nuclear Information Center (NANIC) Sprinkler System
Records Storage Building Sprinkler System
Security Building Sprinkler System
Service Water Chemical Addition System Sprinkler System
~~Site Construction Office Building North (SCOBN) Sprinkler System~~ DCP 07-016
Training Center Building Sprinkler System
Warehouses, including Warehouse #2 (Admin. Annex), Sprinkler Systems
Control Room Simulator Room (Training Center Bldg.) Halon System
Monitor Control Room underfloor area (Security Bldg.) Halon System
Security Control Center underfloor area Halon System
Security Control Center North and South Cable Vaults Halon System
LEOF Computer Room (Training Center Bldg.) Halon System

DCP 07-016
APPENDIX 1-1
PAGE 5 OF 7

FC #7

A fire occurring in the fire-pump house will be fought with the standard yard hose attached to one of these valves and directing the stream into a fire inside the pump house. Portable carbon dioxide (CO_2) or dry-chemical extinguishers are also available for fire protection in the pump house.

In addition to its primary function, the fire protection system also provides alternate sources of makeup water for the spent-fuel pool and for the Unit 1 and Unit 2 auxiliary feedwater systems. The fire protection system, shown in Figure 9.5-1 and Reference Drawing 1, is Seismic Class I from the Service Water Reservoir but not from Lake Anna. The yard connections from the loop to the fuel building and from the loop to the auxiliary feedwater pumphouses are indicated in Reference Drawing 1. The line for the spent-fuel pool extends above the spent-fuel pool and is open-ended so that, when required, water may be discharged into the pool. The lines for the auxiliary feedwater systems connect with the fire protection system to provide fire protection water to the suction of all the auxiliary feedwater pumps. According to design specifications, these secondary functions of the fire protection system do not prohibit the system from performing its primary function. In accordance with BTP-APCSB 9.5-1, Appendix A, Paragraph A.4, postulated fires need not be considered concurrently with other plant accidents. (Also see Sections 9.1.3.2 and 10.4.3.3.)

The station fire-fighting equipment is as follows:

1. A 12-inch yard loop is provided, and yard hydrants are strategically placed around this loop. Branch lines from this loop serve the interior fire protection systems. The loop has a minimum cover of 5 feet for missile protection. All piping subject to freezing at the pumps is heat-traced.

   Each hydrant has a hose house furnished with hose and related firefighting equipment.

   The ~~interconnection of the~~ common yard fire main system ~~between~~ for Units 1 and 2 ~~and the area formerly for Unit 3~~ is shown on Figure 9.5-1 and Reference Drawing 1. Units 1 and 2 are furnishing one motor-driven fire pump and one diesel-driven fire pump.

   DCP 07-016

   DCP 07-016

2. An automatic water spray deluge system, which can also be manually operated (Reference Drawing 3), is provided for the following:

   a. Hydrogen seal-oil unit.

   b. Oil purifier unit.

   c. Turbine-oil reservoir.

   d. Main power transformers.

   e. Station service transformers.

   The sprinkler and water spray deluge systems are not interlocked with the building ventilation and exhaust systems. Any products of combustion will be removed by the normal exhaust systems.

DCP 07-016
APPENDIX 1-1
PAGE 6 OF 7

Figure 9.5-1
FIRE PROTECTION SYSTEM ARRANGEMENT