VERIFICATION OF VYNPS LICENSE RENEWAL PROJECT REPORT

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This report documents evaluations related to the VYNPS license renewal project. Signatures certify that the report was prepared, checked and reviewed by the License Renewal Project Team in accordance with the VYNPS license renewal project guidelines and that it was approved by the ENI License Renewal Project Manager and the VYNPS Manager, Engineering Projects.

License Renewal Project Team signatures also certify that a review for determining potential impact to other license renewal documents, based on previous revisions, was conducted for this revision.

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1.0 Introduction

1.1 Purpose

This report is part of the aging management review (AMR) of the integrated plant assessment (IPA) performed to extend the operating license of Vermont Yankee Nuclear Power Station (VYNPS). This report demonstrates the effects of aging on fuel oil (FO) system passive mechanical components will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis as required by 10 CFR 54.21(a)(3). For additional information on the license renewal project and associated documentation, refer to the License Renewal Project Plan.

The purpose of this report is to demonstrate that aging effects for passive mechanical components will be adequately managed for the period of extended operation associated with license renewal. The approach for demonstrating management of aging effects is to first identify the components that are subject to aging management review in Section 2.0. The next step is to define the aging effects requiring management for the system components in Section 3.0. Section 4.0 then evaluates if existing programs and commitments adequately manage those effects.

Applicable aging effects were determined using EPRI report 1003056 *Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools* **(Ref. 1)**. This EPRI report provides the bases for identification of aging effects based on specific materials and environments and documents confirmation of the validity of the aging effects through review of industry experience. This aging management review report (AMRR), in conjunction with EPRI report 1003056, documents the identification and evaluation of aging effects requiring management for mechanical components in the FO system.

1.2 System Description

The FO system consists of: **(Ref. 2, 3, 10)**

storage tanks including:
fuel oil storage tank (TK-40-1A)
diesel oil day tanks (TK-42-1A, B)
diesel fire pump day tank (TK-43-1A)
heating boiler fuel oil storage tank (TK-41-1A)
John Deere diesel day tank (TK-DG-3-1A)
Associated components (flex hose, injectors, piping, pumps, strainers, tubing, valves, etc.) to deliver fuel to the engines

The system operates only when an associated engine is operating. **(Ref. 26)**

For additional description of the system and its components, see the emergency diesel generator (EDG) system design basis document. **(Ref. 3)**

1.3 System and Component Intended Functions

As described in UFSAR Section 8.5, the FO system provides fuel oil from the day tanks to the corresponding EDG and automatic makeup from the fuel oil storage tank to the EDG day tanks such that a seven day supply is available for one EDG. **(Ref. 2)**

The nonsafety-related diesel driven fire pump uses fuel oil from the fuel oil storage tank. As the diesel driven fire pump is required for compliance with the Commission's regulations concerning fire protection (10CFR50.48), providing fuel oil for its day tank is an intended function of the FO system. **(Ref. 2, 4)**

The John Deere diesel uses fuel oil from the fuel oil storage tank. As the John Deere diesel is required for compliance with the Commission's regulations concerning fire protection (10CFR50.48), providing fuel oil for its day tank is an intended function of the FO system. **(Ref. 6)**

The only safety-related function of the house heating boiler system is to maintain pressure boundary of the control room ventilation system. The boilers do not have a safety-related function. The system is not required for compliance with the Commission's regulations for anticipated transients without scram (10CFR50.62), environmental qualification (10CFR50.49), fire protection (10CFR40.48), pressurized thermal shock (10CFR50.61 – not applicable for BWRs), or station blackout (10CFR50.63). Therefore, providing fuel oil to the boilers is not an intended function of the FO system. **(Ref. 4, 5, 6, 7)**

The FO system passive mechanical components are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for anticipated transients without scram (10CFR50.62), environmental qualification (10CFR50.49), pressurized thermal shock (10CFR50.61 – not applicable for BWRs), or station blackout (10CFR50.63). **(Ref. 5, 6, 7)**

For license renewal, the primary intended function of the FO system components and piping is to maintain system pressure boundary integrity. Flame arrestors in this system have the intended function of flow control. For additional information on system and component functions, see the EDG system design basis document **(Ref. 3)**.

System components outside of the safety class boundary of the FO system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] that are not reviewed in this AMRR are reviewed in AMRM-30, Aging Management Review of Nonsafety-related Systems and Components Affecting Safety-related Systems. For VYNPS this includes items such as piping, valves, pumps, and support elements outside of the safety class pressure boundary, that are required to be structurally sound in order to maintain the integrity of safety class piping.

Refer to VYNPS Report LRPD-01, System and Structure Scoping Results, for additional information on scoping and intended functions of systems and structures for license renewal.

2.0 Screening

Passive, long-lived components that perform a license renewal component intended function are subject to aging management review. Bolting, filter housings, flame arrestors, flex hose, injector housings, piping, pump casings, sight glass, strainer housings, tanks, thermowell, tubing and valve bodies in the FO system are passive, long-lived components. The John Deere diesel flex hoses will be periodically replaced and are therefore not long-lived components. **(Ref. 20)**

Components in the FO system included in this AMRR are the fuel oil storage and day tanks, and components that maintain the pressure boundary of the system from the tanks to the engines requiring fuel. Flame arrestors on the fuel oil storage and day tanks are also included for flow control.

Emergency diesel engine fuel oil relief valves (RV-24-3A and RV-24-3B) are included in this AMRR although they are listed as part of the diesel generator (DG) system in the VY component database. The emergency diesel engines are reviewed in report AMRM-13, Aging Management Review of the Emergency Diesel Generator System. Diesel fire pump day tank (TK-43-1A) is included in this AMRR although it is listed as part of the fire protection (FP) system in the VY component database. The fire pump diesel engine is reviewed in report AMRM-17, Aging Management Review of the Fire Protection – Water System. John Deere diesel engine fuel tank (TK-DG-3-1A) is included in this AMRR although it is listed as part of the security (SEC) system in the VY component database. The John Deere diesel engine is reviewed in report AMRM-21, Aging Management Review of the John Deere Diesel.

Fuel filters in the diesel fire pump and John Deere diesel fuel oil systems are short-lived components that are replaced annually and are, therefore, not subject to aging management review. **(Ref. 22, 23)**

EDG duplex filter elements are short-lived components that are inspected and replaced as necessary and are, therefore, not subject to aging management review. The duplex filter housings are reviewed for aging effects requiring management. **(Ref. 24)**

Nonsafety-related components that are not required for diesel operation such as tank overflow lines and leak/drip collection lines are not reviewed. Tank vents have been included for conservatism to ensure venting is performed to allow the tank to drain (see LRA-G-191162, Sh. 2 for details).

Insulation is installed on some equipment in the FO system. For the evaluation of insulation, refer to LRPD-01, System and Structure Scoping Results, and AMRC-06, Aging Management Review of Bulk Commodities.

A list of the FO system passive mechanical components subject to aging management review is included as Attachment 1. The flow diagram associated with this system, highlighted to identify components requiring aging management review, is available as drawing LRA-G-191162, Sh. 2. **(Ref. 10)**

3.0 Aging Effects Requiring Management

EPRI report 1003056 is used in this section to identify and evaluate aging effects requiring management. Aging effects that may result in loss of intended functions for non-Class 1 mechanical components are cracking (i.e., crack initiation, crack growth, and through-wall cracking), change in material properties, loss of material, and fouling. For additional information on aging effects, refer to the EPRI report. **(Ref. 1)**

The system has components located outside, in the turbine building, at the intake structure and in the John Deere diesel building. Ambient outside air temperature ranges from about -5°F to 90°F and temperatures in the turbine building, intake structure and John Deere diesel building may be slightly higher. The lines between the fuel oil storage tank and the turbine building are heat traced to keep them from falling below 40°F. Although diesel engine fuel oil temperature is not measured, lube oil inlet temperature, which can be conservatively representative of fuel oil temperature, ranges from 150 to 185°F. The only portions of the system that would experience temperatures this high are the engine fuel injectors and return header to the day tanks. The remainder of the system remains below 140°F. **(Ref. 2, 10, 14, 26)**

Attachment 1 is a list of FO system components that require aging management review in this AMRR. These components are highlighted on the associated LRA drawing.

The following sections document the determination of aging effects requiring management for specific component materials and environments.

3.1 Fuel Oil Storage Tank (TK-40-1A)

Fuel oil storage tank, TK-40-1A, is an outdoor, above-ground carbon steel tank coated on its internal and external surfaces. The tank is in contact with fuel oil on internal surfaces. The tank foundation is concrete on a sand cushion. Therefore, external surfaces of the tank are exposed to outdoor air and concrete. **(Ref. 2, 15, 31)**

Loss of material from microbiologically influence corrosion (MIC) and general, pitting and crevice corrosion is an aging effect requiring management for internal surfaces. Erosion is not a concern due to the low oil velocities and limited operating time of this system.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 220°F threshold for carbon steel thermal fatigue. **(Ref. 25, 26)**

Loss of material from general, pitting and crevice corrosion is an aging effect requiring management for carbon steel external surfaces exposed to weather.

Loss of material from MIC and general, pitting and crevice corrosion is an aging effect requiring management for carbon steel external surfaces in contact with concrete.

3.2 Diesel Oil Day Tanks (TK-42-1A/B)

Diesel oil day tanks, TK-42-1A/B, are indoor carbon steel tanks coated on the internal and external surfaces. The tanks are in contact with fuel oil on internal surfaces and indoor air on external surfaces. **(Ref. 2, 16)**

Loss of material from MIC and general, pitting and crevice corrosion is an aging effect requiring management for internal surfaces. Erosion is not a concern due to the low oil velocities and limited operating time of this system.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 220°F threshold for carbon steel thermal fatigue. **(Ref. 25, 26)**

Loss of material from general corrosion is considered an aging effect requiring management for carbon steel external surfaces exposed to indoor air.

3.3 Diesel Fire Pump Day Tank (TK-43-1A)

Diesel fire pump day tank, TK-43-1A, is an indoor carbon steel tank coated on the internal and external surfaces. The tank is in contact with fuel oil on internal surfaces and indoor air on external surfaces. **(Ref. 2, 16, 31)**

Loss of material from MIC and general, pitting and crevice corrosion is an aging effect requiring management for internal surfaces. Erosion is not a concern due to the low oil velocities and limited operating time of this system.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 220°F threshold for carbon steel thermal fatigue. **(Ref. 25, 26)**

Loss of material from general corrosion is considered an aging effect requiring management for carbon steel external surfaces exposed to indoor air.

3.4 John Deere Diesel Day Tank (TK-DG-3-1A) and Piping

The John Deere diesel day tank is a double-walled fiberglass underground tank. The inner wall, the fuel oil pressure boundary, is in contact with fuel oil internally and an interstitial monitoring fluid externally. The exterior wall is in contact with the interstitial monitoring fluid internally and soil externally. Piping associated with this tank is also double-walled fiberglass. **(Ref. 2, 14, 17)**

Fiberglass designed for petrochemical storage is not expected to experience aging effects requiring management in a fuel oil or underground environment. Since the interstitial monitoring fluid (brine) was selected for its compatibility with fiberglass, the tank is not expected to experience aging effects requiring management due to the monitoring fluid. **(Ref. 17)**

3.5 Carbon Steel Components (Fuel Oil - Internal, Indoor or Outdoor Air - External)

The system piping and valves are carbon steel (pipe code CS-1). Many emergency diesel generator fuel oil components are carbon steel; including duplex filter housings (no component numbers); clean fuel return tanks (no component numbers) and associated pump casings (P-202-1A/B); fuel oil transfer pump casings (P-92-1A/B) and associated suction strainer housings (S-78-2A/B); engine driven fuel pump and hand priming pump casings (no component numbers); and fuel injectors (no component numbers). Diesel fire pump carbon steel components include the strainer, injectors, and portions of the injector pump casing (no component numbers). John Deere diesel carbon steel components include the strainer,

injectors, and injector pump casing (no component numbers). See Attachment 1 for a list of carbon steel components. These components are exposed to fuel oil on internal surfaces and indoor or outdoor air on external surfaces. **(Ref. 10, 11, 12, 19, 30, 31)**

Loss of material due to MIC and general, pitting and crevice corrosion is an aging effect requiring management for carbon steel surfaces exposed to fuel oil. Localized galvanic corrosion is also possible at interfaces between carbon steel and stainless steel or copper alloy components. Erosion is not a concern due to the low oil velocities and limited operating time of this system.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 220°F threshold for carbon steel thermal fatigue. **(Ref. 25, 26)**

Loss of material from general corrosion is considered an aging effect requiring management for carbon steel external surfaces exposed to indoor air.

Loss of material from general, pitting and crevice corrosion is considered an aging effect requiring management for carbon steel external surfaces exposed to outdoor air.

3.6 Carbon Steel Components (Fuel Oil - Internal and External)

Fill connection piping for the diesel fire pump day tank is carbon steel. See Attachment 1 for a list of carbon steel components. The submerged portion of this piping is exposed to fuel oil on internal and external surfaces and indoor air on external surfaces. **(Ref. 10)**

Loss of material due to MIC and general, pitting and crevice corrosion is an aging effect requiring management for carbon steel surfaces exposed to fuel oil. Localized galvanic corrosion is also possible at interfaces between carbon steel and stainless steel or copper alloy components. Erosion is not a concern due to the low oil velocities and limited operating time of this system.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 220°F threshold for carbon steel thermal fatigue. **(Ref. 25, 26)**

3.7 Carbon Steel Components (Fuel Oil – Internal, Soil – External)

Approximately 250’ of piping between the fuel oil transfer pumps and the day tanks is underground. This carbon steel pipe is in contact with fuel oil on internal surfaces and soil (including groundwater) on external surfaces. See Attachment 1 for a list of carbon steel components. **(Ref. 10, 31)**

Loss of material from MIC and general, pitting and crevice corrosion is an aging effect requiring management for internal surfaces. Localized galvanic corrosion is also possible at interfaces between carbon steel and stainless steel components. Erosion is not a concern due to the low oil velocities and limited operating time of this system.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 220°F threshold for carbon steel thermal fatigue. **(Ref. 25, 26)**

Loss of material from MIC and general, pitting and crevice corrosion is an aging effect requiring management for carbon steel external surfaces in contact with soil.

3.8 Carbon Steel Components (Outdoor Air – Internal and External)

Vent piping for the fuel oil storage tank, diesel oil day tanks, and diesel fire pump day tank is carbon steel. Fill connection piping for the diesel fire pump day tank is carbon steel. See Attachment 1 for a list of carbon steel components. These components are exposed to outdoor air on internal and external surfaces. **(Ref. 10)**

Loss of material from general, pitting, crevice and galvanic corrosion is an aging effect requiring management for carbon steel internal and external surfaces since they are exposed to weather.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 220°F threshold for carbon steel thermal fatigue.

3.9 Stainless Steel Components

The thermowell housing fuel oil transfer pump suction header temperature indicator (TX-108-5) is stainless steel. FO system relief valves are stainless steel. The EDG FO system contains stainless steel flexible hoses between the day tanks and the diesel engines. The John Deere diesel uses stainless steel flexible hoses. See Attachment 1 for a list of stainless steel components. These components are exposed to fuel oil on internal surfaces and indoor air on external surfaces. **(Ref. 10, 18, 20, 30)**

Stainless steel is inherently resistant to general corrosion and erosion. Stainless steel internal surfaces are susceptible to loss of material due to MIC, pitting and crevice corrosion if moisture or contaminants are present in the fuel oil. Therefore, loss of material is an aging effect requiring management for internal wetted surfaces.

Cracking due to stress corrosion and intergranular attack is an aging effect requiring management for the stainless steel flex hoses in the return header piping to the day tanks since temperature may exceed the 140°F threshold for these mechanisms in stainless steel. **(Ref. 25, 26)**

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains below the 270°F threshold for stainless steel thermal fatigue. **(Ref. 25, 26)**

There are no aging effects requiring management for external stainless steel surfaces due to the inherent resistance of stainless steel to aging effects when not wetted or exposed to aggressive chemicals. Insulation, if used on FO components, is free of contaminants that could cause cracking of stainless steel. **(Ref. 13)**

3.10 Copper Alloy Components

EDG engine driven fuel pump and hand priming pump discharge check valves (no numbers) are copper alloy of unknown Zn content. The diesel fire pump FO system contains tubing (copper alloy <15%Zn) and gate valves (copper alloy of unknown Zn content). The diesel fire pump FO system also contains a sight glass, the housing of which is copper alloy of unknown

Zn content. The John Deere diesel uses flex hoses containing copper alloy of unknown Zn content. In the absence of Zn information, >15% Zn is assumed. See Attachment 1 for a list of copper alloy components. These components are exposed to fuel oil on internal surfaces and indoor air on external surfaces. **(Ref. 10, 20, 21, 30)**

Loss of material from pitting, crevice corrosion, and MIC is an aging effect requiring management for copper alloy surfaces exposed to fuel oil since water and contaminants may be present. Copper alloy > 15% Zn that is not inhibited may also experience selective leaching in oil. Erosion is not expected due to low flow velocities.

Cracking due to stress corrosion and intergranular attack is not an aging effect requiring management for copper alloy since an ammonia environment is not present.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains low. **(Ref. 25, 26)**

No aging effects require management for external surfaces of copper alloy components exposed to indoor air due to the corrosion resistance of copper alloys in air.

3.11 Aluminum Components (Outdoor Air – Internal and External)

Flame arrestors on the fuel oil storage tank, diesel oil day tank, and diesel fire pump day tank are aluminum. See Attachment 1 for a list of aluminum components. These components are exposed to outdoor air on internal and external surfaces. **(Ref. 10)**

There are no aging effects requiring management for internal or external aluminum surfaces due to the inherent corrosion resistance of aluminum in an outdoor air environment.

3.12 Aluminum Components (Fuel Oil – Internal, Indoor Air – External)

The John Deere diesel fuel injector pump casing and portions of the diesel fire pump fuel injector pump casing are aluminum. See Attachment 1 for a list of aluminum components. These components are exposed to fuel oil on internal surfaces and indoor air on external surfaces. **(Ref. 30)**

Loss of material due to MIC and pitting and crevice corrosion is an aging effect requiring management for aluminum surfaces exposed to fuel oil. Erosion is not a concern due to the low oil velocities and limited operating time of this system.

Cracking due to thermal fatigue is not an aging effect requiring management since system temperature remains low. **(Ref. 25, 26)**

There are no aging effects requiring management for external aluminum surfaces due to the inherent corrosion resistance of aluminum in an indoor air environment.

3.13 Glass

The diesel fire pump FO system contains a sight glass, the face of which is glass. There are no aging effects requiring management for the glass since glass is resistant to aging effects when it is not exposed to very hot water, hydrofluoric acids or caustics. **(Ref. 10)**

3.14 Bolting

Pressure retaining bolting in this system is carbon steel and is exposed to indoor or outdoor air. **(Ref. 30)**

Loss of material from general corrosion is considered an aging effect requiring management for carbon steel bolting exposed to indoor or outdoor air.

3.15 Operating Experience

The review of site specific operating experience and recent industry operating experience completed in VYNPS Report LRPD-05, Operating Experience Review Results, did not identify aging effects applicable to the FO system passive mechanical components not addressed in this aging management review report. **(Ref. 9)**

Ultrasonic thickness measurements of the bottom of the fuel oil storage tank in 1996 verified that existing programs are successful in managing loss of material for this above ground carbon steel tank. **(Ref. 27, 28)**

4.0 Demonstration That Aging Effects Will Be Managed

The components of the FO system that are subject to aging management review were described in Section 2.0. For those components, Section 3.0 documented the determination of aging effects requiring management. The aging management review is completed by demonstrating that existing programs, when continued into the period of extended operation, can manage the aging effects identified in Section 3.0. No further action is required for license renewal when the evaluation of an existing program demonstrates that it is adequate to manage the aging effect such that corrective action may be taken prior to loss of the system intended functions. Alternately, if existing programs cannot be shown to manage the aging effects for the period of extended operation, then action will be proposed to augment existing or create new programs to manage the identified effects of aging.

Demonstration for the purposes of this license renewal technical evaluation is accomplished by establishing a clear relationship among

the components under review,

the aging effects on these items caused by the material-environment-stress combinations which, if undetected, could result in loss of the intended function such that the system could not perform its function(s) within the scope of license renewal in the period of extended operation, and

the credited aging management programs whose actions serve to preserve the system intended function(s) for the period of extended operation.

Attachment 2 lists component types and identifies the aging effects requiring management for each material and environment combination. The Buried Piping Inspection Program, Diesel Fuel Monitoring Program, and System Walkdown Program in combination will manage the effects of aging, thereby precluding loss of the intended functions of the system. Sections 4.1 through 4.3 provide the clear relationship between the component, the aging effect, and the aging management program actions which preserve the intended functions for the period of extended operation. Section 4.4 identifies applicable time-limited aging analyses. For a comprehensive review of programs credited for license renewal of VYNPS and a demonstration of how these programs will manage aging effects, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.1 Buried Piping Inspection Program

The Buried Piping Inspection Program manages loss of material from external surfaces of buried carbon steel components by visual inspection.

This program applies to component types indicated on Attachment 2. For additional information on this program, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.2 Diesel Fuel Monitoring Program

The Diesel Fuel Monitoring Program manages loss of material for aluminum, carbon steel, stainless steel, and copper alloy components wetted by fuel oil by ensuring that diesel fuel quality is maintained. The program also manages cracking for stainless steel components wetted by fuel oil by ensuring that diesel fuel quality is maintained.

The Diesel Fuel Monitoring Program includes periodic visual inspections to manage loss of material on internal and external surfaces of fuel oil storage tank, TK-40-1A. TK-40-1A is periodically drained, visually and ultrasonically inspected, cleaned and refilled under the Diesel Fuel Monitoring Program. These inspections, along with maintenance of diesel fuel quality, manage loss of material on internal surfaces of the carbon steel tank.

This program applies to component types indicated on Attachment 2. For additional information on this program, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.3 System Walkdown Program

Under the System Walkdown Program, visual inspections are conducted to manage aging effects on components. For the FO system, the System Walkdown Program manages loss of material for external carbon steel components by visual inspection of external surfaces. Since some internal carbon steel surfaces in this system are exposed to the same environment as the external surfaces, external surfaces will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the System Walkdown Program.

This program applies to component types indicated on Attachment 2. For additional information on this program, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results. **(Ref. 8)**

4.4 Time-Limited Aging Analyses

This system is not exposed to elevated temperatures and the associated metal fatigue. Therefore, metal fatigue analyses are not time-limited aging analysis (TLAA) applicable to this system.

See VYNPS Reports LRPD-03, TLAA and Exemption Evaluation Results, for further review of time-limited aging analyses. **(Ref. 29)**

5.0 Summary and Conclusions

The following aging management programs address the aging effects requiring management for the FO system.

- Buried Piping Inspection Program
- Diesel Fuel Monitoring Program
- System Walkdown Program

For additional review of programs credited for license renewal of VYNPS, see VYNPS Report LRPD-02, Aging Management Program Evaluation Results.

Attachment 2 contains the aging management review results for the FO System.

In conclusion, programs described in Section 4.0 will provide reasonable assurance that the effects of aging on the FO system will be managed such that the intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

6.0 References

1. *Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools*, Revision 3, EPRI, Palo Alto, CA: 2001. 1003056 (The Mechanical Tools)

2. VYNPS Updated Final Safety Analysis Report (UFSAR), Rev. 19-1 Sections 8.5 and 10.11

3. Document EDG, VYNPS Design Basis Document for Emergency Diesel Generator and Auxiliary Systems, Rev. 2, 12/7/04

4. ENN-MS-S-009-VY, Vermont Yankee Site Specific Guidance and System Safety Function Sheets, Rev. 0, 3/22/05

5. Document SADBD, Topical Design Basis Document for Safety Analysis, Rev. 4

6. VYNPP Safe Shutdown Capability Analysis, Rev. 7, 6/26/04

7. VY Environmental Qualification Program Manual, Volume 1, Section 6.0, Rev. 18

8. VYNPS Report LRPD-02, Aging Management Program Evaluation Results

9. VYNPS Report LRPD-05, Operating Experience Review Results

10. Flow Diagram G-191162 Sh. 2, Rev. 25, Miscellaneous Systems Fuel Oil

11. Drawing B-191261, Rev. 6, Instrument Installation Details

12. BWR QC-10, Ebasco Piping Specification, 3/15/70

13. VYNP-III-I-1, Ebasco Insulation Specification, Rev. 2, 12/23/69

14. AP 4801, Management of Underground Storage Tanks (USTs), Rev. 3 lpc00, 12/18/97

15. Drawing 5920-3914, Fuel Oil Stg Tank – Elev & Dets, Rev. 1, 8/8/69

16. Drawing 5920-4047, Diesel Oil Day Tanks, Rev. 2, 2/15/69

17. EDCR 97-0408, Underground Storage Tank Upgrades, 7/6/98

18. Work Order 01-000897-000, Install Thermowell for TI-108-5, in Fuel Oil Transfer Pumps Common Suction Header, 7/22/00

19. VYNPS photographs stored on vyshared1/maintenance public folders/shortcut to Camera 95

20. Equivalency Evaluation No. 1383, John Deere Diesel Fuel Oil Lines, 11/22/00

21. Drawing 5920-3266, Diesel Fuel Tank for Fire Pump P-40-1A, Rev. 1, 11/1/78

22. Repetitive Work Order 03-001112-000, Diesel Fire Pump P-40-1A Annual PM, 7/23/03

23. Repetitive Work Order 03-001108-000, Annual PM for John Deere Diesel, 6/17/03

24. Repetitive Work Order 01-002294-000, Major Diesel Overhaul & Inspection, 11/26/01

25. VYEM 0107, Emergency Diesel Generators Service Manual, Rev. 16, 6/20/05

26. OP 4126, Diesel Generators Surveillance, Rev. 49 lpc01, 10/26/05

27. WO 94-08951-00F, Clean Internals of Diesel Fuel Oil Tank TK-40-1A, 10/17/96

28. WO 94-08951-02F, Perform Ultrasonic Examination of Bottom of Diesel Fuel Oil Tank TK-40-1A, 9/28/96

29. VYNPS Report LRPD-03, TLAA and Exemption Evaluation Results

30. Walkdown information provided by Daniel Jeffries in email dated 9/24/04

31. Walkdown information provided by Daniel Jeffries in email dated 11/19/04

ENVIRONMENT: AIR - INDOOR (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
FO SYSTEM BOLTING	bolting	FO SYSTEM BOLTING	carbon steel

ENVIRONMENT: AIR - OUTDOOR (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
FO SYSTEM BOLTING	bolting	FO SYSTEM BOLTING	carbon steel

ENVIRONMENT: AIR - OUTDOOR (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
FO SYSTEM FLAME ARRESTORS	flame arrestor	FO SYSTEM FLAME ARRESTORS	aluminum
FO SYSTEM OUTDOOR VENT PIPING	piping	FO SYSTEM OUTDOOR VENT/FILL PIPING	carbon steel

ENVIRONMENT: CONCRETE (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
TK-40-1A	tank	FUEL OIL STORAGE TANK	carbon steel

ENVIRONMENT: FUEL OIL (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
FO SYSTEM INDOOR PIPING	piping	FO SYSTEM INDOOR PIPING	carbon steel

ENVIRONMENT: FUEL OIL (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
A DIESEL CLEAN FUEL RETURN TANK	tank	A DIESEL CLEAN FUEL RETURN TANK	carbon steel
A DIESEL DUPLEX FILTER HOUSING	filter housing	A DIESEL DUPLEX FILTER HOUSING	carbon steel
A DIESEL ENGINE-DRIVEN FUEL PUMP	pump casing	A DIESEL ENGINE-DRIVEN FUEL PUMP	carbon steel
A DIESEL ENGINE-DRIVEN FUEL PUMP DISCHARGE CHECK	valve body	A DIESEL ENGINE-DRIVEN FUEL PUMP DISCHARGE CHECK VALVE	copper alloy >15% Zn
A DIESEL FUEL INJECTORS	injector housing	A DIESEL FUEL INJECTORS	carbon steel
A DIESEL HAND PRIMING PUMP	pump casing	A DIESEL HAND PRIMING PUMP	carbon steel
A DIESEL HAND PRIMING PUMP DISCHARGE CHECK VALVE	valve body	A DIESEL HAND PRIMING PUMP DISCHARGE CHECK VALVE	copper alloy >15% Zn
B DIESEL CLEAN FUEL RETURN TANK	tank	B DIESEL CLEAN FUEL RETURN TANK	carbon steel
B DIESEL DUPLEX FILTER HOUSING	filter housing	B DIESEL DUPLEX FILTER HOUSING	carbon steel

ENVIRONMENT: FUEL OIL (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
B DIESEL ENGINE-DRIVEN FUEL PUMP	pump casing	B DIESEL ENGINE-DRIVEN FUEL PUMP	carbon steel
B DIESEL ENGINE-DRIVEN FUEL PUMP DISCHARGE CHECK	valve body	B DIESEL ENGINE-DRIVEN FUEL PUMP DISCHARGE CHECK VALVE	copper alloy >15% Zn
B DIESEL FUEL INJECTORS	injector housing	B DIESEL FUEL INJECTORS	carbon steel
B DIESEL HAND PRIMING PUMP	pump casing	B DIESEL HAND PRIMING PUMP	carbon steel
B DIESEL HAND PRIMING PUMP DISCHARGE CHECK VALVE	valve body	B DIESEL HAND PRIMING PUMP DISCHARGE CHECK VALVE	copper alloy >15% Zn
DIESEL FIRE PUMP FUEL INJECTOR PUMP	pump casing	DIESEL FIRE PUMP FUEL INJECTOR PUMP	aluminum
DIESEL FIRE PUMP FUEL INJECTOR PUMP	pump casing	DIESEL FIRE PUMP FUEL INJECTOR PUMP	carbon steel
DIESEL FIRE PUMP FUEL INJECTORS	injector housing	DIESEL FIRE PUMP FUEL INJECTORS	carbon steel
DIESEL FIRE PUMP FUEL STRAINER	strainer housing	DIESEL FIRE PUMP FUEL STRAINER	carbon steel
FIRE PUMP DIESEL FO SIGHTGLASS	sightglass	FIRE PUMP DIESEL FO SIGHTGLASS and HOUSING	copper alloy >15% Zn
FIRE PUMP DIESEL FO SIGHTGLASS	sightglass	FIRE PUMP DIESEL FO SIGHTGLASS and HOUSING	glass
FO SYSTEM BURIED PIPING	piping	FO SYSTEM BURIED PIPING	carbon steel
FO SYSTEM BURIED PIPING	piping	FO SYSTEM BURIED PIPING	fiberglass

ENVIRONMENT: FUEL OIL (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
FO SYSTEM COPPER TUBING	tubing	FO SYSTEM COPPER TUBING	copper alloy <15% Zn
FO SYSTEM FLEX HOSES CONTAINING COPPER	flex hose	FO SYSTEM FLEX HOSES CONTAINING COPPER	copper alloy >15% Zn
FO SYSTEM INDOOR PIPING	piping	FO SYSTEM INDOOR PIPING	carbon steel
FO SYSTEM STAINLESS STEEL FLEX HOSES	flex hose	FO SYSTEM STAINLESS STEEL FLEX HOSES	stainless steel
JOHN DEERE DIESEL FUEL INJECTOR PUMP	pump casing	JOHN DEERE DIESEL FUEL INJECTOR PUMP	aluminum
JOHN DEERE DIESEL FUEL INJECTORS	injector housing	JOHN DEERE DIESEL FUEL INJECTORS	carbon steel
JOHN DEERE DIESEL FUEL STRAINER	strainer housing	JOHN DEERE DIESEL FUEL STRAINER	carbon steel
LCV-108-2A	valve body	DIESEL OIL DAY TANK A	carbon steel
LCV-108-2B	valve body	DIESEL OIL DAY TANK B	carbon steel
LCV-108-3	valve body	RETIRED IN PLACE - FUEL OIL DAY TANK FOR HEATING BOILERS	carbon steel
P-202-1A	pump casing	A DIESEL CLEAN FUEL RETURN TANK PUMP	carbon steel
P-202-1B	pump casing	B DIESEL CLEAN FUEL RETURN TANK PUMP	carbon steel
P-92-1A	pump casing	FO TRANSFER PUMP	carbon steel
P-92-1B	pump casing	FO TRANSFER PUMP	carbon steel
RV-24-3A	valve body	DG-1-1A FUEL OIL RELIEF VALVE	stainless steel
RV-24-3B	valve body	DG-1-1B FUEL OIL RELIEF VALVE	stainless steel

ENVIRONMENT: FUEL OIL (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
S-78-2A	strainer housing	FUEL OIL TRANSFER SYSTEM STRAINER	carbon steel
S-78-2B	strainer housing	FUEL OIL TRANSFER SYSTEM STRAINER	carbon steel
S-78-3A	strainer housing	EMERGENCY DIESEL GENERATOR "A" ENGINE DRIVEN FUEL OIL PUMP SUCTION STRAINER.	carbon steel
S-78-3B	strainer housing	EMERGENCY DIESEL GENERATOR "B", ENGINE DRIVEN FUEL OIL PUMP SUCTION STRAINER.	carbon steel
SR-78-3A	valve body	FUEL OIL TRANSFER SYSTEM RELIEF VALVE	stainless steel
SR-78-3B	valve body	FUEL OIL TRANSFER SYSTEM RELIEF VALVE	stainless steel
TK-40-1A	tank	FUEL OIL STORAGE TANK	carbon steel
TK-42-1A	tank	DIESEL OIL DAY TANK	carbon steel
TK-42-1B	tank	DIESEL OIL DAY TANK	carbon steel
TK-43-1A	tank	DIESEL FIRE PUMP DAY TANK	carbon steel
TK-DG-3-1A	tank	JOHN DEERE DIESEL ENGINE FUEL TANK	fiberglass
TX-108-5	thermowell	THERMOWELL HOUSING FUEL OIL TRANSFER PUMP A/B SUCTION HEADER TEMPERATURE INDICATOR (TI-108-5) INSTALLED BY WO 01-897	stainless steel
V78-10A	valve body	GATE VALVE	carbon steel
V78-11	valve body	GATE VALVE	carbon steel
V78-12A	valve body	GATE VALVE	carbon steel
V78-12B	valve body	GATE VALVE	carbon steel
V78-14A	valve body	GATE VALVE	carbon steel
V78-14B	valve body	GATE VALVE	carbon steel
V78-15A	valve body	GATE VALVE	carbon steel
V78-15B	valve body	GATE VALVE	carbon steel
V78-16A	valve body	GATE VALVE	carbon steel
V78-16B	valve body	GATE VALVE	carbon steel
V78-2	valve body	FOS CHECK VALVES	carbon steel
V78-25A	valve body	GATE VALVE	carbon steel

ENVIRONMENT: FUEL OIL (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
V78-25B	valve body	GATE VALVE	carbon steel
V78-25C	valve body	GATE VALVE	carbon steel
V78-25D	valve body	GATE VALVE	carbon steel
V78-27A	valve body	GATE VALVE	carbon steel
V78-27B	valve body	GATE VALVE	carbon steel
V78-28A	valve body	FO CHECK VALVE, P-92-1A DISCHARGE CHECK VALVE	carbon steel
V78-28B	valve body	FO CHECK VALVE, P-92-1B DISCHARGE CHECK VALVE	carbon steel
V78-29A	valve body	GATE VALVE	carbon steel
V78-29B	valve body	GATE VALVE	carbon steel
V78-30A	valve body	FO GATE VALVES	carbon steel
V78-30B	valve body	FO GATE VALVES	carbon steel
V78-4	valve body	GATE VALVES	carbon steel
V78-40A	valve body	STRAINER INLET TURB BLDG 252' DIESEL FO DAY TANK A ROOM	carbon steel
V78-40B	valve body	STRAINER INLET TURB BLDG 252' DIESEL FO DAY TANK B ROOM	carbon steel
V78-44	valve body	PSH-108-5 FO STRG BLDG FO PUMP ROOM	carbon steel
V78-44H	valve body	LS-108-15 4 AND 14 OUTSIDE FO STRG BLDG	carbon steel
V78-46	valve body	PI-12 FO STRG BLDG FO PUMP ROOM	carbon steel
V78-48A	valve body	PI-8A FO STRG BLDG FO PUMP ROOM	carbon steel
V78-48B	valve body	PI-8B FO STRG BLDG FO PUMP ROOM	carbon steel
V78-5	valve body	GATE VALVE	carbon steel
V78-50A	valve body	PI-5A FO STRG BLDG FO PUMP ROOM	carbon steel
V78-50B	valve body	PI-5B FO STRG BLDG FO PUMP ROOM	carbon steel
V78-6	valve body	GATE VALVE	carbon steel
V78-60A	valve body	LSH-108-2B DRAIN TURB BLDG 252' DIESEL FO DAY TANK B ROOM	carbon steel

ENVIRONMENT: FUEL OIL (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
V78-60B	valve body	LSH-108-12B DRAIN TURB BLDG 252' DIESEL FO DAY TANK B ROOM	carbon steel
V78-60C	valve body	LSH-108-3B DRAIN TURB BLDG 252' DIESEL FO DAY TANK B ROOM	carbon steel
V78-60D	valve body	LSH-108-13B DRAIN TURB BLDG 252' DIESEL FO DAY TANK B ROOM	carbon steel
V78-61A	valve body	LSH-108-2A DRAIN TURB BLDG 252' DIESEL FO DAY TANK A ROOM	carbon steel
V78-61B	valve body	LSH-108-12A DRAIN TURB BLDG 252' DIESEL FO DAY TANK A ROOM	carbon steel
V78-61C	valve body	LSH-108-13A DRAIN TURB BLDG 252' DIESEL FO DAY TANK A ROOM	carbon steel
V78-61D	valve body	LSH-108-3A DRAIN TURB BLDG 252' DIESEL FO DAY TANK A ROOM	carbon steel
V78-7	valve body	FUEL TANK SAMPLE VALVE #1	carbon steel
V78-8A	valve body	GATE VALVE	carbon steel
V78-8B	valve body	GATE VALVE	carbon steel
V78-9	valve body	GATE VALVE	carbon steel
V80-1	valve body	DIESEL FIRE PUMP DAY TANK GATE VALVES (DFPDT)	copper alloy >15% Zn
V80-2	valve body	DIESEL FIRE PUMP DAY TANK GATE VALVES (DFPDT)	copper alloy >15% Zn

ENVIRONMENT: INTERSTITIAL FLUID (BRINE) (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
TK-DG-3-1A	tank	JOHN DEERE DIESEL ENGINE FUEL TANK	fiberglass

ENVIRONMENT: INTERSTITIAL FLUID (BRINE) (INTERNAL)

Comp ID	Comp Type	Comp Name	Material
TK-DG-3-1A	tank	JOHN DEERE DIESEL ENGINE FUEL TANK	fiberglass

ENVIRONMENT: SOIL (EXTERNAL)

Comp ID	Comp Type	Comp Name	Material
FO SYSTEM BURIED PIPING	piping	FO SYSTEM BURIED PIPING	carbon steel
FO SYSTEM BURIED PIPING	piping	FO SYSTEM BURIED PIPING	fiberglass
TK-DG-3-1A	tank	JOHN DEERE DIESEL ENGINE FUEL TANK	fiberglass

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Bolting	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - outdoor (ext)	Loss of material	System walkdown
Filter housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
Flame arrestor	Flow control	Aluminum	Air - outdoor (ext)	None	None
			Air - outdoor (int)	None	None
Flex hose	Pressure boundary	Copper alloy >15% Zn	Air - indoor (ext)	None	None
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
		Stainless steel	Air - indoor (ext)	None	None
			Fuel oil (int)	Cracking	Diesel fuel monitoring
				Loss of material	Diesel fuel monitoring
Injector housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Fuel oil (int)	Loss of material	Diesel fuel monitoring

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Piping	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - outdoor (ext)	Loss of material	System walkdown
			Air - outdoor (int)	Loss of material	System walkdown
			Fuel oil (ext)	Loss of material	Diesel fuel monitoring
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
			Soil (ext)	Loss of material	Buried piping inspection
		Fiberglass	Fuel oil (int)	None	None
			Soil (ext)	None	None
Pump casing	Pressure boundary	Aluminum	Air - indoor (ext)	None	None
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
		Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
Sight glass	Pressure boundary	Copper alloy >15% Zn	Air - indoor (ext)	None	None
			Fuel oil (int)	Loss of material	Diesel fuel monitoring

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Sight glass (cont.)	Pressure boundary	Glass	Air - indoor (ext)	None	None
			Fuel oil (int)	None	None
Strainer housing	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
Tank	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - outdoor (ext)	Loss of material	System walkdown
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
			Concrete (ext)	Loss of material	Diesel fuel monitoring
		Fiberglass	Fuel oil (int)	None	None
			Interstitial fluid (brine) (ext)	None	None
			Interstitial fluid (brine) (int)	None	None
			Soil (ext)	None	None
Thermowell	Pressure boundary	Stainless steel	Air - indoor (ext)	None	None
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
Tubing	Pressure boundary	Copper alloy <15% Zn	Air - indoor (ext)	None	None
			Fuel oil (int)	Loss of material	Diesel fuel monitoring

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs
Valve body	Pressure boundary	Carbon steel	Air - indoor (ext)	Loss of material	System walkdown
			Air - outdoor (ext)	Loss of material	System walkdown
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
		Copper alloy >15% Zn	Air - indoor (ext)	None	None
			Fuel oil (int)	Loss of material	Diesel fuel monitoring
		Stainless steel	Air - indoor (ext)	None	None
			Fuel oil (int)	Loss of material	Diesel fuel monitoring