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SUBJECT: Forwards response to request request for addl info on request for exemption re special use of Thermo-Lag fire barriers in outdoor fire area,per GL 86-10.Oversize drawings encl.

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FPL

AUG 29 1995

L-95-235
10 CFR §50.12
10 CFR §50.48
10 CFR Part 50 Appendix R

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

Subject: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Response to Request for Additional Information on Request for Exemption - Special Use of Thermo-Lag Fire Barriers in Outdoor Fire Area

By letter L-94-146, Florida Power and Light Company (FPL) submitted a request, in accordance with the provisions of Title 10 Code of Federal Regulations section 50.12 (10 CFR §50.12), for an exemption from certain requirements of 10 CFR Part 50 Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," for Turkey Point Units 3 and 4. On October 12, 1994, the NRC requested additional information regarding the exemption request. The attachment to this letter provides FPL's response to the request for additional information for Turkey Point Units 3 and 4.

Please contact us if there are any questions regarding this submittal.

Very truly yours,

T F Plunkett

T. F. Plunkett
Vice President
Turkey Point Plant

OIH

Attachments

cc: S. D. Ebneter, Regional Administrator, Region II, USNRC
T. P. Johnson, Senior Resident Inspector, USNRC, Turkey Point

050067

Drawings located in Central Files

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ATTACHMENT 1

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION RELATED TO OUTDOOR EXEMPTION FOR THERMO-LAG 330-1 FIRE BARRIERS

Item a:

[1] In its submittal, the licensee stated that the as-installed Thermo-Lag fire barriers have a minimum fire rating of 30 minutes, based on the results of the Nuclear Energy Institute (NEI) Thermo-Lag fire barrier test program and the NEI application guide. Some of the NEI test specimens in the NEI test program were not subjected to a hose stream test. In addition, in reviewing the NEI test results (Test 2-2) and separating each fire barrier system into individual segments, as described by the NEI application guide, the NRC staff observed that individual conduit segments exceeded the temperature criteria prior to meeting the minimum 30-minute fire rating. The radial bend on the 2-inch diameter conduit test specimen exceeded the temperature criteria in 28 minutes and portions of the horizontal and vertical sections of the 3/4-inch diameter conduit test specimen exceeded the temperature criteria at 20 minutes. [2] Thus, confidence in the barrier's fire endurance performance and its ability to resist minor external impact from falling objects or firefighting operations has not been established. Since the specific outdoor applications that were tested by NEI were not subjected to a hose stream test, please justify how the test results establish the technical bases for accepting of the entire population of outdoor fire barrier assemblies installed at Turkey Point. In addition, describe in detail how the results of the applicable fire test bounds the various installed outdoor raceway applications (e.g., conduit sizes, junction boxes, lateral bends, horizontal and vertical runs).

Response to a[1]:

The Turkey Point Outdoor Exemption Request applies to Thermo-Lag 330-1 fire barriers used for outdoor installations where:

(a) As-installed fire barriers have a minimum rating of 30 minutes, based on test results and the use of test acceptance criteria as provided in ASTM E-119, NFPA-251, Generic Letter 86-10 Supplement #1 and the NEI (NUMARC) Application Guide; and

(b) The fire barriers are not within 50 feet of a major in situ combustible.

When using the guidance documents to rate a particular fire barrier, if the rating is less than ½-hour, then the barrier does not meet the requirements of the exemption request and modifications will be performed. An example of a particular fire barrier that does not meet the

requirements of this exemption request and will require modification is the 3/4-inch conduit. This is discussed in more detail in the response to Item a[2] below.

The two center conduits of NEI Test 2-2 were constructed at FPL's request to Turkey Point specifications. These conduits are representative of the Turkey Point outdoor installations by:

(a) using 3M caulk in the joints,

(b) using a weather-resistant topcoating, and

(c) having weep holes installed in the enclosure for potential water drainage.

The test was intended to show the similarity in test results to the standard installations which were being tested. This test included a hose stream test following completion of the 1-hour test interval.

The thermal acceptance criteria, as stated in ASTM E-119 and NFPA-251, and reiterated in Generic Letter 86-10 Supplement # 1, are:

- The average unexposed side temperature of the fire barrier system, as measured on the exterior surface of the raceway or component, does not exceed 250°F above its initial temperature; and

- Any single thermocouple does not exceed 30 percent of the maximum allowable temperature rise (i.e., 325°F above its initial temperature).

Applying these criteria to the 2-inch aluminum conduit, the allowable average temperature was exceeded at 40 minutes and the allowable maximum single temperature was exceeded at 35 minutes. Also, the maximum single temperature was exceeded on the radial bend at 35 minutes. Even so, this assembly passed the hose stream test and still had virgin material remaining after testing was completed.

For the 3/4-inch aluminum conduit, the allowable average temperature was exceeded at 27 minutes and the allowable maximum single temperature was exceeded at 26 minutes. Also, the allowable maximum single temperature was exceeded on the radial bend at 31 minutes. For most of the conduit, no uncharred material was evident following the 1-hour fire and hose stream testing.

Testing of conduits with Thermo-Lag 330-1 protection has indicated that, with all other factors the same, the smaller the conduit, the lower the fire rating. Additionally, testing has indicated that conduits do not have a structural failure mode as do cable trays for one-hour configurations. For the above reasons, two small conduit sizes (worst case) were selected for testing using the installation techniques unique to Turkey Point outdoor installations. The differences in the Turkey Point installations versus the standard baseline installations do not have any appreciable effect on the fire rating of the barriers. The differences and the reasons for assuming consistency in fire rating is as follows:

1) Fire Dam 150 (3M) Caulk is used as a joint filler for Turkey Point, whereas Thermo-Lag 330-1 trowel grade material is used for the standard baseline installations. The Fire Dam 150 Caulk is used in other fire rated assemblies, and has a similar fire rating to the Thermo-Lag 330-1 trowel grade, which it is replacing, for the thickness tested.

2) Drainage holes of 1/4-inch diameter are provided at low points on raceways to permit any moisture trapped in the enclosure to escape. Due to the physical expansion nature of the Thermo-Lag material in fire conditions, these holes seal rapidly and provide a fire barrier equivalent to the remainder of the assembly.

3) A topcoating system is applied over the completed assembly for waterproofing. Although topcoating systems are generally flammable out of the can, when they cure (dry) the flammability is greatly diminished. Also, the flammability of a thin layer of topcoat would be overwhelmed by the furnace heat flux, and no effect on the fire rating was expected.

It was the intention of this test to show a comparison to other conduit tests (same configuration), so that the other tested configurations would be applicable for the analysis of Turkey Point outdoor configurations. A comparison is made to NEI Test 2-1, where baseline construction techniques were employed.

	NEI Test 2-1		NEI Test 2-2	
	3/4" Conduit	2" Conduit	3/4" Conduit	2" Conduit
Time (Minutes) to Allowable Maximum Single Temperature	27	41	26	35
Time (Minutes) to Allowable Average Temperature	27	39	27	40

The time to the allowable average temperature is essentially the same for these two tests. The conclusion is that no new failure modes were generated with the use of the three new aforementioned construction techniques, and testing performed to baseline construction methods are valid for Turkey Point outdoor configurations to determine fire rating.

Response to a[2]:

Fire endurance and hose stream testing was performed in NEI Test 2-2 (Reference 1) per ASTM E-119 and NFPA-251, as stated in Generic Letter 86-10 Supplement #1. The specific outdoor applications were hose stream tested in NEI Test 2-2.

The NEI testing assessed (among other things) the performance of two 1-hour outdoor configuration baseline fire barriers constructed using pre-formed Thermo-Lag conduit sections on 3/4-inch and 2-inch diameter conduits (center assemblies). The test was conducted for 60 minutes. No barrier openings occurred for the 2-inch diameter conduit, even though it received an additional fire exposure of 25 minutes beyond the point where temperature criteria were exceeded. The 3/4-inch conduit barrier had observable openings. The conduit had been subjected to 34 minutes of fire exposure beyond the point (at 26 minutes into the test) when it initially exceeded temperature criteria.

Although it is difficult to determine exactly when the openings occurred, it is reasonable to assume, based on the 2-inch conduit performance, that openings did not occur at 26 minutes and may have occurred well after that point. Based on temperature profile data recorded during the test, no joint openings (or any structural failure) occurred for the 3/4-inch conduit barrier during the entire period of the fire exposure. Instead, the openings were characterized as "burn-through" where the Thermo-Lag material had been consumed to the underlying stress skin. Therefore, it is reasonable to conclude that this burn-through occurred well after exceeding the temperature criteria, and that the openings more likely occurred as a result of hose stream testing.

Based on the preceding, the 2-inch conduit barrier passed the hose stream test requirements at one hour, and there is a very high confidence level that the 3/4-inch conduit barrier had sufficient fire and firefighting endurance capability to have met the hose stream requirements for the fire endurance rating (26 minutes) provided.

Tested Configurations

The purpose of the two specific configurations in NEI Test 2-2 was to evaluate the effectiveness of three specific configuration features, namely the 3M joint compound, weep holes, and topcoat, as indicated

earlier in this response. The testing of a limited number of configurations is sufficient to justify these features as discussed below.

The first feature (the joints) is a critical design feature in that failure of a joint would constitute failure of the assembly. It is known that the smaller the conduit, the lower the fire rating of the assembly (all other parameters kept the same). Specifications for the joint gap prior to installing a joint compound is the same for small and large conduits. Therefore, testing the smaller conduit would test the worst case combination of joint with conduit size.

A 3/4-inch (small) conduit and a 2-inch (medium) conduit were tested with the 3M Fire Dam 150 Caulk. These results are compared to results for equivalent testing with Thermo-Lag 330-1 trowel grade material as the joint compound. The results are found to be consistent, leading to the conclusion that the 3M Fire Dam 150 Caulk functions in a similar manner as the Thermo-Lag 330-1 trowel grade material when used as a joint compound.

The second feature (drainage holes) are a unique characteristic of the outdoor Turkey Point installations. If the small (1/4-inch diameter) hole failed to seal or depleted the material at a faster rate than a continuous barrier, the hole would reduce fire resistance of the assembly. A failure at this location would not depend on the conduit size or orientation, only on the effect of the hole to seal itself. Thus, a single test is sufficient to determine the effect of this feature. The results demonstrate that small drainage holes do not reduce the fire rating of the assembly, as compared to similar testing without the drainage holes.

The third feature is the topcoat used for weather resistance in the Turkey Point outdoor locations. This coating is external to the barrier, and does not affect any of the installed parameters of the barrier. The only potential adverse effect could be additional fire loading on the surface of the assembly, which might affect the fire barrier rating, or a chemical reaction with the Thermo-Lag which would degrade the performance of the fire barrier material. Again, a single test is sufficient to determine if there is any significant effect of this feature. The results support the conclusion that the topcoat does not reduce the fire rating of the assembly, as compared to similar testing without the topcoating.

Item b:

[1] For the outdoor Thermo-Lag fire barrier assemblies installed to protect circuits needed for post-fire reactor shutdown, describe how the design parameters and the construction attributes used to install the fire barriers were verified to be the same as those used to construct the test specimens. [2] In addition, describe how the fire barrier design parameters and the construction attributes (e.g., fire material thickness, caulk type used, wire tie spacing) of the field installations were bounded by the NEI test results.

Response to b[1]:

The design parameters and construction attributes used to install the fire barriers at Turkey Point were verified to be the same as or bounded by those used to construct the test specimens by comparing NEI test specimen features with Turkey Point installation requirements and as-built conditions. This was accomplished by reviewing the NEI Application Guide, NEI Test 2-2, FPL Construction Specification MN-3.21 (Reference 5), and by destructively testing various fire barrier installations.

Six box-type assemblies and 48 linear feet of raceway have been inspected. They represent a cross-section of installation periods (different years of installation), and configurations. FPL has concluded that the installers were consistent in their installation practices and the installations met FPL's installation procedure.

The quantities and sizes of Thermo-Lag fire barrier assemblies destructively tested provide a sufficient sampling because (a) destructive tests were performed on sections found to be damaged or degraded during routine inspection, and were therefore randomly obtained, and (b) the methods and techniques used to construct each barrier are the same regardless of the protected barrier size. Table 1 below provides a comparison of the parameters and attributes. The results of the destructive tests confirm that the Turkey Point installations are consistent with plant-specific installation instructions and guidelines and the NEI Application Guide.

Response to b[2]:

Table 1 below compares the attributes of a representative outdoor 2-inch conduit installed at Turkey Point Plant with corresponding construction specification requirements and NEI Application Guide Test 2-2 parameters.

In summary, NEI used minimum thickness Thermo-Lag material and aluminum conduit with zero percent fill. The installed configuration at Turkey Point used up to 50% thicker Thermo-Lag material (more thermal protection), steel conduit (higher thermal mass than aluminum) and an actual cable fill (more thermal mass to resist temperature rise). Other as-built parameters were the same as or more conservative than the test specimens. Therefore, the configurations installed at Turkey Point provide a higher fire rating than the NEI tested configurations. On this basis, the NEI test results are bounding for Turkey Point.

TABLE 1

REPRESENTATIVE 2" CONDUIT, 1 HOUR FIRE BARRIER, in OUTDOOR AREA			
	NEI Test 2-2	FPL SPECIFICATION	INSTALLED
COMMODITY PARAMETERS			
Size	2"	2"	2"
Material	aluminum	steel	steel
Contents/Total Enclosed Mass (lbs./linear ft.)	Empty/1.16	not stated	3.32
Orientation	Horizontal & Vertical	not stated	Skew, Vertical, & Horizontal
BARRIER PARAMETERS			
Material Type	pre-formed	pre-formed	pre-formed
Material Thickness	1/2" nominal	1/2" minimum	1/2"; +1/4",-0"
Stress Skin Location	inside	inside	inside
Joint Type	butt	butt	butt
Joint Gap	1/4" maximum; 3M caulk	1/4" maximum; 3M caulk	<< 1/4"; 3M caulk or Trowel Grade
Fastener Size/Material	1/2" wide bands	18g SS wire or 1/2" wide band	18g SS Wire
Fastener Spacing	12"	12" maximum	8" to 10"
Fastener Distance from Joints	2"	2" minimum	< 2"
Joint Reinforcement Mechanisms	none	none req'd	none
Structural Support & Intervening Steel Protection	none	9"	9"

Item c.

For each fire barrier for which an exemption is requested, identify the barrier and describe location, the other fire protection features in the area, the amount and type of combustibles (e.g., fire load) in the area and its location relative to the fire barrier, the safe shutdown function(s) being protected by the barrier assembly, and what impact its loss would have on plant safety. In addition, provide drawings which show the routing of these fire barrier assemblies and their redundant safe shutdown function(s), and the interrelationship (e.g., location and configuration) between the fire barrier/conduit assembly and in-situ combustibles in the fire area of concern.

Response to c:

A detailed description of the combustible load, fire control and fire protection features for each outdoor fire zone is provided in Updated Final Safety Analysis Report (UFSAR) Appendix 9.6A, Section 4.0 (Reference 6). Due to the extensive volume of information contained in the UFSAR, it is included by reference. However, the highlights of this information, which emphasize the lack of combustibles near wrapped raceways where this exemption is requested, are summarized in Table 2 below.

The small quantity of lubricating oil in pumps is an insignificant in situ combustible because the oil is contained in reservoirs encased within the pumps. The relatively massive steel casings would mitigate the propagation of flame from a credible exposure fire to the oil in the reservoirs.

Safe shutdown raceways which are located within 50 feet of major combustibles and require protection will be modified to meet the requirements of Appendix R and are not included in the exemption request. The conduits protected with Thermo-Lag material are located in horizontal, vertical and skew runs, at grade elevation, up walls, in free space and over roof tops.

The only in situ fire loads are sparsely populated cable trays, primarily located 15 to 20 feet above grade, and Thermo-Lag material. The fuel load is so low and spread out, that the cable and Thermo-Lag are considered negligible and are represented as such in Table 2 below. The wrapped raceways contain cables for a number of control and power supplies, including the control power for the Emergency Diesel Generators, Switchgear, and Load Centers.

Loss of AC Power is not an immediate concern for assuring safe shutdown (the Auxiliary Feedwater (AFW) Pumps are steam-driven and critical system controls and valves have a DC power source), but should be restored as soon as possible. For a fire affecting AFW pumps, power to the Standby Steam Generator Feedwater (SSGFW) pumps is ensured without taking credit for wrapped conduit protection. Replacement of the electric motor for the "B" SSGFW Pump with a diesel driver added additional diversity to the Steam Generator water supply systems.

Since there are negligible in situ combustibles, there is no threat to wrapped conduits. The attached plant drawings (Items 1 through 19 of Attachment 2) show the routing of wrapped conduits in outdoor locations. The attached site figures (Items 20 through 23 of Attachment 2) depict in situ combustibles, outdoor fire area 50 foot exclusion areas, turbine lube oil piping, and hydrogen piping locations.

Table 2

Turkey Point Outdoor Fire Zone Features (Summary from UFSAR Appendix 9.6A)

Fire Zone	Combustible Load(Btu)within Fire Zone, >50 feet from Major Combustibles	Local Fire Control/Protection Features
47	Negligible cable, <1 gallon lube oil in each of 3 pumps	Water suppression systems, fire detection, fire extinguishers and hose stations.
54	Negligible cable, <1 gallon lube oil in each of 3 pumps	Water suppression systems, fire detection, fire extinguishers and hose stations.
79	Negligible cable, trays located 18 feet to 20 feet above grade	Fire extinguishers and hose stations.
80	Negligible cable	Fire extinguishers and hose stations.
82	Negligible for portions of this zone which are >50 feet from the transformers and seal oil equipment	Transformers have detection and suppression. Suppression over most of this zone, including lube oil piping. Fire extinguishers, hose station and hydrant.
83	Negligible for portions of this zone which are >50 feet from the lube oil filter	Lube oil filter has detection and suppression. Suppression over lube oil piping. Fire extinguishers, hose station and hydrant.
84	Negligible, <24.5 gallons of lube oil and grease in each of 3 turbine-driven pumps	Fire extinguishers and hose station. Redundant safe shutdown via Standby Steam Generator Feedwater system takes no credit for wrap conduit protection.
85	Negligible cable	Suppression over lube oil piping. Fire extinguishers, hose station and hydrant.
86	Negligible for portions of zone which are >50 feet from transformers	Transformers have detection and suppression. Suppression over lube oil piping. Fire extinguishers, hose stations and hydrants.
87	Negligible for portions of zone which are >50 feet from Auxiliary Transformer and seal oil equipment	Auxiliary Transformer has detection and suppression. Suppression over most of this zone, including the lube oil piping. Fire extinguishers, hose station and hydrant.

Fire Zone	Combustible Load(Btu)within Fire Zone, >50 feet from Major Combustibles	Local Fire Control/Protection Features
88	Negligible cable	Suppression over lube oil piping. Fire extinguishers and hose station.
89	Negligible cable	Fire extinguisher and hose station.
91	Negligible cable, lube oil encased in of 3 pumps	Fire extinguishers and hose stations.
92	Negligible cable, lube oil encased in each of 3 pumps	Fire extinguishers and hose stations.
105	Negligible cable	Fire extinguishers and hose stations.
106R	Negligible; Control Room Air Conditioning units on roof	Fire extinguishers and hose station.
113	Negligible cable	Flame detection, fire extinguishers and hose stations.
114	Negligible cable	Fire extinguishers and hose stations.
115	Negligible cable	Fire extinguisher and hose station.
116	Negligible cable	Flame detection, fire extinguishers and hose station.
117	Hydrogen gas blanket in main generator (43 BTU/ft^2)	Fire extinguishers and hose stations on open turbine deck.
118	Negligible cable	Fire extinguishers and hose stations.
119	Negligible cable, largest volume is 17 gallons lube oil encased in each of 4 Circulating Water pump motors	Flame detection, fire extinguishers and hydrants.
120	Negligible cable, largest volume is 17 gallons lube oil encased in each of 4 Circulating Water pump motors	Flame detection, fire extinguishers and hydrants.
143	Negligible	Fire extinguishers and hose stations.

Item d:

Turbine failures (e.g., Salem overspeed event; Fermi blade failure) can lead to the failure of the turbine lube oil system and loss of lube oil from the turbine lube oil system. In addition, the rupture of high pressure lube oil piping could result in a pressure-type fire. In order to get a better understanding of the relationship of this major fire hazard to these fire barrier assemblies in the areas of concern, provide drawings that show the routing of the turbine lube oil system piping and the routing of those fire barrier assemblies that are located within 50 feet of this hazard and those assemblies that are in the immediate vicinity of but are just outside the 50-foot boundary, plant areas covered by automatic sprinklers, and the location of other major plant equipment (e.g., safe shutdown and safety-related). In addition, provide an evaluation of the potential impacts turbine lube oil fires could have on these fire barriers, adjacent plant areas, and the safe shutdown capability.

Response to d:

The catastrophic failure of the turbine causing a failure to the lube oil system is considered a low probability event at Turkey Point.

Sufficient regulatory guidance, industry experience and design features are provided to preclude the failure of the turbine lube oil system. However, oil system failures due to failure of other turbine components have been documented, and based on industry experience, are considered to be possible. Fires resulting from these oil system failures are therefore considered to be credible and require evaluation. FPL has determined the locations of the most probable lube oil system failures and the leakage path for the oil, and evaluated the impact of fires resulting from this oil.

NRC guidance provided in NUREG-0800, Section 9.5.1 "Fire Protection Program", Section 1.b. "Fire Hazard Analysis" (Reference 4), states:

> 'Worst case' fires need not be postulated to be simultaneous with nonfire-related failures in safety systems, plant accidents, or the most severe natural phenomena.

This guidance clearly does not require postulating a turbine blade failure concurrent with a fire from a hypothetical ignition source and fed by a failure of the turbine lube oil system piping at its most remote location.

The Turkey Point lube oil piping is under the turbine deck and is located outside the condenser shell. Thus, the turbine deck is between the turbine rotor and the piping. This should preclude a turbine blade from causing a turbine lube oil leak. A fire on the turbine deck would be a local radiant heat problem only, since there is no roof or walled enclosure above the turbine deck. The general area around the turbine generator and exciter (within 20 feet) on the open air turbine deck does not contain Thermo-Lag protected circuits.

At Turkey Point, various control features and protection devices are provided to prevent an overspeed event which could generate a turbine missile. These include the auxiliary governor, the Load Drop Anticipator Overspeed Protection circuitry and a mechanical trip device.

The auxiliary governor closes the governor valve and the intercept valves when turbine speeds exceed 103% of its rated speed. The auxiliary governor is also designed with an acceleration feature that anticipates overspeed and immediately closes the valves upon acceleration after the generator breaker is opened. This is accomplished by energizing overspeed protection solenoid valves which dump the control oil header to quickly close the governor and intercept valves.

In addition to the control functions described above, a mechanical overspeed device is also provided to trip the turbine and prevent overspeed. This device is a mechanical/hydraulic device that closes all of the turbine valves. The setpoint for this trip is 110% of the turbine's rated speed.

The lube oil piping system in the areas of the requested exemption is not considered a major fire hazard. There is no exposed high pressure oil piping or valves under the turbine deck within 50 feet of any Thermo-Lag installations. Only low pressure guarded (atmospheric) return lube oil piping is exposed below the turbine deck. This piping is routed around the turbine pedestal just below the turbine deck. A site figure of this pipe routing is provided with the response to Item "c" above (Item 22 of Attachment 2). Additionally, the turbine lube oil system has annunciators that will alert operators to a high pressure lube oil pipe break, or other pressure-loss related problems. These annunciators include:

Annunciator	Set Point
Turbine Bearing lube oil pressure(E 2/1)	8 psig
Emergency Bearing oil pump running (E 2/3)	7 psig
Turbine Aux oil pump running (E 4/1)	10 psig
Guarded oil actuation (E 5/6)	2 psig
Turbine bearing oil low pressure trip (E 6/2)	5.5 psig

There are no valves (potential leak locations) in the turbine lube oil piping under the turbine deck. The high pressure supply piping is encased in a low pressure (atmospheric) guard pipe which drains to the turbine lube oil reservoir. In the event of a leak in a high pressure turbine lube oil line, the leakage will be diverted to the turbine lube oil reservoir via the guard piping. A leak in the high pressure portion of the turbine lube oil system will cause turbine trip and/or turbine valve closures and/or control room annunciation.

Based on the above, FPL concludes that the probability of a high pressure turbine lube oil leak resulting from a turbine blade ejection failure is very low.

Westinghouse, the turbine supplier, has indicated that, historically, there have been relatively few reports of significant fires associated with their turbine and auxiliaries. This is attributed to the design of the oil guarding around the lube and control oil piping as well as the use of welded pipe joints in the lube oil piping. However, oil leakage from turbines has been known to occur. The most common scenario resulting in lube oil leakage is a failure of the bearing pedestal oil seals. Oil leakage at this location could range from a few drops to several gallons per minute.

As the most probable and credible oil system failure which could cause a fire, FPL has evaluated the impact of a lube oil fire caused by a failure of any one of the turbine bearing oil seals. A walkdown was performed to identify the path and final destination of oil leaking from the turbine bearing seals. It was determined that, except for the number 1 bearing on the Unit 4 turbine, oil leakage from turbine bearings would collect in the condensate pits. Oil leakage from the Unit 4 Number 1 bearing would flow to the drain by the chemical injection pumps (south of the Unit 4 turbine). As the condensate pits and the area south of the Unit 4 turbine are a probable collection point for oil, it is reasonable to assume that a fire would be localized to these areas. A site drawing is attached (Item 24 of Attachment 2) which depicts the turbine lube oil leakage flow paths.

The impact of a fire in these areas (main condenser pit, condensate pump pit and vicinity) was determined. Cables and raceways in the immediate proximity of these fire areas were identified and evaluated. Circuits and raceways necessary to bring the plant to safe shutdown were identified as requiring protection from fires. As necessary, and as a condition of exemption approval, FPL will make modifications to ensure that these cables are either relocated or that a one-hour fire barrier or suppression is provided.

Item e:

For the other major fire hazards in the vicinity of these fire barriers, provide a detailed fire hazard evaluation for each of these fire hazards (e.g., station transformers, potential Unit 1 and 2 exposure type fire hazards, hydrogen lines). These evaluations should contain similar information to that specified for the turbine lube oil in Item d., above.

Response to e:

The requested exemption only applies beyond 50 feet from major combustible sources. Major combustible sources include station transformers, lube oil storage tanks, hydrogen seal oil units and fossil unit fuel oil storage tanks.

The methodology for fire hazard analyses of Turkey Point nuclear facilities is presented in UFSAR Appendix 9.6A, Section 4.0. Existing analyses are provided in the UFSAR 4.0D-series subsections and describe zone features, combustible loading sources and fire control facilities.

Given the exclusion basis for exemption request, the following fire hazard evaluations are provided. An attached site figure (Item 25 of Attachment 2), depicts the general site layout and site fire hazards.

Station Transformers

The main, auxiliary, startup and C-bus transformers are located in the open area along the west side of the Turbine Building. More so, the C-bus transformer is located on the banks of the discharge canal, west of the west plant access road and over 100 feet from the Turbine Building.

The primary combustible loading source in the respective fire zones is the volume of cooling oil contained within the transformers. The transformer oil volume is the most significant component of the combustible loading described in the UFSAR subsections.

Each transformer is provided with facilities to either contain oil leakage or channel it to a safe drainage area. The transformers are primarily protected by open-head fixed water spray (also referred to as "deluge") fire suppression systems, supplemented by local fire extinguishers. Secondary protection is also provided by nearby standpipe hose stations and hydrants. The transformers are mounted over gravel pits to contain oil leakage and are provided with thermal detection which alarms in the Control Room.

Lube Oil Reservoir

The turbine lube oil reservoirs are located outdoors in concrete pits along the west side of the Turbine Building. Each reservoir contains less than 14,000 gallons (56 lb/ft^3) of lube oil having a conservative assumed heating value of 20,000 BTU/lbm. The reservoirs are primarily protected by fixed water spray fire suppression systems, supplemented by local fire extinguishers. Secondary protection is also provided by nearby standpipe hose stations and hydrants.

Hydrogen Seal Oil Units

The hydrogen seal oil units are located on the west side of the open Turbine Building and near the auxiliary transformers. The combined combustible loading of a hydrogen seal oil unit and auxiliary transformer is less than 6000 gallons (56 lb/ft^3) of oil with a conservative assumed heating value of 20,000 BTU/lbm.

The hydrogen seal oil units are mounted on a reinforced concrete slab. Any significant oil leakage will flow to a safe drain. The hydrogen seal oil facilities are provided with thermal detection which alarms in the Control Room. The units are primarily protected by fixed water spray fire suppression systems, supplemented by local fire extinguishers. Secondary protection is also provided by nearby standpipe hose stations and hydrants.

Hydrogen Supply Lines

A hydrogen supply header is routed in the Turbine Building serving the main generator manifold. The header is routed over the Auxiliary Building roof to enter the Turbine Building from the east. The header continues through to the far west side of the Turbine Building, where it connects with a north-south header serving both nuclear units.

The header serves the main generator hydrogen manifolds, located west of the turbine shaft centerline. A wet pipe fire suppression system is provided where the hydrogen manifolds are located.

The hydrogen supply header is 1-inch, schedule 40 piping with welded fittings. As such, it is not considered a combustible threat. Furthermore, due to the open nature of the surroundings, any hydrogen leak that might occur would be quickly diluted and dissipate.

Fossil Unit Facilities

With regard to the fossil units, the facilities are far from the nuclear plant and are not considered to be within the vicinity of protected circuits.. The main structures alone are more than 85 feet away from the nuclear facilities. The following are separation distances (approximated using a site plan) from major fossil unit oil facilities to the nuclear facilities:

From Bulk Fuel Oil Storage Tank to Unit 4 EDG Building	785 feet
South Monitor Tank to Unit 4 EDG Building	160 feet
South Monitor Tank to Unit 3 EDG Fuel Oil Tank	245 feet
South Monitor Tank to nearest Thermo-Lag	260 feet

These distances far exceed the separation guidelines to nuclear facility components and structures. Therefore, the fossil plant facilities are not considered a combustible threat to the protected circuits.

Item f:

In its explanation on how transient combustibles are controlled for outside areas, the licensee stated that the control of combustible program does not allow storage of combustibles in outdoor areas that contain safety-related equipment or cables. It is not clear if this program applies to areas that contain safe shutdown cables and equipment. In addition, plant procedures specify that flammable liquids be attended at all times and that a special permit is required for quantities greater than 5 gallons. Does this include combustible liquids or is it limited to flammable liquids? The licensee did not identify how transient combustibles are controlled with respect to assuring that the cumulative amount of transients and their concentration for several work activities in a given fire area does not exceed the maximum allowable heat release rate and potential fire duration which could degrade the fire-resistive rating of the subject fire barrier assemblies. Describe and justify how the transient combustibles within a given fire area will be controlled so that the cumulative amount of combustibles will not challenge the fire-resistive rating of the barrier.

Response to f:

There are several levels of fire prevention involving control of transient flammable and combustible materials at Turkey Point. Overall, transient combustible and flammable substances located or used anywhere in the plant area are controlled by procedure. In addition, they are further restricted in certain areas to prevent the possibility of a fire from interfering with proper operation of systems required for safe shutdown. These restrictions address storage and handling of transient combustible and flammable substances.

The restrictions are specifically implemented under FPL Administrative Procedure 0-ADM-016.1, "Transient Combustible and Flammable Substances Program" (Reference 3). This procedure defines the term "transient combustible" as "any combustible or flammable material that is not permanently installed...or stored in a designated storage area." The procedure also defines the restricted areas by illustration. These areas include safe shutdown component areas as well as safety related component areas, plus the Radwaste Building, Fire Pump and Storage Tank area.

A Transient Combustible Permit (TCP) is required under specifically defined conditions, including where Class A materials exceed 100 pounds (10 pounds for Fire Zones 79A, 98 and 132), where Class B liquids exceed 5 gallons (1 gallon for Fire Zones 79A, 98 and 132), in excess of five flammable or combustible aerosol containers or flammable gas cylinders which are not associated with a Hot Work Permit. TCPs are issued and tracked by the Fire Protection Representative who also determines the need for additional fire prevention measures at the work site. No transient combustible or flammable materials are allowed to be unattended unless specifically exempted by the Fire Protection Representative.

With regard to the accumulation of transient combustibles in a specific location due to multiple work activities, there is no need for procedural restrictions for the following reasons:

- Maintenance activities performed during plant power generation are restricted from an operational perspective, and usually do not require transient combustibles.

- Any transient combustible materials are continuously attended by those performing the task in the area.

- By nature of the work, most maintenance activities cannot be performed in close proximity to one another, so that work space often limits exposure to more than the transient combustibles required for the task.

- Plant work controls require that a TCP be required and visually posted at the work location under the conditions discussed above.

- Restrictions imposed by the TCP are very conservative with respect

to the exposure hazard required to challenge fire protection features in work areas.

In light of the preceding, there are very few transient combustibles in the plant at any one time, and those that are have sufficient controls.

Item g:

The submittal stated that the transient combustible controls assure that a worst case transient fire caused by a flammable liquids spill would be far below a hazard level that could challenge a 30-minute Thermo-Lag fire barrier. To qualify this statement the licensee provided the following example: the fire from a 20-gallon flammable transient spill (over a 15 square foot area) would generate a fire with a duration less than 15 minutes. This assessment appears to equate that the burning duration of a fire is key to a fire barrier's ability to provide protection. In reality it is based on the fire barrier's ability to resist the intensity (energy released) of the fire itself. Generally, flammable/combustible liquid-related fires, when they do occur, develop and propagate very quickly and their intensity is greater than a fire involving ordinary combustibles. On that basis, a fire barrier test specimen which has been qualified by exposing it to an ASTM E-119 test fire would not obtain the same rating if it were exposed to the ASTM E-1529 Hydrocarbon fire curve. For example, a 30-minute fire barrier qualified by exposing it to ASTM E-119 standard fire would not be able to achieve a 30-minute rating if it were tested to the ASTM E-1529. For those areas of the plant, where flammable and/or a hydrocarbon fire resulting from a breakdown in the control of combustible liquid hazards could be present, in your fire hazard evaluations, as requested by items d and e, above, please include an assessment of the effects a fire such as a hydrocarbon fire associated with a turbine failure event, combustible program, etc., would have on the rating of ASTM E-119 tested fire barrier (30-minute Thermo-Lag fire barriers). Your assessment should consider worst case credible fire scenarios and the interrelationship between the fire itself and the protective fire barrier system.

Response to g:

The ASTM E-1529 test methods are intended to simulate a sudden and total continuous engulfment in flames in the hottest areas of large hydrocarbon fuel pool fires. By contrast, the ASTM E-119 test methods simulate the more gradual exposure to fires typically associated with solid fuel combustion.

FPL recognizes that materials can perform quite differently in response to ASTM E-1529 test methods than with ASTM E-119 test methods. The main reason is that the test specimens get hotter faster during ASTM E-1529 testing and are subjected to strong thermal shock. Even so, a fire barrier rating based on ASTM E-119 is more appropriate for Turkey Point Units 3 and 4 as discussed below.

The ASTM E-1529 test methods are used to evaluate fire barrier performance of materials used in the hydrocarbon processing industry (such as refineries and petrochemical plants) for structures that could be exposed to large (hundreds or thousands of gallons spread over several hundred to several thousand square foot areas), free-burning, unmitigated, fluid-hydrocarbon fueled pool fires. Such fire scenarios are not credible for the Turkey Point for the following reasons:

1. Areas of the plant containing major combustible inventories, such as transformers and turbine lube oil reservoirs, are protected by water spray-type deluge systems and are not part of this exemption request (the exemption request only applies beyond 50 feet from these major combustible sources).

2. The condensate pumps are located in a pit below grade and have lubricating oil in the motor housing. Leaking oil would drain to the condenser pit. There are also a few cable trays and turbine lube oil piping located around the turbine pedestals. The oil process piping is contained within a guard pipe. In addition, a wet pipe sprinkler system provides coverage for the areas around the turbine pedestals where the turbine lube oil piping is located.

3. Major equipment maintenance is usually performed during plant outages. Equipment overhauls are performed on the turbine deck or in one of the laydown areas outside of the Turbine Building. Lube oil replacement may be performed locally. In all cases, however, the handling of combustible fluids is strictly controlled as discussed above.

In summary, there is substantial defense-in-depth in fire prevention through in situ combustible fluid containment and separation from other combustible fluid sources, and control through in-place fire suppression facilities. These are supplemented by fire brigade response.

FPL assessed the effects on the ASTM E-119 tested fire barrier rating should a hydrocarbon-fueled fire occur due to equipment failure or a violation of the combustible control program. The following provides the results of this assessment:

1. FPL is not taking credit for any circuits located within 50 feet of a major combustible source. This is well beyond Appendix R requirements which assume that for 1-hour fire rated wrap, suppression and detection provide adequate protection.

2. FPL proposes to protect exposed outdoor safe shutdown circuits with a 30-minute fire rated wrap system.

3. There are essentially no ignition sources in areas near safe shutdown circuits. The hot steam and feedwater lines are primarily located on the turbine deck and on the feedwater and steam platforms. The lower temperature feedwater lines are

located near the condenser at grade and on the mezzanine level of the open Turbine Building.

4. Transient combustible fluids near safe shutdown circuits are limited to a few gallons of paint or lube oil. A postulated spill could only develop a small pool and would tend to migrate to area drains, even without mitigating action by the one who spilled it.

5. A significant pool of combustible fluid could only be created through catastrophic failure of a transformer or turbine lube oil storage tank. These facilities are designed to contain spills (dikes) and are equipped with fire suppression systems. In situ fire suppression would begin mitigation of such a fire almost immediately, and would be promptly supported by the fire brigade. These areas are not part of the exemption request.

6. Even considering the rupture of the turbine lube oil piping on the east side of the turbine pedestal, the oil would flow into the condenser pit and have minimal impact on the Thermo-Lag circuits. Again, there are no ignition sources for leaking oil. Also, in event of a substantial break, the turbine would trip and alarms would sound in the Control Room.

Based on the preceding, the potential for exposure to a hydrocarbon-fueled fire that could challenge safe shutdown circuit fire wrap is extremely unlikely. The potential for creating such a fire is remote. Also, there are provisions for combustible fluid containment and fire mitigation, should such a fire occur, and the protected safe shutdown circuits are far from the potential fire sources. In this regard, the rating of the 30-minute Thermo-Lag fire barriers would not be compromised.

Item h:

For those outside areas of the plant not provided with automatic fire detection, please explain how a fire would be detected in these areas? If reliance is placed on the human element (outside areas harder to detect incipient smoke conditions), has a study been done to determine what percentage of time these spaces are occupied by plant personnel? If such a study does exist, please provide us with a summary of the methodology used to perform this study and its results. The licensee's submittal indicates the fire brigade can respond to an outside fire within 15 minutes; therefore, a fire barrier safety factor of 2 exists. This is somewhat misleading. In order to judge the effectiveness of the fire brigade and its ability to mitigate a fire's potential impact on a fire barrier system, several factors in addition to response time must be considered (e.g., reflex time, which is the time span from the point when the fire is discovered/detected to the time the fire brigade is actually notified; fire fighting strategy development time, this is the time span where the brigade gathers and the fire brigade leader makes a size-up of the situation and determines the best method to control and extinguish the fire; equipment deployment time, this is the time needed by the fire brigade to deploy hose lines, set up special fire fighting

equipment, and get into position to attack the fire; fire control and extinguishment time, this is the time needed to control and extinguish the fire). Considering a fire which could challenge an outdoor fire barrier system, please provide a summary of any fire brigade performance-oriented time lines evaluations which have been conducted, where individual fire brigade crews participated in actual training exercises using live fires that fully evaluated the fire brigade leader's ability to develop a firefighting strategy, the deployment of firefighting equipment, and the brigade crew's ability to implement fire mitigation measures.

Response to h:

The outdoor areas without automatic fire detection capabilities either a) contain negligible in situ combustibles, b) do not contain ignition sources which could cause a fire of any note, or c) have potential losses deemed as being of no consequence to plant safe shutdown. Additionally, areas which contain relatively high in situ combustible loadings, or could significantly affect plant operation in event of a fire, are provided with fire suppression systems.

Only transient combustible materials could potentially cause any significant fire, and they are strictly controlled (see response to Item f). In these cases, plant personnel are required to continuously accompany a transient combustible and provide the primary means of detection and reporting for a fire, even in areas where detection facilities are installed. This provision is only supplemented by fire watch patrols. Thus, a study to determine what percentage of time these areas are occupied by plant personnel is unnecessary.

Based on the preceding, a fire which could challenge an outdoor fire barrier system is extremely unlikely. Even so, the fire brigade staffing and training meet or exceed the requirements as provided in 10 CFR 50, Appendix R, Sections III.H and III.I. All fire brigade members are trained at an accredited fire training facility once a year. This facility exercises the leadership skills of the fire brigade members through training with live fires.

In addition, fire brigade response/control times for actual fires at Turkey Point have been recorded. "Response Time" is defined as the time it takes for the fire brigade to arrive at the scene. "Control Time" is defined as the time required to extinguish the fire. The fire brigade control/response time data for unstaged fires during the period 1989-1994 is as follows:

1989 There were two events requiring fire brigade response from oil soaked lagging (caused by turbine oil seal leak during safeguards testing) in the Unit 3 turbine area. The first fire occurred on 2/6/89; the fire brigade (5 members) response/control times were 5/7 minutes. The second event occurred on 2/7/89; the fire brigade (5 members) response/control times were 5/15 minutes.

1990 There was one event requiring fire brigade response located behind the Technical Support Center from a discarded cigarette igniting a piece of tarp on the ground. The event occurred on 2/10/90; the fire brigade (5 members) response/control times were 10/4 minutes.

1991 There were two events requiring fire brigade response. The first event occurred on 5/21/91 outside the Nuclear Administration Building from trash in roll-off dumpster box ignited by a discarded cigarette; the fire brigade (10 members) response/control times were 5/6 minutes. The second event occurred on 11/1/91 in the Health Physics computer room from a computer transformer burning due to an electrical short; the fire brigade (13 members) response/control times were 1/5 minutes.

1992 No events occurred requiring fire brigade response.

1993 There was one event requiring fire brigade response located in the Radwaste Building from a smoldering mop head (caused by welding slag dropped onto the mop). The event occurred on 12/6/93; the fire brigade (11 members) response/control times were 7/8 minutes.

1994 There were two events requiring fire brigade response. The first event occurred on 3/21/94 in the Laundry Room from protective clothing in dryer #10 (caused by an overheated dryer element); the fire brigade (5 members) response/control times were 2/0.5 minutes. The second event occurred on 12/6/94 at the new cafeteria site from an engine fire on a diesel powered back hoe (caused by an oil line on engine failing); the fire brigade (9 members) response/control times were 2/5 minutes.

Item I:

These fire barriers are exposed to outdoor environmental conditions such as, rain, ultraviolet rays from the sun, salt spray, etc., which may have an effect on fire barrier performance. Please provide a summary of the tests that you have performed and their results which confirm that the long-term effects of typical southern Florida environmental conditions will not cause a reduction in the fire-resistive performance of these barriers. In addition, has any of the outdoor Thermo-Lag fire barrier installations ever been replaced as a result of environmental conditions? If so, please summarize indicating what years it was replaced, how much was replaced during those years, and the reasons why it had to be replaced.

Response to I:

Environmental effects (specifically water damage) on the Thermo-Lag material were noted during initial installations at Turkey Point in outdoor locations. Rain water was finding its way into the Thermo-Lag enclosures. When weeping out through the enclosure walls, the water would also take part of the binding material. The effects are detected visually by material swelling, cracking, peeling, delamination and discoloration.

This leaching process occurs only when liquid flows through Thermo-Lag material. It was observed that if wetted material is allowed to air-dry, there was no evidence of leaching. This led to the installation of weep holes in locations where water intrusion was most likely, and the use of a topcoating system to prevent water intrusion.

The Thermo-Lag installations are monitored by Turkey Point Fire Protection personnel by periodic inspections, which are performed under the fire barrier inspection program and cover 100% of the Thermo-Lag over each 18-month period. If the material does not pass visual inspection criteria for cracks, gaps, and such, it is declared inoperable and a Fire Protection Impairment (FPI) is identified.

Ongoing Thermo-Lag maintenance has been performed since installation of the material began (circa 1984). Although some of the repairs have been due to physical damage from construction or maintenance activities, most of the maintenance in outdoor installations has resulted from the effects of weather. With the exception of post-Hurricane Andrew repairs, the current trend shows the number of weather-related cases decreasing.

As long as the physical configuration, consistency and surface hardness (sponginess) of the material is maintained (that is, no visible swelling, cracking, peeling or delamination), there is reasonable assurance that the fire-resistance performance capability of the installation is maintained. In this regard, the current inspection program is sufficient to provide this assurance. No other testing has been performed, per se, to evaluate long-term environmental effects.

Item j:

Since the outdoor conduit Thermo-Lag fire barrier applications tested by NEI did not pass the acceptance criteria nor were they fully qualified as 30-minute fire resistive barriers, the cables protected by these barriers and their ability to perform their function become factors which need to be considered. In order to get an understanding of the thermal resistance of the cables by these barrier systems, please provide a description of the type of cables protected (i.e., control, power, instrumentation), a description of their required function, the fire areas which these cables are routed through, the material composition of the cable insulation and jacket for each cable type, thermal properties of these insulation and jacket material types (e.g., material is thermoplastic or thermoset, short circuit temperature) and a

description of any cable functionality tests performed (e.g., air oven/hot megger tests and the results obtained by these tests.

Response to j:

The 3/4-inch conduit did not pass a 30-minute fire rating in the configuration in which it was tested in NEI Test 2-2, and FPL does not intend to take credit for 3/4-inch conduits in outdoor locations, in the as-constructed configuration, as being 30-minute fire rated. However the 2-inch conduit exceeded the 30-minute fire rating in the configuration in which it was tested in NEI Test 2-2 (including the hose stream test).

A calculation (Reference 2) has been performed to evaluate the fire barrier ratings of various sizes of Thermo-Lag configurations in outdoor locations. The following table summarizes the results of this evaluation, which utilized the NEI Application Guide and its associated fire endurance tests (a combination of NEI Tests 2-1 and 2-2):

CONDUIT DIAMETER (inches)	NEW 1 HOUR FIRE RATING (minutes)	NEW 3 HOUR FIRE RATING (minutes)
3/4	25	62
1	27	68
1-1/2	32	76
2	36	81
3	42	90
4	46	94
5	50	99
6	54	101

FPL has no plans to evaluate cables for elevated temperatures. If the conduit does not meet the test requirements for a 30-minute barrier, FPL will not take credit for the barrier as meeting the criteria for this exemption in outdoor areas.

REFERENCES

1. NEI Application Guide No. 0784-00001-TR-02,"Application Guide for Evaluation of Thermo-Lag 330 Fire Barrier Systems," Revision 1, dated July 7, 1994.

2. FPL Calculation, PTN-BFJM-94-016, Rev. 01, "Fire Barrier Evaluation for Thermo-Lag in Outdoor Locations."

3. Administrative Procedure 0-ADM-016.1, "Transient Combustible and Flammable Substances Program", Approved August 2, 1994.

4. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," July 1989.

5. FPL Construction Specification MN-3.21, Rev. 3, "Installation and Inspection Guidelines for Thermo-Lag Fire Barrier Material".

6. Turkey Point Units 3 & 4 Updated Final Safety Analysis Report, Revision 12, May 1995.

Attachment 2

Plant Drawings and Site Figures Referred to in Request for Additional Information Response

1. 5610-E-56A, Rev. 1, Raceway Fire Protection Wrap, EL. 18'-0", Area 20.
2. 5610-E-61A, Rev. 4, Raceway Fire Protection Wrap, EL. 18'-0", Area 18.
3. 5610-E-67A, Rev. 1, Raceway Fire Protection Wrap, EL. 10'-0" & Below area 9 & 10.
4. 5610-E-119A, Rev. 4, Raceway Fire Protection Wrap, EL. 18'-0", Area 8.
5. 5610-E-124A, Rev. 2, Raceway Fire Protection Wrap, EL. 18'-0", Area 14.
6. 5610-E-125, Rev. 15, Conduit & Grounding Auxiliary Building Roof.
7. 5610-E-127A, Rev. 3, Raceway Fire Protection Wrap, Above EL. 18'-0", Area 10.
8. 5610-E-128A Rev. 2, Raceway Protection Wrap, EL. 30'-0", Area 16.
9. 5610-E-131A Rev. 3, Raceway Fire Protection Wrap, All Elevations, Area 24.
10. 5610-E-133A Rev. 5, Raceway Fire Protection Wrap, All Elevations, Area 17.
11. 5610-E-135A Rev. 4, Raceway Fire Protection Wrap, EL. 42'-0", Area 8.
12. 5610-E-150A Rev. 4, Raceway Fire Protection Wrap, EL. 18'-0", Area 1.
13. 5610-E-151A Rev. 3, Raceway Fire Protection Wrap, EL. 30'-0" & 31'-0", Area 1.
14. 5610-E-154A Rev. 2, Raceway Fire Protection Wrap, EL. 30'-0", Area 2.
15. 5610-E-160A Rev. 4, Raceway Fire Protection Wrap, EL. 18'-0", Area 3.
16. 5610-E-161A Rev. 3, Raceway Fire Protection Wrap, EL. 30'-0", Area 3.
17. 5610-E-626A Rev. 0, Raceway Fire Protection Wrap, North of Unit #3 Turbine Building
18. 5610-E-629A Rev. 0, Raceway Fire Protection Wrap, North of Unit 3 Turbine Building Auxiliary Power Upgrade.
19. 5610-E-791A Rev. 2, Raceway Fire Protection Wrap, Area 16, Above El. 58'-0".
20. Site Figure, RAI C, Sh. 1, Rev. 0, "Appendix "R" Outdoor Fire Areas & In Situ Combustibles".

21. Site Figure, RAI C, Sh. 2, Rev. 0 "Appendix "R" Major Combustibles, 50 Foot Exclusion Areas".

22. Site Figure, RAI C, Sh. 3, Rev. 0, "Appendix "R" Turbine Lube Oil Piping Location".

23. Site Figure, RAI C, Sh. 4, Rev. 0 "Appendix "R" Hydrogen Piping Location".

24. Site Figure, RAI D, Rev. 0, "Appendix "R" Turbine Lube Oil Leakage Flow Path".

25. Site Figure, RAI E, Rev. 0, "Appendix "R", Site Fire Hazards".