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EISENHUT,D.G. Division of Licensing

SUBJECT: Submits info in response to NRC Question 410.10 re handling of light loads.

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FLORIDA POWER & LIGHT COMPANY

May 7, 1982
L-82-190

Office of Nuclear Reactor Regulation
Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

RECEIVED
MAY 10 1982

Dear Mr. Eisenhut:

Re: St. Lucie Unit #2
Docket No. 50-389
Handling of Light Loads

Attached please find Florida Power and Light Company's response to NRC Question 410.10 regarding the handling of light loads at St. Lucie Unit 2.

Very truly yours,

J. A. De Mastry

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/RAK/ga

Attachment

cc: James P. O'Reilly, Region II
Harold F. Reis, Esquire

B001 S 1/1

St. Lucie Unit 2
Response to NRC Question 410.10
Light Loads

Question 410.10:

Describe, discuss and verify that the maximum potential kinetic energy contained in all objects of less weight than a spent fuel assembly which will be handled over spent fuel will not exceed the effects of the fuel handling accident in section 15.7.4 of the FSAR.

Response:

FPL has reviewed the potential for an inadvertent drop of light objects onto spent fuel at St. Lucie Unit 2. The objects that were considered were all lighter than a fuel assembly and its associated lifting tool and thus had not been previously considered in the heavy loads analysis. A postulated drop may occur in either of two locations; over the spent fuel pool or over an open reactor vessel. Any object that might be lifted over either area was considered in this review. The conclusions of this review are presented below:

A) Light loads lifted over the spent fuel pool:

All objects that are lifted over the spent fuel pool were considered for a potential drop. Since each fuel assembly in the spent fuel pool is stored in a separate module of the spent fuel rack (see FSAR section 9.1.2) it is not considered conceivable that more than one fuel assembly could be damaged. Since the analysis contained in section 15.7.4 assumed that all the pins in one full assembly were damaged, and that all the activity in the pin gas gap was released, the drop of a light load would have results that are no more limiting than the previously analyzed accident. A dropped light load in the spent fuel pool can not impact more than one assembly and the offsite dose can not be greater than that identified in section 15.7.4.

B) Light loads lifted over the open reactor vessel:

In the process of analyzing this potential accident, the following steps were taken:

1) determine what could be dropped.
2) determine when these items could impact fuel in the vessel.
3) determine the damage associated with each dropped item.
4) calculate the consequences of this damage.

The following details each of the steps:

I - Light Loads Identification

The maintenance and operations departments of St. Lucie 1, a near duplicate plant to St. Lucie 2, provided a list of potential items to be considered in this light loads drop review. This list included any item that would be lifted by a load handling system over the reactor vessel. This list of items is shown on attachment 1. Since St. Lucie 1 has been refueled four times, the compiled list has been developed with considerable experience on what may be or has been lifted over open reactor vessels. It should be noted that these items are lifted rarely and do not constitute a significant percentage of lifts within containment.

II - Time of Impact

The time period during which an impact could occur was reviewed. An impact of dropped items with spent fuel in the reactor vessel may only occur when the reactor vessel head and the reactor internals upper guide structure are removed from the vessel. This period only occurs during a refueling of the reactor. Additionally, release from damaged fuel will not result in any appreciable offsite dose unless the containment integrity is not established; that is, the containment equipment hatch must be open to effect appreciable release to the atmosphere. This is never the case during refueling periods when the reactor is open except for extremely limited time intervals when it is essential to move equipment into or out of containment. Core alterations are not allowed when containment integrity is not established. Further, during these periods lifting activities over the open vessel are not normally conducted.

III - Potential Damage

The damage associated with any individually dropped item was considered. Several items were identified as potentially serious contributors to fuel damage. An in depth review of these items indicated that a very sophisticated analysis would be required to determine the extent of any fuel damage.

Rather than embarking on a very lengthy and state-of-the-art calculation to assess the precise damage that might be caused by dropped light loads, a simplified calculation was performed that indicated the number of fuel pins that could be damaged and not cause the site boundary dose to exceed a small part of 10 CFR 100 limits. The number of pins to cause site limits to be reached is dependent on the decay time allowed prior to release. The results of this calculation can be shown in Figure 1. As indicated on the figure, it will take only 6 days of decay to allow a release from one entire assembly without exceeding a small fraction of site limits. The time of decay is quite significant to this light loads concern. First, available gas curie content per pin decreases with time; i.e., the fission gas decay. Second, the minimum time that must pass before the fuel in the reactor is exposed to potential drop damage is several days. To date, the reactor vessel head and upper guide structure has not been removed in less than 10 days; and this corresponds to decay time of sufficient duration to maintain site boundary limits even if 360 pins are damaged. As can be seen from these values, this corresponds to significant damage to 1.41 fuel assemblies. Therefore, from a qualitative standpoint, it is apparent that a dropped light load would need to cause considerable damage before any site boundary limits are exceeded.

The calculations that have been performed to assess boundary doses conservatively assume that all released fission gases are immediately released from containment. This assumption is very conservative since the actual release path would be out through the containment equipment hatch which is several levels below the refueling canal water level, the level at which the gas is released. In the event of an actual fission gas release from the refueling canal, the fission gases would mix with the containment air in the upper containment atmosphere and allow considerable time to isolate the equipment hatch. It is reasonable to assume that the equipment hatch can be closed in 45 minutes following a gas release. Once the containment hatch is closed, all fission products inside containment will be isolated from the outside atmosphere.

FPL does not lift items over the open reactor vessel with fuel exposed as a matter of course. This practice is in keeping with standard safe maintenance procedures. It is recognized, however, that there may be an instance that requires lifting some object over the exposed fuel. This evolution is not standard, it does not occur often and it is not performed in a cavalier manner.

In conclusion, the review of a dropped light load event has lead us to several findings. First, the probability of damage to fuel appears quite low because of the large number of pins that would have to be damaged by a dropped item after a reasonable decay time. Next, the probability is further reduced because containment is usually secured when the reactor vessel is open and therefor an offsite release would not likely occur. Finally, since FPL does not normally lift items over the open vessel, the incidence of a dropped load is extremely remote. In order to provide further assurance that dropped light loads do not cause problems in the future, FPL provides specific instructions to its crane operators to avoid lifting any objects over the open vessel when the containment integrity is not established. These instructions will be included in the crane operator training program.

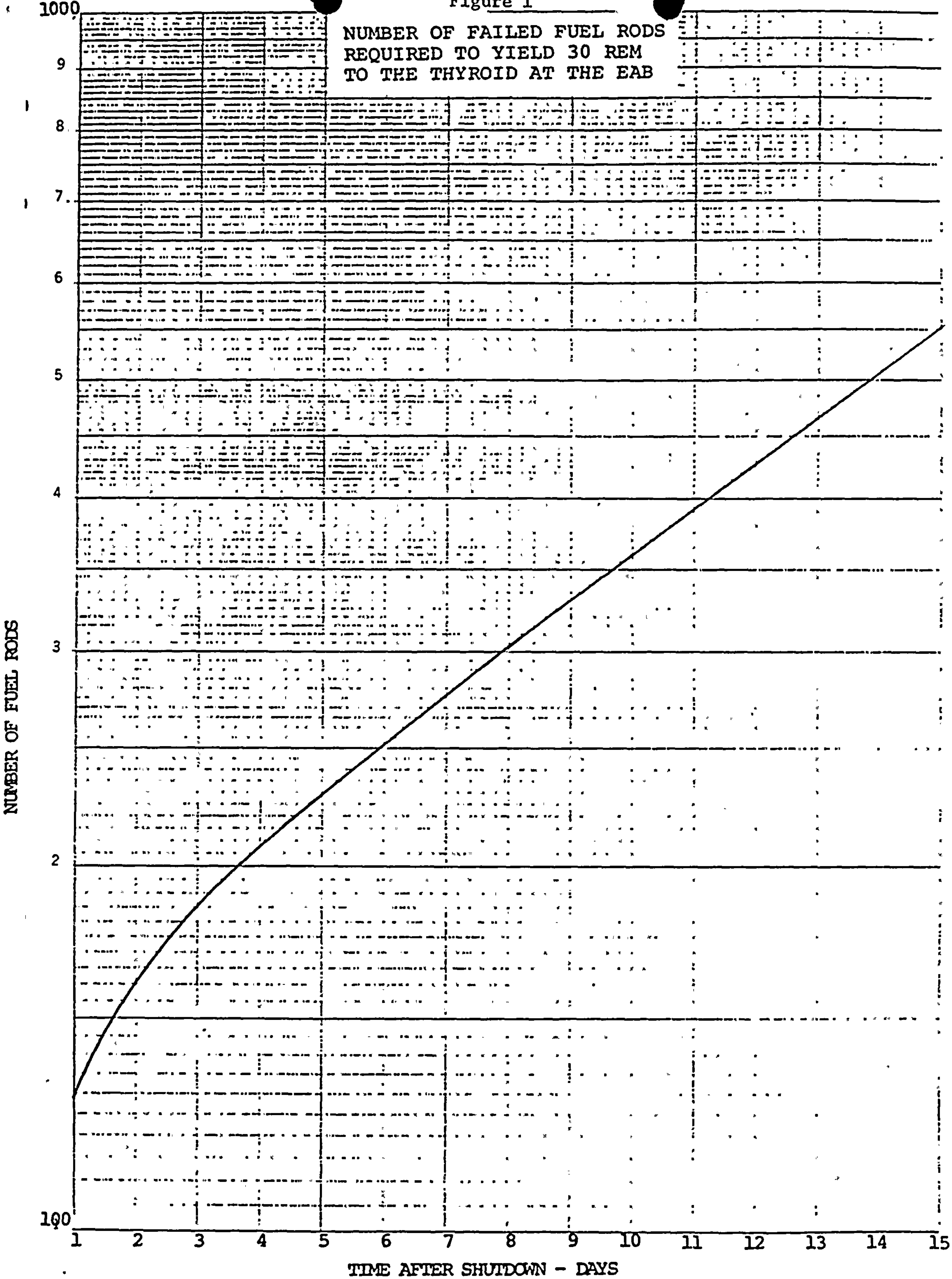
Therefore, FPL feels that the probability of unacceptable consequences resulting from the drop of a light load over an open reactor vessel is very low. With the incorporation of more definitive information in the crane operator training program to further assure against fuel damage it is felt that this probability is acceptably low and further action does not appear warranted.

Attachment 1
List of Items that May be Lifted
Over the Reactor Vessel by a Load Handling System

Item	Approximate Weight
Incore Instrumentation adapter torque tool	50#
3 Lifting bolt torque tools	50# ea.
2 Extension shaft handling tools	75# ea.
60 CEA extension shaft protective sleeves	40# ea.
Cavity seal ring extension torque wrench	25#
#1 CEA extension shaft	100#
Upper Guide Structure lift rig deck plate(s)	40# ea.
Utility basket	300#
TV Camera - portable	20#
TV Camera console	50#
Upper Guide Structure lift rig tripod	800#
Reactor cavity ladder cage	250#
Reactor cavity upper ladder section	100#
8 Incore detector Bullet noses	25# ea.
CEA removal tool	100#
3 Pressurizer safety valves	300# ea.
2 Power-operated relief valves	150# ea.
2 HEPA filter ventilators	300# ea.
4 RCP seals	1,000# ea.

Figure 1

NUMBER OF FAILED FUEL RODS REQUIRED TO YIELD 30 REM TO THE THYROID AT THE EAB



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