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May 11, 1987

Docket No.: 50-352

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Mr. Edward G. Bauer, Jr.
Vice President and General Counsel
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Dear Mr. Bauer:

SUBJECT: TECHNICAL SPECIFICATION CHANGES FOR SOURCE RANGE MONITOR MINIMUM COUNT RATE

RE: LIMERICK GENERATING STATION, UNIT 1

The Commission has issued the enclosed Amendment No. 4 to Facility Operating License No. NPF-39 for the Limerick Generating Station, Unit 1. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated February 11, 1987.

This amendment changes the requirements of Technical Specification 3.9.2 and Technical Specification Table 3.3.6-1 for a minimum Source Range Monitor detector count rate when 16 or fewer fuel assemblies are in the reactor.

A copy of our Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/s/

Robert E. Martin, Project Manager
Project Directorate I-2
Division of Reactor Projects I/II

Enclosures:
1. Amendment No. 4 to License No. NPF-39
2. Safety Evaluation

cc w/enclosures:
See next page

PDI-2/LA	PDI-2/PM	OGC	PDI-2/D	
MO'Brien	RMartin:ca	MYoung	WButler	WB
5/1/87	5/14/87	5/6/87	5/11/87	

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

May 11, 1987

Docket No.: 50-352

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Vice President and General Counsel
Philadelphia Electric Company
2301 Market Street
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

PHILADELPHIA ELECTRIC COMPANY

DOCKET NO. 50-352

LIMERICK GENERATING STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 4
License No. NPF-39

1. The Nuclear Regulatory Commission (the Commission) has found that

   A. The application for amendment by Philadelphia Electric Company (the licensee) dated February 11, 1987, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-39 is hereby amended to read as follows:

   Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 4 , are hereby incorporated into this license. Philadelphia Electric Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/s/

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 11, 1987

PDI-2/LA	PDI-2/PM	OGC	PDI-?/D
MO'Brien	RMartin:ca		WButler
/87	5/04/87	/87	5/11/87

3. This license amendment is effective as of its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Walter R. Butler

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 11, 1987

ATTACHMENT TO LICENSE AMENDMENT NO. 4

FACILITY OPERATING LICENSE NO. NPF-39

DOCKET NO. 50-352

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by Amendment number and contain vertical lines indicating the area of change. Overleaf page(s) provided to maintain document completeness.*

Remove	Insert
3/4 3-57*	3/4 3-57*
3/4 3-58	3/4 3-58
3/4 3-59	3/4 3-59
3/4 3-60*	3/4 3-60*
3/4 9-3	3/4 9-3
3/4 9-4	3/4 9-4
B 3/4 9-1	B 3/4 9-1
B 3/4 9-2*	B 3/4 9-2*

3/4.3.6 CONTROL ROD BLOCK INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.6. The control rod block instrumentation channels shown in Table 3.3.6-1 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3.6-2..

APPLICABILITY: As shown in Table 3.3.6-1.

ACTION:

a. With a control rod block instrumentation channel trip setpoint less conservative than the value shown in the Allowable Values column of Table 3.3.6-2, declare the channel inoperable until the channel is restored to OPERABLE status with its trip setpoint adjusted consistent with the Trip Setpoint value.

b. With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip Function requirement, take the ACTION required by Table 3.3.6-1.

SURVEILLANCE REQUIREMENTS

4.3.6 Each of the above required control rod block trip systems and instrumentation channels shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST, and CHANNEL CALIBRATION operations for the OPERATIONAL CONDITIONS and at the frequencies shown in Table 4.3.6-1.

TABLE 3.3.6-1

CONTROL ROD BLOCK INSTRUMENTATION

TRIP FUNCTION	MINIMUM OPERABLE CHANNELS PER TRIP FUNCTION	APPLICABLE OPERATIONAL CONDITIONS	ACTION
1. ROD BLOCK MONITOR[a]			
a. Upscale	2	1*	60
b. Inoperative	2	1*	60
c. Downscale	2	1*	60
2. APRM			
a. Flow Biased Neutron Flux - Upscale	4	1	61
b. Inoperative	4	1, 2, 5	61
c. Downscale	4	1	61
d. Neutron Flux - Upscale, Startup	4	2, 5	61
3. SOURCE RANGE MONITORS ***			
a. Detector not full in[b]	3	2	61
	2	5	61
b. Upscale[c]	3	2	61
	2	5	61
c. Inoperative[c]	3	2	61
	2	5	61
d. Downscale[d]	3	2	61
	2	5	61
4. INTERMEDIATE RANGE MONITORS			
a. Detector not full in	6	2, 5	61
b. Upscale	6	2, 5	61
c. Inoperative	6	2, 5	61
d. Downscale[e]	6	2, 5	61
5. SCRAM DISCHARGE VOLUME			
a. Water Level-High	2	1, 2, 5**	62
6. REACTOR COOLANT SYSTEM RECIRCULATION FLOW			
a. Upscale	2	1	62
b. Inoperative	2	1	62
c. Comparator	2	1	62
7. REACTOR MODE SWITCH SHUTDOWN POSITION	2	3, 4	63

TABLE 3.3.6-1 (Continued)

CONTROL ROD WITHDRAWAL BLOCK INSTRUMENTATION

ACTION STATEMENTS

ACTION 60 - Declare the RBM inoperable and take the ACTION required by Specification 3.1.4.3.

ACTION 61 - With the number of OPERABLE channels one or more less than required by the Minimum OPERABLE Channels per Trip Function requirement, place at least one inoperable channel in the tripped condition within one hour.

ACTION 62 - With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip Function requirement, place the inoperable channel in the tripped condition within one hour.

ACTION 63 - With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip Function requirement, initiate a rod block.

NOTES

* With THERMAL POWER $\geq$ 30% of RATED THERMAL POWER.

** With more than one control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

*** These channels are not required when sixteen or fewer fuel assemblies, adjacent to the SRMs, are in the core.

(a) The RBM shall be automatically bypassed when a peripheral control rod is selected or the reference APRM channel indicates less than 30% of RATED THERMAL POWER.

(b) This function shall be automatically bypassed if detector count rate is > 100 cps or the IRM channels are on range 3 or higher.

(c) This function is automatically bypassed when the associated IRM channels are on range 8 or higher.

(d) This function is automatically bypassed when the IRM channels are on range 3 or higher.

(e) This function is automatically bypassed when the IRM channels are on range 1.

TABLE 3.3.6-2

CONTROL ROD BLOCK INSTRUMENTATION SETPOINTS

TRIP FUNCTION	TRIP SETPOINT	ALLOWABLE VALUE
1. ROD BLOCK MONITOR		
a. Upscale		
i. flow biased	$\leq$ 0.66 W + 40%, with a maximum of,	$\leq$ 0.66 W + 43%, with a maximum of,
ii. high flow clamped	$\leq$ 106%	$\leq$ 109%
b. Inoperative	N.A.	N.A.
c. Downscale	$\geq$ 5% of RATED THERMAL POWER	$\geq$ 3% of RATED THERMAL POWER
2. APRM		
a. Flow Biased Neutron Flux - Upscale	$\leq$ 0.66 W + 42%*	$\leq$ 0.66 W + 45%*
b. Inoperative	N.A.	N.A.
c. Downscale	$\geq$ 4% of RATED THERMAL POWER	$\geq$ 3% of RATED THERMAL POWER
d. Neutron Flux - Upscale, Startup	$\leq$ 12% of RATED THERMAL POWER	$\leq$ 14% of RATED THERMAL POWER
3. SOURCE RANGE MONITORS		
a. Detector not full in	N.A.	N.A.
b. Upscale	$\leq 1 \times 10^5$ cps	$\leq 1.6 \times 10^5$ cps
c. Inoperative	N.A.	N.A.
d. Downscale	$\geq$ 3 cps**	$\geq$ 1.8 cps**
4. INTERMEDIATE RANGE MONITORS		
a. Detector not full in	N.A.	N.A.
b. Upscale	$\leq$ 108/125 divisions of full scale	$\leq$ 110/125 divisions of full scale
c. Inoperative	N.A.	N.A.
d. Downscale	$\geq$ 5/125 divisions of full scale	$\geq$ 3/125 divisions of full scale
5. SCRAM DISCHARGE VOLUME		
a. Water Level-High		
a. Float Switch	$\leq$ 257' 5 9/16" elevation***	$\leq$ 257' 7 9/16" elevation

Amendment No. 3
FEB 17 19

3/4.9 REFUELING OPERATIONS

BASES

3/4.9.1 REACTOR MODE SWITCH

Locking the OPERABLE reactor mode switch in the Shutdown or Refuel position, as specified, ensures that the restrictions on control rod withdrawal and refueling platform movement during the refueling operations are properly activated. These conditions reinforce the refueling procedures and reduce the probability of inadvertent criticality, damage to reactor internals or fuel assemblies, and exposure of personnel to excessive radioactivity.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of at least two source range monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core. The minimum count rate is not required when sixteen or fewer fuel assemblies are in the core. During a typical core reloading, two, three or four irradiated fuel assemblies will be loaded adjacent to each SRM to produce greater than the minimum required count rate. Loading sequences are selected to provide for a continuous multiplying medium to be established between the required operable SRMs and the location of the core alteration. This enhances the ability of the SRMs to respond to the loading of each fuel assembly. During a core unloading, the last fuel to be removed is that fuel adjacent to the SRMs.

3/4.9.3 CONTROL ROD POSITION

The requirement that all control rods be inserted during other CORE ALTERATIONS ensures that fuel will not be loaded into a cell without a control rod.

3/4.9.4 DECAY TIME

The minimum requirement for reactor subcriticality prior to fuel movement ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the accident analyses.

3/4.9.5 COMMUNICATIONS

The requirement for communications capability ensures that refueling station personnel can be promptly informed of significant changes in the facility status or core reactivity condition during movement of fuel within the reactor pressure vessel.

3/4.9.6 REFUELING PLATFORM

The OPERABILITY requirements ensure that (1) the refueling platform will be used for handling control rods and fuel assemblies within the reactor pressure vessel, (2) each hoist has sufficient load capacity for handling fuel assemblies and control rods, (3) the core internals and pressure vessel are protected from excessive lifting force in the event they are inadvertently engaged during lifting operations, and (4) inadvertent criticality will not occur due to fuel being loaded into a unrodded cell.

3/4.9.7 CRANE TRAVEL - SPENT FUEL STORAGE POOL

The restriction on movement of loads in excess of the nominal weight of a fuel assembly and associated lifting device over other fuel assemblies in the storage pool ensures that in the event this load is dropped 1) the activity release will be limited to that contained in a single fuel assembly, and 2) any possible distortion of fuel in the storage racks will not result in a critical array. This assumption is consistent with the activity release assumed in the safety analyses.

3/4.9.8 and 3/4.9.9 WATER LEVEL - REACTOR VESSEL and WATER LEVEL -SPENT FUEL STORAGE POOL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. This minimum water depth is consistent with the assumptions of the accident analysis.

3/4.9.10 CONTROL ROD REMOVAL

These specifications ensure that maintenance or repair of control rods or control rod drives will be performed under conditions that limit the probability of inadvertent criticality. The requirements for simultaneous removal of more than one control rod are more stringent since the SHUTDOWN MARGIN specification provides for the core to remain subcritical with only one control rod fully withdrawn.

3/4.9.11 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

The requirement that at least one residual heat removal loop be OPERABLE or that an alternate method capable of decay heat removal be demonstrated and that an alternate method of coolant mixing be in operation ensures that 1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during REFUELING, and 2) sufficient coolant circulation would be available through the reactor core to assure accurate temperature indication and to distribute and prevent stratification of the poison in the event it becomes necessary to actuate the standby liquid control system.

The requirement to have two shutdown cooling mode loops OPERABLE when there is less than 22 feet of water above the reactor vessel flange ensures that a single failure of the operating loop will not result in a complete loss of residual heat removal capability. With the reactor vessel head removed and 22 feet of water above the reactor vessel flange, a large heat sink is available for core cooling. Thus, in the event a failure of the operating RHR loop, adequate time is provided to initiate alternate methods capable of decay heat removal or emergency procedures to cool the core.

3/4.9.2 INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.9.2 At least two source range monitor (SRM) channels* shall be OPERABLE and inserted to the normal operating level with:

a. Continuous visual indication in the control room,

b. At least one with audible alarm in the control room,

c. One of the required SRM detectors located in the quadrant where CORE ALTERATIONS are being performed and the other required SRM detector located in an adjacent quadrant, and

d. Unless adequate shutdown margin has been demonstrated, the shorting links shall be removed from the RPS circuitry prior to and during the time any control rod is withdrawn.**

APPLICABILITY: OPERATIONAL CONDITION 5.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS and insert all insertable control rods.

SURVEILLANCE REQUIREMENTS

4.9.2 Each of the above required SRM channels shall be demonstrated OPERABLE by:

a. At least once per 12 hours:

1. Performance of a CHANNEL CHECK,

2. Verifying the detectors are inserted to the normal operating level, and

3. During CORE ALTERATIONS, verifying that the detector of an OPERABLE SRM channel is located in the core quadrant where CORE ALTERATIONS are being performed and another is located in an adjacent quadrant.

---

*These channels are not required when sixteen or fewer fuel assemblies, adjacent to the SRMs, are in the core. The use of special movable detectors during CORE ALTERATIONS in place of the normal SRM nuclear detectors is permissible as long as these special detectors are connected to the normal SRM circuits.

**Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.

SURVEILLANCE REQUIREMENTS (Continued)

b. Performance of a CHANNEL FUNCTIONAL TEST:

1. Within 24 hours prior to the start of CORE ALTERATIONS, and

2. At least once per 7 days.

c. Verifying that the channel count rate is at least 3.0 cps:*

1. Prior to control rod withdrawal,

2. Prior to and at least once per 12 hours during CORE ALTERATIONS, and

3. At least once per 24 hours.

d. Verifying, within 8 hours prior to and at least once per 12 hours during, that the RPS circuitry "shorting links" have been removed during:

1. The time any control rod is withdrawn,** or

2. Shutdown margin demonstrations.

*May be reduced to 0.7 cps provided the signal-to-noise ratio is $\geq$ 2. These channels are not required when sixteen or fewer fuel assemblies, adjacent to the SRMs, are in the core.

**Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 4 TO FACILITY OPERATING LICENSE NO. NPF-39

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION, UNIT 1

DOCKET NO. 50-352

1.0 INTRODUCTION

By letter dated February 11, 1987, Philadelphia Electric Company (the licensee) requested an amendment to Facility Operating License No. NPF-39 for the Limerick Generating Station, Unit 1. The proposed amendment would change the Technical Specifications (TS) for the Limerick Generating Station, Unit 1 by revising the current requirements of TS 3.9.2 and Table 3.3.6-1 for a minimum Source Range Monitor (SRM) detector count rate when 16 or fewer fuel assemblies are in the reactor.

The licensee has scheduled the first refueling outage to begin on May 16, 1987. During the outage, a complete core offloading is planned in order to more efficiently complete and accommodate refueling outage work. The fuel assemblies adjacent to the Source Range Monitors (SRMs), being the last fuel assemblies to be removed, would cause the loss of SRM detector count rate contrary to the requirements of the current TS 3/4.9.2, which require that a minimum SRM detector count rate be maintained at all times during core alterations. This application requests a revision to the requirement for a minimum SRM count rate when sixteen or fewer assemblies are in the core so as to permit complete core offloading. The proposed TS changes consist of a footnote to be added to the bottom of pages 3/4 3-59, 3/4 9-3 and 3/4 9-4. The footnote allows the SRM count rate to decrease below 3.0 cps (0.7 cps when the signal-to-noise ratio is greater than or equal to 2) whenever sixteen or fewer fuel assemblies are in the core adjacent to the SRMs. A change is also made to the TS BASES 3/4.9.2 which further describes how the fuel is to be offloaded and reloaded without the currently required minimum SRM count rate.

The licensee states that the SRM system provides neutron flux information during startup and low flux level operations; monitors neutron flux level during refueling operations; provides protection against high neutron flux during the approach to criticality; and, monitors neutron flux through the overlap into the Intermediate Range Monitoring System. The SRM functions addressed by the proposed amendment are related to its use in the refueling mode.

2.0 EVALUATION

The changes are directed at the Limiting Conditions for Operation for core monitoring during core alterations, and addresses Source Range Monitor (SRM) operability, via count rate, and fuel assembly loading limits. It specifically involves Specification 3/4.9.2 and related Basis, and Table 3.3.6-1. During reload operations the Technical Specifications require minimum count rate levels to be met by the SRM. During reload operations in a BWR in which the entire core is to be unloaded, especially if sources are not present, there may be times, when there are few fuel assemblies in the core, when this minimum can not be met with the usual SRM. For this condition, other monitors, Fuel Loading Chambers (FLC), usually called "Dunking Chambers", that can be moved from place to place in the core as loading proceeds, are frequently used as a replacement for the SRM. Without sources, even these may not be able to meet the Technical Specification requirements. Furthermore, the FLC are an impediment to operations and it is thus desirable to keep their use to a minimum.

During the past several years several utilities have requested Technical Specification changes to permit loading operations such that the use of FLC and/or sources can be avoided. The reactors include Peach Bottom, Browns Ferry, Hatch, Susquehanna and Brunswick. An example of such a procedure and relevant background and bases are discussed in the staff's SER for the most recently approved revision for Browns Ferry. As permitted by these changes, the loading operation for full core reloads involving irradiated fuel may begin without minimum count rates for the SRM for a limited number of assembly loadings (determined to be subcritical). These loadings place irradiated fuel adjacent to SRM locations. This provides (e.g., from gamma-neutron reactions) sufficient neutron source to meet the Technical Specification minimum SRM count rate requirements. After the SRM is thus fully operational the loading proceeds in the usual manner, e.g., spiral loading from the center. The initial loading is acceptable because it is not possible to be critical, even with control rods removed, with the fuel configurations used.

PECo proposes, for Limerick, to be allowed to go below the required SRM count rate when there are not more than four fuel assemblies in each core quadrant, loaded around each of the four SRM positions for either loading or unloading operations. For example, for a reload in which all fuel assemblies and normal sources have been removed from the core, they first load up to four (as necessary) irradiated assemblies next to each of the four SRM locations, without necessarily meeting the required count rate until this loading is finished. The loading would then continue in normal fashion, e.g., spiral loading from the core center, and would have to meet the usual counting rate requirement. General Electric has calculated that the configuration of (any GE) four assemblies (2x2 array) at the maximum reactivity condition (as a function of burnup), without control rods inserted and separated from other assemblies by a distance of two fuel cells would have a k_{eff} of less than 0.95. Thus the above configuration is well subcritical.

The proposed Limerick modifications to the SRM count rate requirement and the loading (and unloading) procedures to safely approach the required count rate are the same as (or similar to) those reviewed and approved for previous applications in this area by the other utilities. Our review indicates that the pre-count configurations should indeed be well subcritical and experience indicates that required count rates should be achieved with the irradiated assemblies next to the SRM.

The Technical Specification changes proposed to allow such operation is a "note" addition to the 3.9.2 applicability statement (and to the corresponding basis) and to Table 3.3.6-1. It states that the required SRM count rate will not be applicable when there are less than the (previously discussed) four groups of four SRM adjacent assemblies in the core. This is a suitable implementation of the above considerations and is acceptable.

Conclusion

PECo has requested Technical Specification changes for Limerick which would remove during the loading (unloading) of the first (last) fuel assemblies (adjacent to the SRM) the requirement that the SRM meet a minimum count rate with fuel in the core. Other loading requirements will be unchanged. The primary reason for wanting the change is to eliminate the need for sources and to minimize the need for FLC ("Dunking Chambers") during loading operations. The primary basis for the safety of the requested change is that the core will be well subcritical during the loading of the initial assemblies, and subsequent loading will be well monitored by the SRM. Our review has concluded that this process is acceptable and that the requested Technical Specification changes appropriately implement the process and are acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement nor environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the

public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and the security nor to the health and safety of the public.

Prinicipal Contributor: H. Richings

Dated: May 11, 1987