UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 10, 1994

Docket No. 50-352

Mr. George A. Hunger, Jr.
Director-Licensing, MC 52A-5
PECO Energy Company
Nuclear Group Headquarters
Correspondence Control Desk
P.O. Box No. 195
Wayne, Pennsylvania 19087-0195

Dear Mr. Hunger:

SUBJECT: TECHNICAL SPECIFICATIONS CHANGE, ARTS/MELLA IMPLEMENTATION, LIMERICK GENERATING STATION, UNIT 1 (TAC NO. M87308)

The Commission has issued the enclosed Amendment No. 66 to Facility Operating License No. NPF-39 for the Limerick Generating Station, Unit 1. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated August 27, 1993, and supplemented by your submittal of November 17, 1993.

The amendment revises the TS, contained in Appendix A of the Operating License, to allow an expanded power-to-flow operating domain supported by Average Power Range Monitor - Rod Block Monitor Technical Specifications/ Maximum Extended Load Line Limit Analyses (ARTS/MELLLA). The design basis Loss-of-Coolant Accident (LOCA) has been analyzed using the SAFER/GESTR-LOCA methodology which is generically approved by the staff when plant-specific criteria are met. The staff finds the implementation of the ARTS/MELLLA program and SAFER/GESTR-LOCA methods acceptable.

The amendment is effective as of its date of issuance. You are to inform the staff when you have implemented the provisions of this amendment. In your application, you proposed that the ARTS/MELLA amendments apply to both Units 1 and 2, however, you noted that the ARTS/MELLA modifications would not be made on Unit 2 until its third refueling outage, which is currently scheduled for January 1995. In order to preclude confusion between the effective date for the Unit 2 ARTS/MELLLA amendment and any subsequent amendment requests that might affect the same TS pages, the staff will issue the ARTS/MELLLA amendment for Unit 2 just prior to the Unit 2 third refueling outage. The enclosed safety evaluation applies to both units. However, the enclosed amendment applies only to Unit 1. A separate amendment will be issued a year from now to authorize the same TS changes for Unit 2 prior to January 1995.

CP-1

230052

DF01

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

Sincerely,

/S/

Frank Rinaldi, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 66 to
   License No. NPF-39
2. Safety Evaluation

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OFC	:PDI-2/LA	:PDI-2/PM	:SRXB	:OGC	:PDI-2/D	:
NAME	:MO'Brien	:FRinaldi:rb	:RJones	:[illegible]	:CMiller	:
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OFC	:PDI-2/LA	:PDI-2/PM	:SRXB	:OGC	:PDI-2/D	:
NAME	:MO'Brien	:FRinaldi:rb	:RJones	:	:CMiller	:
DATE	:2/9/93 94	:1/13/93	:1/21/93	:2/3/94	:2/10/93	:

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

PHILADELPHIA ELECTRIC COMPANY

DOCKET NO. 50-352

LIMERICK GENERATING STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 66
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 August 27, 1993, and supplemented by letter dated November 17, 1993, 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. 66, 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

Charles L. Miller

Charles L. Miller, Director
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the
Technical Specifications

Date of Issuance: February 10, 1994

ATTACHMENT TO LICENSE AMENDMENT NO. 66

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 pages are provided to maintain document completeness.*

Remove	Insert
i	i
ii	ii
iii	iii
iv	iv*
v	v*
vi	vi
xvii	xvii*
xviii	xviii
1-1	1-1*
1-2	1-2
1-3	1-3
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1-5	1-5
1-6	1-6
1-7	1-7
1-8	1-8*
2-3	2-3*
2-4	2-4
B 2-7	B 2-7
B 2-8	B 2-8*
3/4 1-17	3/4 1-17*
3/4 1-18	3/4 1-18
3/4 1-19	3/4 1-19
3/4 1-20	3/4 1-20
3/4 2-1	3/4 2-1
3/4 2-2	3/4 2-2*

ATTACHMENT TO LICENSE AMENDMENT NO. 66

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 pages are provided to maintain document completeness.*

Remove	Insert
3/4 2-7	3/4 2-7
3/4 2-8	3/4 2-8
3/4 2-9	3/4 2-9
3/4 2-10	3/4 2-10*
3/4 3-7	3/4 3-7*
3/4 3-8	3/4 3-8
3/4 3-59	3/4 3-59
3/4 3-60	3/4 3-60
3/4 3-60a	3/4 3-60a
3/4 3-60b	3/4 3-60b*
3/4 3-61	3/4 3-61
3/4 3-62	3/4 3-62
3/4 4-1	3/4 4-1
3/4 4-1a	3/4 4-1a
B 3/4 1-3	B 3/4 1-3
B 3/4 1-4	B 3/4 1-4
B 3/4 1-5	B 3/4 1-5
-	-
B 3/4 2-1	B 3/4 2-1
B 3/4 2-2	B 3/4 2-2
B 3/4 2-3	B 3/4 2-3*
B 3/4 2-4	B 3/4 2-4
B 3/4 2-5	B 3/4 2-5
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ATTACHMENT TO LICENSE AMENDMENT NO. 66

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 pages are provided to maintain document completeness.*

Remove	Insert
B 3/4 4-1	B 3/4 4-1
B 3/4 4-2	B 3/4 4-2*
B 3/4 6-3	B 3/4 6-3
B 3/4 6-3a	B 3/4 6-3a*
6-18a	6-18a
-	-

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 66 TO FACILITY OPERATING

LICENSE NO. NPF-39

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION, UNITS 1 AND 2

DOCKET NOS. 50-352 AND 50-353

1.0 INTRODUCTION

By letter dated August 27, 1993 (Reference 1), and supplemented by letter dated November 17, 1993 (Reference 2), the Philadelphia Electric Company (PECo or the licensee) submitted a request for changes to the Limerick Generating Station (LGS), Units 1 and 2 Technical Specifications (TS). The requested changes implement an expanded power-to-flow operating domain supported by the Average Power Range Monitor - Rod Block Monitor Technical Specifications/ Maximum Extended Load Line Limit Analyses (ARTS/MELLLA) program. The November 17, 1993, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

The amendment is effective as of its date of issuance. PECo is to inform the staff when you have implemented the provisions of this amendment. In its application, PECo proposed that the ARTS/MELLA amendments apply to both Units 1 and 2, however, it was noted that the ARTS/MELLA modifications would not be made on Unit 2 until its third refueling outage, which is currently scheduled for January 1995. In order to preclude confusion between the effective date for the Unit 2 ARTS/MELLLA amendment and any subsequent amendment requests that might affect the same TS pages, the staff will issue the ARTS/MELLLA amendment for Unit 2 just prior to the Unit 2 third refueling outage. This safety evaluation applies to both units. However, this amendment applies only to Unit 1. A separate amendment will be issued a year from now to authorize the same TS changes for Unit 2 prior to January 1995.

The request proposed four fundamental changes: (1) Deletion of the flow-biased APRM scram and rod block trip setpoint setdown requirements; (2) Modification of the flow-biased APRM scram and rod block trip equations to expand the power-to-flow operating domain; (3) Replacement of the flow-biased Rod Block Monitor (RBM) trip setpoints with power-dependent trips; and (4) Revision of the Standby Liquid Control System (SLCS) Boron-10 enrichment percentage to accommodate operation in the MELLL region. Additionally, a proposal is made to reset the recirculation pump runback intermediate speed to accommodate a feedwater pump trip while operating in the MELLL region.

The first change, eliminating the APRM scram and rod block trip setpoint setdown, is a result of ARTS updates to the thermal limits requirements. These updates are made so that the safety limit Minimum Critical Power Ratio (MCPR) and fuel thermal-mechanical design bases are not violated during postulated transient events initiated from other than rated power or flow conditions. These updates include:

a. Elimination of the use of and reference to the K_f MCPR flow multiplication factor.

b. Introduction of power and flow dependent adjustment factors for the Maximum Average Planar Linear Generation Heat Rate (MAPLHGR) and MCPR limits.

c. Revision of the Core Operating Limits Report (COLR) documentation requirements to include parameters used to determine the power and flow dependent MCPR and MAPLHGR limits for each cycle.

d. Removal of the Fraction of Rated Power (FRP) and the Maximum Fraction of Limiting Power Density (MFLPD) definitions and requirements since they are used only in the determination of the required setdown of the APRM and rod block setpoints.

The APRM and RBM equations, setpoints, operability requirements, and hardware are modified to implement the thermal limit changes of the ARTS/MELLLA program. The RBM trip setpoint changes include alterations to the RBM input and trip logic. The SLCS Boron-10 enrichment is increased in order to maintain the suppression pool temperatures below the design limit of 190 °F during an ATWS while operating in the MELLL region. The recirculation pump runback intermediate speed setting is reduced to bring the power sufficiently low to be within the normal capacity of the feedwater system in the event of a feedwater pump trip.

In support of the requested changes, the licensee has submitted the proposed TS changes, a brief explanation of the changes, and a General Electric (GE) topical report (Reference 3) describing in detail the ARTS/MELLLA program for LGS.

Also as a part of the submittal, the licensee adopted the SAFER/GESTR-LOCA methodology for the analysis of the design basis Loss of Coolant Accident (LOCA). The safety analyses prepared by General Electric to support the change to this LOCA evaluation model was presented in a GE topical report included in the original submittal (Reference 4). In anticipation of implementing the ARTS/MELLLA at LGS, Units 1 and 2, the SAFER/GESTR model was also used to calculate the fuel rod peak cladding temperature during a LOCA with the ARTS/MELLLA improvements.

2.0 EVALUATION

The proposed ARTS/MELLL changes for LGS are common for GE Boiling Water Reactors (BWRs). They have become part of standard operating flexibility options as described in the GE standard application for reactor fuel (Reference 5). These options have been approved for several BWRs, including ARTS/MELLL upgrades on plants such as Hatch and Monticello in 1984, as well as Fermi 2 and Pilgrim in 1991. The methodologies used for the safety analyses justifying the changes and establishment of new operating limits have been previously reviewed and approved by the staff. The proposed new operating region and the APRM and RBM changes are similar to equivalent changes approved for other reactors.

Since the submittal for LGS included changes which have become standard and have been well considered for other plants, only a brief description of them is included here. More detailed information is available in the first such reviews performed for Hatch and Monticello. Aspects of changes or analyses specific to LGS are discussed in more depth, although all of the analyses were examined for this review. The changes to the SLCS Boron-10 enrichment and recirculation pump runback setting are required as a result of the findings of the MELLL analyses during particular Anticipated Transients Without Scram (ATWS).

2.1 ARTS/MELLL Analyses

Program Description

The MELLL mode of operation extends the current operating envelope to the region bounded by the rod line that passes through the 100% power/75% core flow point(i.e. approximately the 121% rod line), the rated power line, and the 100% rated load line. This region allows for more flexibility with power ascensions and allows other fuel cycle efficiency strategies to be utilized. In addition, the ARTS program is developed to increase plant efficiency while in the MELLL region by updating the thermal limit requirements and improving plant instrumentation responses and accuracies.

The changes associated with the MELLL mode of operation and the ARTS program include the following:

a. A power dependent MCPR thermal limit similar to that used by BWR type 6 plants is implemented to complement the new power biased RBM system.

b. The APRM trip setdown requirement is replaced by power and flow dependent thermal limits to reduce the need for manual setpoint adjustments and to allow more direct thermal limits administration. These limits are specified through the use of MAPLHGR and MCPR adjustment factors: MAPFAC(P), MAPFAC(F), MCPR(P), and MCPR(F).

c. The flow biased RBM trips are replaced with power dependent trips. As part of the RBM modification, the Local Power Range Monitor (LPRM) inputs will be reassigned to improve the response characteristics of the system, to improve the response predictability, and to reduce the frequency of nonessential alarms. In addition, the RBM electronics are modified to produce a trip signal as a function of the percentage increase from an initial reference signal.

d. The Rod Withdrawal Error (RWE) analysis is updated utilizing statistical methods that more accurately reflect actual plant operating conditions and is consistent with the system changes.

e. The Standby Liquid Control System (SLCS) Boron-10 enrichment percentage is revised to accommodate operation in the MELLL region as a result of ATWS studies.

Results of analyses that justify the above changes and which determine instrument setpoints and operating limits consistent with their implementation are included with the submittal. These analyses include fuel performance transient analyses, mechanical evaluations of the reactor internals and structural vibrations, LOCA analyses, containment load evaluations, and rod withdrawal error analyses. The thermal limits developed through ARTS/MELLLA are specified for fuel protection during Anticipated Operational Occurrences (AOOs) and portions are intended to be applicable to future fuel cycles utilizing GE fuel designs up to GE11 and also for Asea Brown Boveri (ABB) and Siemens Nuclear Power (SNP) qualification bundles. The specific operating limits and validation of the multipliers are to be updated for each reload and reported in the COLR. Changes in fuel designs, analytical methods, or plant configurations may require confirmatory verification. Plant-specific portions of the generic ARTS limits for LGS were developed based on the LGS Unit 1 Cycle 5 configuration. Similarity of plant configuration and fuel types also allow these ARTS plant-specific limits to be applicable to LGS Unit 2.

<u>MELLL Analyses</u>

LGS is currently licensed to operate in the Extended Load Line Limit (ELLL) and Increased Core Flow (ICF) regions, above the rated rod line along the 108% APRM rod block line, up to the 100% power, between 87% and 105% core flow and/or Partial Feedwater Heating (PFH). The MELLL analysis further expands the operating domain along the 121% rod line to 100% power at 75% core flow. The APRM scram trip setpoints will insert clamp values for core flows greater than 75% rated core flow.

The core wide AOOs included current LGS Unit 1 Cycle 5 reload licensing analyses and were expanded to justify operation in MELLL domain. These also included relaxed assumptions of Recirculation Pump Trip Out-of-Service (RPTOOS) and Turbine Bypass Valve Out-of-Service (TBVOOS). The power and flow dependent MCPR and MAPLHGR limits are derived from evaluations of the most limiting of these transients. The limiting occurrences studied in detail included the Turbine Trip with No Bypass (TTNBP), Feedwater Controller Failure

(FWCF), Inadvertent High Pressure Coolant Injection (IHPCI), and Feedwater Heater Failure (FWHF) of 100 °F. The analysis input assumptions, such as Reactor Protection System setpoints and plant configurations, are based on LGS Unit 1 Cycle 5 information and also used the 100% power at 75% core flow operating point for reanalysis. ICF and Feedwater Temperature Reduction (FWTR) operating points were also considered as starting points for some of the analyses. These transients determined the power dependent MCPR(P) and MAPFAC(P) that bound the initial MCPR and MAPLHGR to assure that the fuel safety limits will not be violated for each transient. The flow dependent MCPR(F) and MAPFAC(F) were derived from the results of slow-flow recirculation pump run out events with the corresponding power rise. These factors are derived so that the fuel MAPLHGR will not increase above the fuel thermal mechanical design basis values and so that the MCPR values remain within the generic bounding values. The analyses show that the generic multipliers are conservative when applied to the rated MCPR and MAPLHGR operating limit for nominal assumptions and are, therefore, applicable to LGS. The COLR will include MCPR(P) curves for both conditions of operable and inoperable recirculation pump trip and turbine bypass valves.

Reactor Vessel overpressure protection was demonstrated by evaluation of the MSIV closure with neutron flux scram from the 102% power/75% flow point using the End of Cycle 5 (EOC5) target exposure shape. The results show the peak vessel pressure is below the ASME Code limit.

Even though the operating region has been expanded with MELLL, compliance with interim measure of USNRC Bulletin 88-07, Supplement 1, "Power Oscillations in Boiling Water Reactors," has been maintained through operating procedures and/or Technical Specifications. The Loss of Feedwater pump transient was evaluated to determine the recirculation pump speed setting that corresponds to a power level low enough to be within the capacity of the remaining feedwater pumps. In order to meet this requirement when operating along the MELLL rod line, the new setting is determined to be 42% speed, which is lower than the current 47%. The stability requirements are still met because this speed corresponds to approximately 54% flow and if flow were to drop below 45%, TS requirements would then ensure proper stability actions are taken.

Results of the Anticipated Transient Without Scram (ATWS) analysis conducted for operation in the MELLL domain showed maximum values of the key performance parameters (i.e., fuel cladding temperature and reactor vessel bottom pressure) were within generic limits. The suppression pool temperature did show an increase above the 190 °F limit due to operation in the MELLL domain with elevated values of 110% power and 87% core flow. As a result, to maintain the suppression pool temperature less than 190 °F beginning from this limiting operation point, the required Boron-10 enrichment in the sodium pentaborate solution is raised so that the SLCS can sooner reduce the reactivity and the reactor heat load.

Subsequent reload licensing reviews will include examination of cycle-specific data in the MELLL operating region and the reference operating limits will be reported in the COLR. Except for minor differences included for sensitivity study and future consideration, the analyses presented for LGS operation in the MELLL region conform to those previously evaluated by the staff and yield acceptable results.

<u>ARTS Analyses</u>

The ARTS improvement program provides changes to both the APRM and RBM systems. The removal of the APRM trip setdown requirement is justified by showing certain criteria are met while operating in the MELLL region. These criteria include ensuring the MCPR Safety Limit is not violated as a result of any AOO; fuel thermal-mechanical design bases remain within licensing limits; and PCT, maximum hydrogen generation, and maximum cladding oxidation fraction following a LOCA remain within the limits of 10CFR50.46. The LOCA analysis is discussed in Section 2.2 of this evaluation. With the requirements met, the setdown factor on the APRM flow biased trip is replaced with a set of power and flow dependent MAPLHGR and MCPR adjustment factors, as verified with the MELLL analysis.

The RBM changes take advantage of the new MAPLHGR and MCPR limits and advances in electronic circuitry. The MELLL analyses were used to justify these changes. In addition, new RWE analyses were conducted to establish the CPR limit and trip setpoints for each power level. There are three power level ranges (low, intermediate, and high) and each range has a corresponding RBM trip setpoint. The RBM was statistically evaluated with the reconfigured LPRM inputs and APRM initial reference signal with consideration given to low MCPR and high MAPLHGR conditions. The many RWEs required for the statistical approach were generated by randomly varying the initial position of the error rod and varying the location and number of failed LPRMs. This analysis was shown to be valid for all GE fuel types including GE11 and is also applicable to Asea Brown Boveri (ABB) and Siemens Nuclear Power (SNP) qualification bundles.

Specific LGS analyses were performed to confirm the applicability of generic power and flow dependent MCPR and MAPLHGR limits (in terms of multiplication factors on plant rated operating limits) taken from the ARTS data base. The plant limits were selected to remain valid through future reloads using up to GE11 fuel and currently approved analysis methods. The ARTS analyses used the LGS Unit 1, Cycle 5 inputs along with bounding values for core power, maximum core flow, and reduced feedwater temperature (for feedwater controller failure transient). The cycle-specific MCPR and MAPLHGR limits for rated conditions and for relaxed conditions of RPTOOS and TBVOOS and the curves for the power and flow dependent factors will be required and referenced in the COLR.

Overall, the ARTS analyses and improvements to the APRM and RBM systems parallel ARTS submittals for other BWRs which were accepted by the staff. The power setpoints and RBM setpoints requested in the TS change are within the range of generic settings presented in Reference 3 and are acceptable.

The ARTS changes to the APRM and RBM systems and the supporting analyses are similar to submittals for other BWRs which were accepted by the staff. The adoption of the SAFER/GESTR-LOCA methodology was used to support these changes and is further discussed in Section 2.2. The ARTS hardware updates proposed for LGS are the same as others evaluated by the staff. Of note however, discussion on the use of the adjustable trip time delay option t_{d2} above the minimum setting is also included in the analysis report. The option is included with the hardware, although it is acknowledged that sufficient RWE analysis was not performed to allow its use. The suggestion made by the GE report that the t_{d2} setting could be used to bypass the RBM system when permitted is counter to previous staff findings (i.e. the Hatch ARTS Instrument and Control review). Manual adjustment of the t_{d2} setpoint as a means of bypassing a RBM channel in lieu of using the existing RBM channel bypass switch (which provides automatic indication of the bypass condition) is not acceptable and is not to be permitted. Any future use of this time delay setting will require the evaluation of further analysis, as discussed in the GE report. Beside this single exclusion, the analyses and system changes associated with the ARTS updates, including the hardware modifications and proposed analytical limits, are acceptable.

2.2 SAFER/GESTR-LOCA Analyses

As part of their submittal, the licensee adopted the SAFER/GESTR-LOCA methodology for LOCA analysis. Application and validation of this approach was detailed in Reference 4 and was evaluated in conjunction with the LGS ARTS/MELLLA implementation. LOCA analysis was also performed using the SAFER/GESTR-LOCA methodology to ensure that the 10 CFR 50.46 and Appendix K LOCA criteria would be met when using the new thermal limits and the MELLL operating region. The results of this analysis were submitted with the application and were evaluated by the staff as part of the ARTS/MELLL application.

Requirements for the use of SAFER/GESTR-LOCA were established in the Topical Report Evaluation contained in Reference 6. The methodology includes the stipulation that a sufficient number of plant specific Peak Cladding Temperature (PCT) points based on both nominal input values and Appendix K values are calculated so that the shape of the PCT versus break size can be verified. The conditions for demonstrating applicability of the SAFER/GESTR analysis to a particular plant also includes confirming that plant-specific operating parameters have been bounded by the models and inputs used in the generic calculations and confirming that the plant-specific ECCS configuration is consistent with the referenced plant class ECCS configuration. The plant operating conditions and model inputs have been reviewed and found to be bounding and/or consistent with the generic analysis of Reference 7 and, therefore, the licensee meets the latter two criteria for acceptability. The applicability of the PCT values will be discussed in the next paragraphs.

The nominal PCT (PCT_{NOM}) curve is determined using best estimate values of plant response and a representative number of break sizes. The analysis included break sizes ranging from 0.05 ft^2 to the design basis accident (DBA) recirculation suction line break (4.16 ft^2). The curve generated is used to determine the limiting LOCA (highest PCT) which is then used for subsequent calculations. Another curve is generated using the Appendix K conservative assumptions and resultant PCT_{AppK} values. A Licensing Basis PCT (PCT_{LIC}) is determined from the limiting PCT_{NOM}, PCT_{AppK}, and plant uncertainty terms. The limiting PCT_{NOM} must also pass another criterion for its statistical upper bound value to be less than the PCT_{LIC}. The Upper Bound PCT (PCT_{UB}) is a function of the limiting PCT_{NOM}, modeling bias, and plant variable uncertainty. The analysis presented in the generic report uses assumptions arising from conditions based on the large break event. The requirements of the Topical Report Evaluation ensure that specific plant LOCA response does not significantly diverge from the generic LOCA response and possibly invalidate application of SAFER/GESTR-LOCA analysis.

LGS 1 and 2 are BWR-4s with Low Pressure Coolant Injection (LPCI) introduction into the bypass region of the core, therefore, LGS must be compared to the generic conformance calculation for the BWR-5/6 and some BWR-4 type plants. Results of break calculations presented in the LGS PCT vs break size plot in Figure 5-1 of Reference 4 are consistent with the curves in Figure 3-4 in Reference 7. These studies were performed with a power level of 110% to conservatively bound the currently licensed rated power. The limiting break for the nominal and Appendix K studies was found to be the DBA recirculation suction line break coincident with battery failure. Results of a sensitivity study show that the increase in PCT by using the 110% power level is less than 35 °F. In both cases, the PCT_{LIC} are below the 10 CFR 50.46 requirement of 2200 °F and the PCT_{UB} are less than the respective PCT_{LIC}. In all cases the PCT_{UB} is below the 1600 °F limit set by the bases of the SAFER/GESTR analysis. Conformance with the other 10 CFR 50.46 criteria for maximum local oxidation and hydrogen generation is also demonstrated by the analysis in Reference 4.

PCT results were obtained for several GE fuel types up to the GE11 type. Because the accident analyses have been performed using approved methods, and the results meet the staff's acceptance criteria, we conclude that these analyses are acceptable and the results may be used to provide a new LOCA licensing basis for LGS 1 & 2. Studies considering MELLL/ARTS conditions at 110% power and 75% core flow were performed and results show that increases in PCT are small (<20 °F) when compared with rated core flow cases and in no cases do the PCT_{LIC} exceed 2200 °F. Cases run for ICF, FWTR, FWHOOS, and SLO also show little change in PCT from the rated condition cases. These extra studies also show that no low flow MAPLHGR multiplier is required for ECCS considerations while in the MELLL operating domain because there is sufficient PCT margin available with respect to the 2200 °F criteria.

Coincident with the LOCA analysis, the containment responses under the revised MELLL assumptions were determined for a double-ended guillotine break of a recirculation line. The results show the peak containment drywell pressure is bounded by the LGS Updated Final Safety Analysis Report (UFSAR) values and remain well below the design value of 55 psig. The drywell deck differential pressure is above the UFSAR value but is below the design value. The containment dynamic loads analysis included loads from pool swell, condensation oscillation, and chugging. The results show that the peak containment wetwell airspace pressure during the suppression pool swell period is calculated to be 38 psig which is above the UFSAR result but below the design basis limit of 55 psig. These analyses considered the bounding short-term containment response and appear acceptable. The results of the long-term response analysis described in the UFSAR remain applicable for MELLL operation.

In summary, the licensee demonstrated conformance to 10 CFR 50.46 and Appendix K with the submitted LOCA analyses and based on the review described above, the SAFER/GESTR methodology is found to be acceptable and results may be used to provide a new LOCA licensing basis for LGS Units 1 & 2.

3.0 TECHNICAL SPECIFICATIONS

Changes to LGS limits and operability requirements in the TS are necessary to implement ARTS/MELLL. The proposed TS changes are as follows:

a. Definitions are added to TS Section 1.0 for the Downscale Trip Setpoint (DTSP), High Trip Setpoint (HTSP), Intermediate Trip Setpoint (ITSP), Low Trip Setpoint (LTSP), flow dependent MAPLHGR factor (MAPFAC(F)), and power dependent MAPLHGR factor (MAPFAC(P)). The definition for MCPR is revised to include the flow and power dependent MCPR limit factors (MCPR(F) and MCPR(P), respectively. The definitions for the Fraction of Limiting Power Density (FLPD), Fraction of Rated Thermal Power (FRP), and Maximum Fraction of Limiting Power Density (MFLPD) are deleted.

b. Current flow referenced RBM setpoint TS are replaced with the RBM power referenced setpoints as described below:

   i. Revise Limiting Condition for Operation (LCO) "Rod Block Monitor," TS Section 3.1.4.3, to update the operability requirements.

   ii. Revise "Control Rod Withdrawal Block Instrumentation," TS Table 3.3.6-1, to reference the RBM LCO.

   iii. Revise "Control Rod Block Instrumentation Setpoints," TS Table 3.3.6-2, to reference the COLR requirements, implement the new Power Range Setpoints, and update the flow referenced APRM rod block equations.

   iv. Revise "Control Rod Block Instrumentation Surveillance Requirements," TS Table 4.3.6-1, to reference to the RBM LCO.

   v. Revise "Control Rod Program Controls," TS Bases 3/4.1.4, to include power reference and operability requirements.

c. TS are changed as follows, to reflect the implementation of power and flow dependent fuel thermal limits in order to eliminate APRM trip setdown requirements and to support the power dependent RBM trips:

i. Revise "APRM Setpoints," TS Table 2.2.1-1, to update the flow referenced APRM scram setpoints.

ii. Delete the flow referenced trip setpoint discussion from "Reactor Protection System Instrumentation Setpoints for the Average Power Range Monitor," TS Bases, page B 2-7, because it is no longer required with the new setpoints.

iii. Revise LCO "Average Planar Linear Heat Generation Rate," TS Section 3/4.2.1, to include the MAPLHGR limit adjustments defined in the COLR.

iv. Delete LCO and Surveillance Requirements "APRM Setpoints," TS Section 3/4.2.2, because it is no longer required with the new limits.

v. Revise LCO and Surveillance Requirements for "Minimum Critical Power Ratio," TS Section 3/4.2.3, to include the MCPR adjustment factors defined in the COLR.

vi. Revise the Bases discussion of Average Planar Linear Heat Generation Rate (APLHGR), TS Bases 3/4.2.1, to discuss the implementation of the new flow and power dependent MAPLHGR limits.

vii. Delete the Bases discussion of APRM Setpoints, TS Bases 3/4.2.2, because it is no longer required with the new limits and setpoints.

viii. Revise the Bases discussion of Minimum Critical Power Ratio (MCPR), TS Bases 3/4.2.3, to discuss the implementation of the new operating limit MCPR's dependent on core flow and power.

ix. Revise "Reactor Protection System Instrumentation Surveillance Requirements," TS Table 4.3.1.1-1, to eliminate the APRM setdown.

x. Revise Administrative Controls "Core Operating Limits Report," TS Section 6.9.1.9, to include the new flow and power dependent fuel thermal limits.

d. Revise the Reactor Recirculation System TS to incorporate Single Loop Operation (SLO) requirements as follows:

i. Delete LCO ACTION a.1.c in TS Section 3.4.1.1 and reletter subsequent sections, to remove the APRM setdown.

ii. Revise LCO ACTION a.2 in TS Section 3.4.1.1, to reference the new APRM scram and rod block setpoint equations for SLO.

iii. Revise TS Bases 3/4 4.1 to reference the new APRM scram and rod block setpoints for SLO.

e. Revise and add to the Standby Liquid Control System Surveillance Requirements and Bases (TS Sections 4.1.5 and B3/4 1.5 respectively) to incorporate the new requirements for sodium pentaborate volume and Boron-10 enrichment.

f. Revise the Depressurization System TS Bases 3/4 6.2 to account for the updated containment pressure response of the ARTS/MELLL analysis.

g. Revise the References cited in TS Bases 3/4.2.4 to include various topical reports related to the ARTS/MELLL and SAFER/GESTR-LOCA analyses.

Based upon the acceptance of the methods and results of the ARTS/MELLLA for LGS as discussed in Section 2 of this evaluation, these TS changes are acceptable.

4.0 SUMMARY

The Philadelphia Electric Company (PECo) requested changes to the Limerick Generating Station (LGS), Units 1 and 2 Technical Specifications. The changes implement an expanded power-to-flow operating domain supported by the ARTS/MELLLA program. The application included the adoption of the SAFER/GESTR-LOCA methods as the LOCA licensing basis for LGS Units 1 & 2. The analyses presented examined the same areas as previous ARTS/MELLLA submittals reviewed by the staff. The methods used have been previously approved and the results of this study fall within accepted limits. The instrumentation modifications, operating limits, and setpoints proposed are acceptable. The staff review concludes that the results presented in the report contained in Reference 3 justify the proposed ARTS/MELLLA changes to LGS, Units 1 and 2. The SLCS Boron-10 enrichment and recirculation pump runback speed setting changes determined as an outcome of the analyses have been implemented as recommended in Reference 3 and appear acceptable. Further, the SAFER/GESTR-LOCA analysis has been reviewed, and based on submitted material and previously approved GE analytical techniques and design data, it is deemed acceptable.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC 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 the amendment involves no significant hazards consideration, and there has been no public comment on such finding (58 FR 52992). Accordingly, the 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 or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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6.0 REFERENCES

1. Letter from G. A. Hunger, Jr. (PECo) to NRC dated August 27, 1993, Limerick Generating Station, Units 1 and 2, Technical Specification Change Request 92-08-0.

2. Letter from G. A. Hunger, Jr. (PECo) to NRC dated November 17, 1993, Supplemental to Limerick Generating Station, Units 1 and 2, Technical Specification Change Request 92-08-0 Additional Information.

3. NEDC-32193P, Revision 2, "Maximum Extended Load Line Limit and ARTS Improvement Program Analysis for Limerick Generating Station Units 1 and 2," October 1993, (General Electric proprietary information).

4. NEDC-32170P, Revision 1, "Limerick Generating Station Units 1 and 2 SAFER/GESTR-LOCA Loss-of-Coolant Accident Analysis," June 1993, (General Electric proprietary information).

5. NEDE-24011-P-A-10-US, "General Electric Standard Application for reactor Fuel," April 1991, (General Electric proprietary information).

6. Letter from C. O. Thomas (NRC) to J. F. Quirk (GE) dated June 1, 1984, Accepting GE Topical Report NEDE-23785 Rev. 1, Vol. III(P), "The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident."

7. NEDE-23785-1-PA, "The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident," Volume III, Revision 1, October 1984, (General Electric proprietary information).