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

January 16, 1987

Docket Nos. 50-265

Mr. Dennis L. Farrar
Director of Nuclear Licensing
Commonwealth Edison Company
Post Office Box 767
Chicago, Illinois 60690

Dear Mr. Farrar:

SUBJECT: CYCLE 9 RELOAD AND SINGLE LOOP OPERATION

Re: Quad Cities Nuclear Power Station, Unit 2

The Commission has issued the enclosed Amendment No. 95 to Facility Operating License No. DPR-30 for the Quad Cities Nuclear Power Station, Unit 2. The amendment is in response to your application dated September 18, 1986, as clarified December 10 and 23, 1986. The amendment reflects Cycle 9 reload fuel and transient analyses. In addition, the amendment removes the provisions for single loop operation as a license condition and incorporates a similar provision into the body of the Technical Specifications (TS). For administrative convenience we have enclosed a revised copy of license condition page 7.

By letter dated December 10, 1986, and as agreed to per telephone conversation, Commonwealth Edison has committed to continue to monitor the Core Plate Differential Pressure as a means to monitor Jet Pump integrity. This surveillance will be performed by procedure and in no way affects this TS change.

Also, by letter dated December 23, 1986, and as also agreed to per telephone conversation, Commonwealth Edison has committed to perform the requirements of TS 3.6.H.3 within 12 hours as opposed to the 24 hours stated. For this TS, earlier action is more conservative and since Commonwealth Edison has stated this requirement could be accomplished within 12 hours, Commonwealth Edison has documented its commitment to perform TS 3.6.H.3 within 12 hours. This time period will be controlled administratively with station procedures. Also, as stated in the December 23, 1986 letter, single loop operation is permitted only when the Recirculation System is in the manual mode of operation. NRC staff requested this restriction be maintained by procedure. Commonwealth Edison has agreed to comply with this request and will maintain station procedures to ensure this restriction continues.

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

Sincerely,

Original signed by

John A. Zwolinski, Director
BWR Project Directorate #1
Division of BWR Licensing

Enclosures:
1. Amendment No. 95 to License No. DPR-30
2. Safety Evaluation

cc w/enclosures:
See next page

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Local PDR	OGC-BETH	WJones	JPartlow	
BWD#1 Reading	LJHarmon	DVassallo	EButcher	
RBernero	ELJordan	ACRS (10)	NThompson	
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1/8/87	1/8/87	1/14/87	1/16/87

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

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

DOCKET NO. 50-265

QUAD CITIES NUCLEAR POWER STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 95
License No. DPR-30

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

   A. The application for amendment by Commonwealth Edison Company (the licensee) dated September 18, 1986, as clarified December 10 and 23, 1986, 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 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 deleting license condition paragraph 3.J and by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B. and 3.J of Facility Operating License No. DPR-30 are hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 95 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

J. Deleted.

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

FOR THE NUCLEAR REGULATORY COMMISSION

John A. Zwolinski, Director
BWR Project Directorate #1
Division of BWR Licensing

Attachment:
Changes to License No. DPR-30
and the Technical Specifications

Date of Issuance: January 16, 1987

ATTACHMENT TO LICENSE AMENDMENT NO. 95

FACILITY OPERATING LICENSE NO. DPR-30

DOCKET NO. 50-265

1. For your convenience we are enclosing a revised copy of page 7 of DPR-30 for Quad Cities Nuclear Power Station, Unit 2. The text on page 7a of the license has been relocated to page 7.

2. Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the attached pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change.

REMOVE	INSERT
ii	ii
1.0-5	1.0-5
Figure 2.1-1	Figure 2.1-1
Figure 2.1-3	Figure 2.1-3
3.5/4.5-10	3.5/4.5-10
Figure 3.5-1 (Sheets 1-6)	Figure 3.5-1 (Sheets 1-6)
3.6/4.6-5	3.6/4.6-5
3.6/4.6-5a	3.6/4.6-5a
--	3.6/4.6-5b
3.6/4.6-13	3.6/4.6-13
--	3.6/4.6-13a

3.J Deleted

3.K Post-Accident Sampling [7/31/86 correction to Amd. 90]

A program will be established, implemented, and maintained which will ensure the capability to obtain and analyze reactor coolant, radioactive iodines and particulates in plant chimney effluents, and containment atmosphere samples under accident conditions. The program shall include the following: [Amd. 90, 6/10/86]

1. Training of personnel,

2. Procedures for sampling and analysis, and

3. Provisions for maintenance of sampling and analysis equipment.

4. This license is effective as of the date of issuance, and shall expire at midnight, February 15, 2007.

FOR THE ATOMIC ENERGY COMMISSION

Original license signed by:

A. Giambusso, Deputy Director
for Reactor Projects
Directorate of Licensing

Enclosures: Appendices A and B -- Technical Specifications
Date of Issuance: December 14, 1972

TABLE OF CONTENTS (Cont'd)

Amendment No. 84, 90, 95

II. Dose Equivalent I-131 - That concentration of I-131 (microcurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors For Power and Test Reactor Sites."

JJ. Process Control Program (PCP) - Contains the sampling, analysis, and formulation determination by which solidification of radioactive wastes from liquid systems is assured.

KK. Offsite Dose Calculation Manual (ODCM) - Contains the methodology and parameters used in the calculation of offsite doses due to radioactive gaseous and liquid effluents, and in the calculation of gaseous and liquid effluent monitor alarm/trip setpoints.

LL. Channel Functional Test (Radiation Monitor) - Shall be the injection of a simulated signal into the channel as close to the sensor as practicable to verify operability including alarm and/ or trip functions.

MM. Source Check - The qualitative assessment of instrument response when the sensor is exposed to a radioactive source.

NN. Member(s) of the Public - Shall include all persons who are not occupationally associated with the plant. This category does not include employees of the utility, its contractors, or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

OO. Dual Loop Operation (DLO) - Reactor power operation with both recirculation pumps running.

PP. Single Loop Operation (SLO) - Reactor power operation with one recirculation pump running.

APRM Flow Reference Scram
and APRM Rod Block Settings

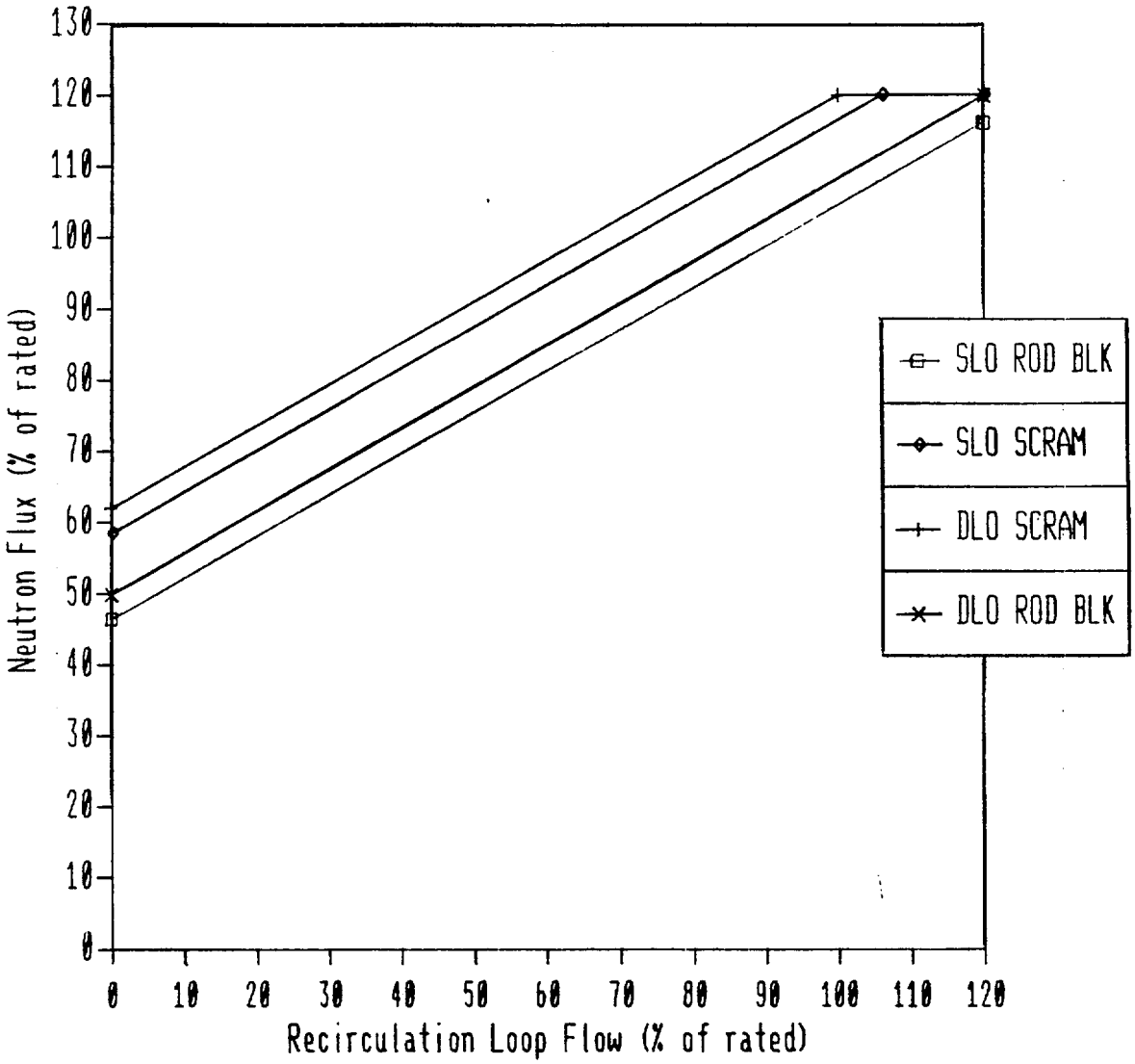


Figure 2.1-1

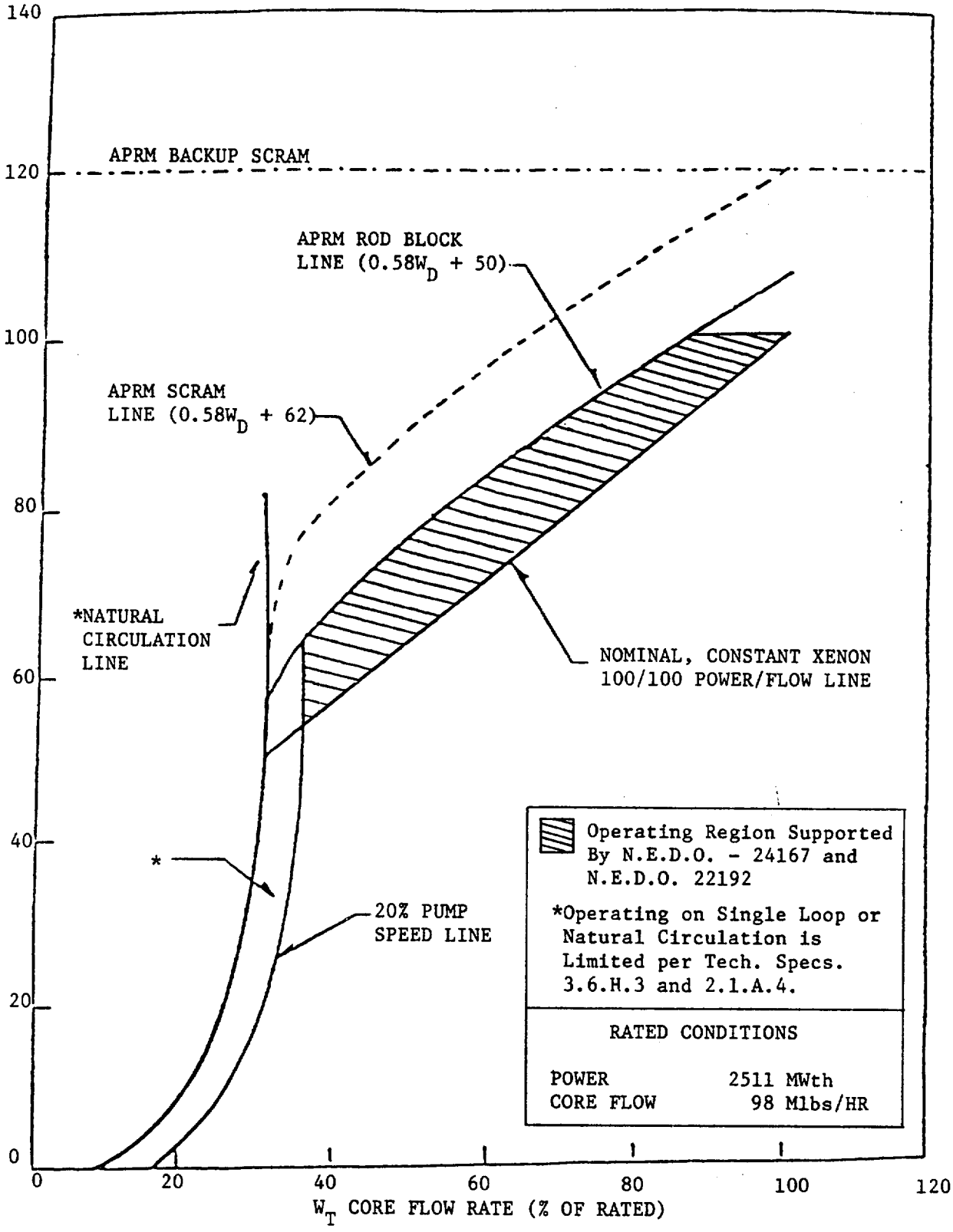


FIGURE 2.1-3
(SCHEMATIC)
APRM FLOW BIAS SCRAM RELATIONSHIP
TO NORMAL OPERATING CONDITIONS

Amendment No. 64, 95

within the prescribed limit within 2 hours, the reactor shall be brought to the cold shutdown condition within 36 hours. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits. Maximum allowable LHGR for all 8X8 fuel types is 13.4 KW/ft.

K. Minimum Critical Power Ratio (MCPR)

During steady-state operation at rated core flow, MCPR shall be greater than or equal to:

1.38 for $\tau_{ave} \leq 0.73$ secs

1.43 for $\tau_{ave} \geq 0.86$ secs

$0.385\ \tau_{ave} + 1.099$

for $0.73 < \tau_{ave} < 0.86$ secs

where τ_{ave} = mean 20% scram insertion time for all surveillance data from specification 4.3.C which has been generated in the current cycle.

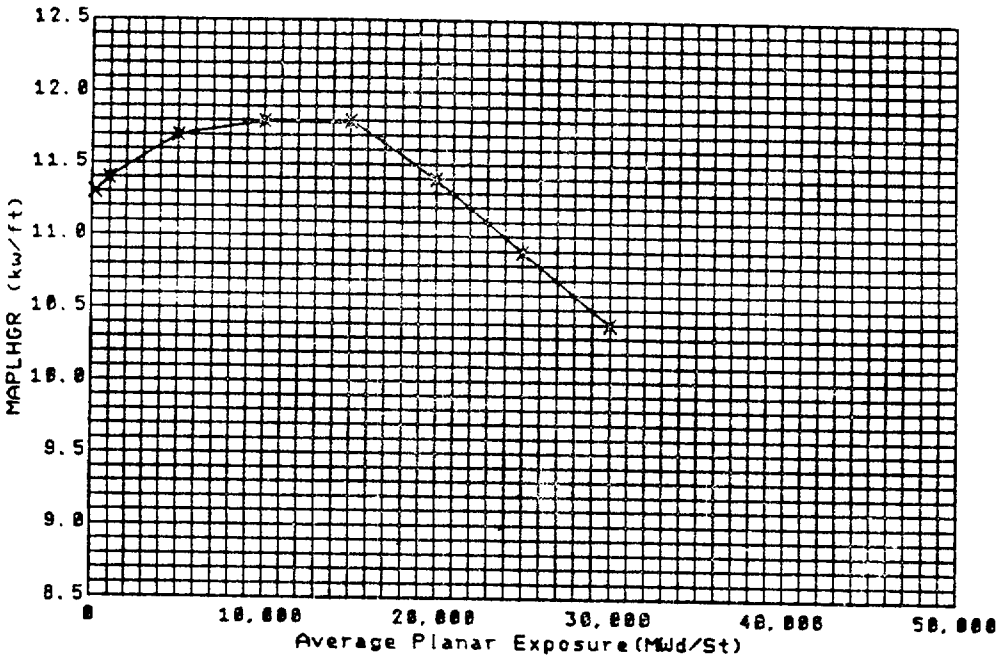
For core flows other than rated, these nominal values of MCPR shall be increased by a factor of k_f where k_f is as shown in Figure 3.5.2. If any time during operation it is determined by normal surveillance that the limiting value for MCPR is being exceeded, action shall be initiated within 15 minutes to restore operation to within the prescribed limits. If the steady-state MCPR is not returned to within the prescribed limits within 2 hours, the reactor shall be brought to the cold shutdown condition within 36 hours. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits.

K. Minimum Critical Power Ratio (MCPR)

The MCPR shall be determined daily during steady-state power operation above 25% of rated thermal power.

Amendment No. 87, 89, 79, 80, 85, 95

MAPLHGR VS. Average Planar Exposure
Fuel Type P8DRB239



MAPLHGR VS. Average Planar Exposure
Fuel Type P8DGB263L

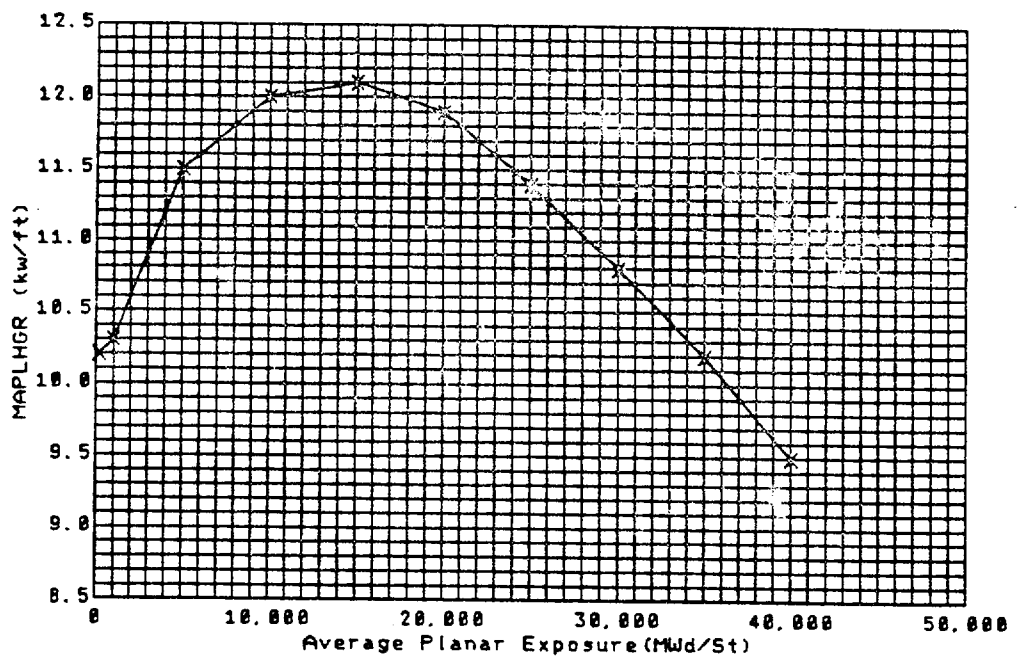
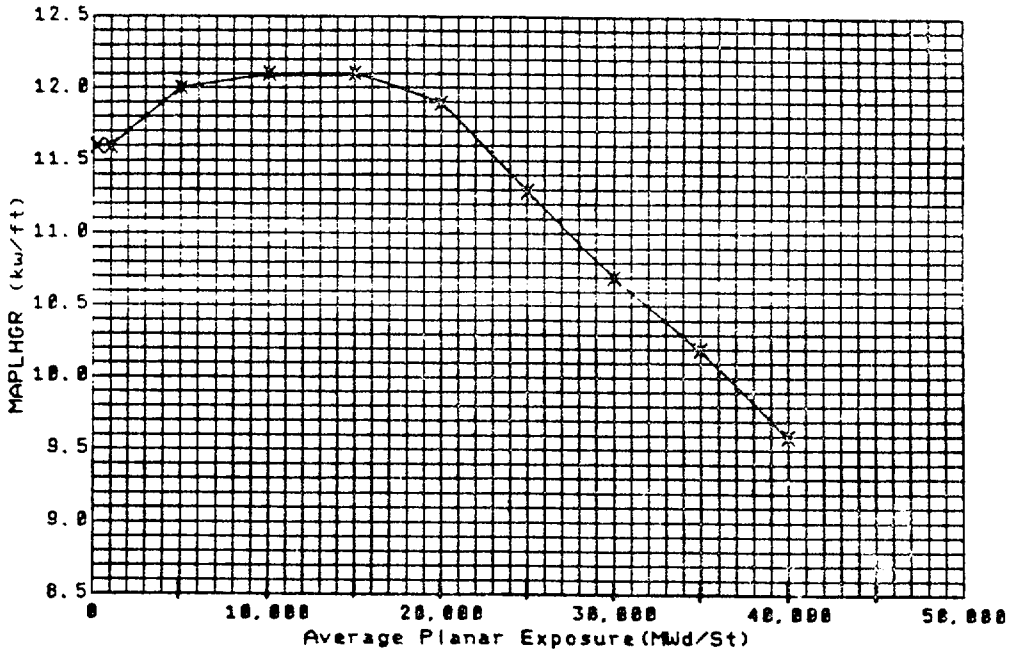


Figure 3.5-1
Sheet 1 of 6

MAPLHGR Vs. Average Planar Exposure
Fuel Types P8DGB265L, P8DRB265L



MAPLHGR VS. Average Planar Exposure
Fuel Type P8DRB265H, BP8DRB265H

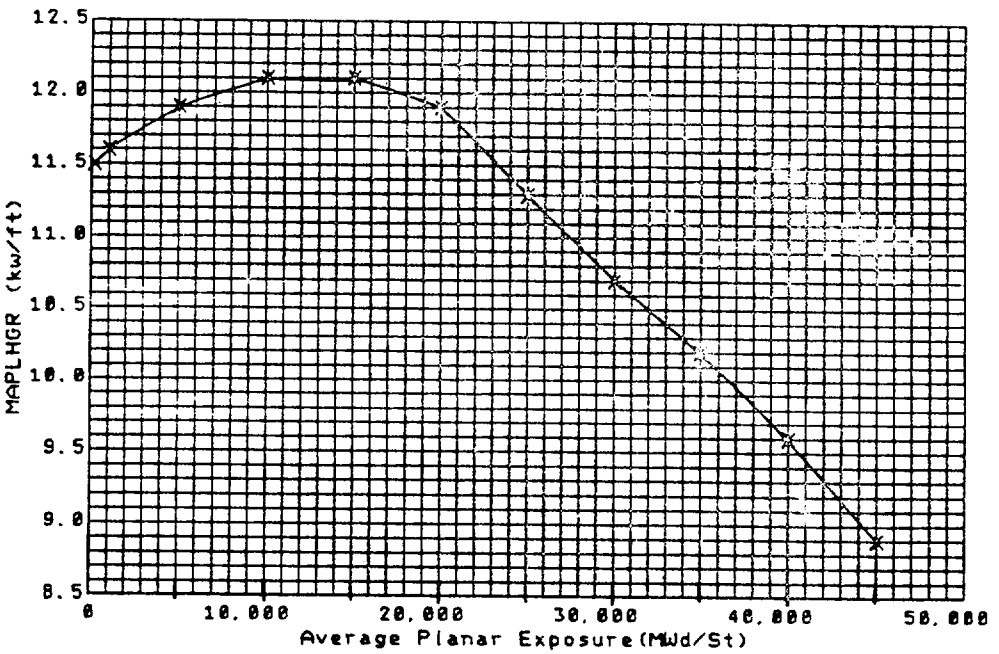
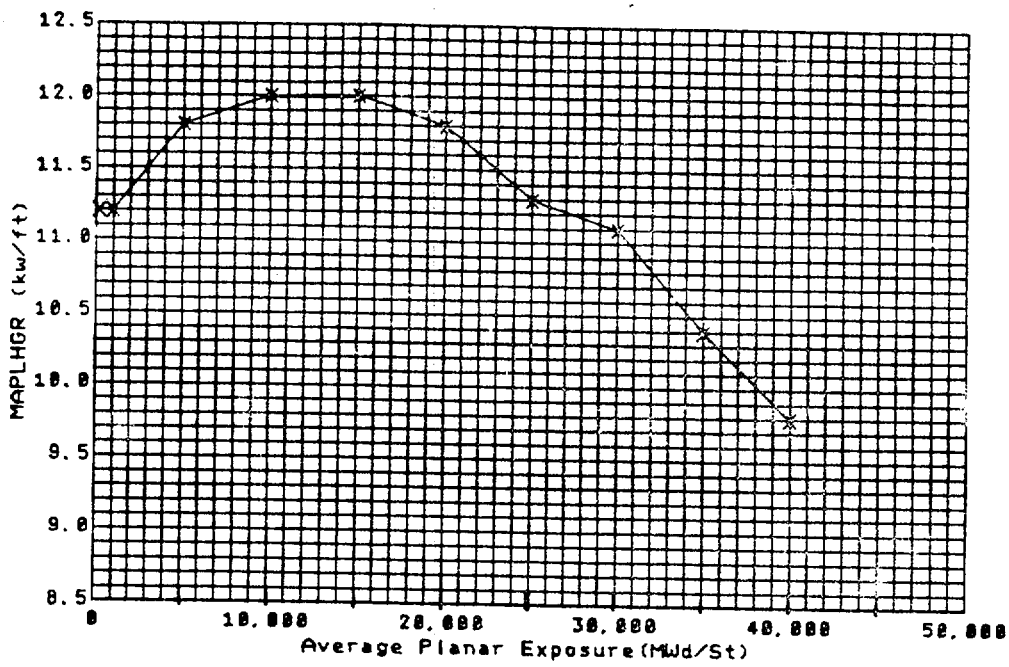


Figure 3.5-1
Sheet 2 of 6

MAPLHGR VS. Average Planar Exposure
Fuel Type P8DRB282



MAPLHGR VS. Average Planar Exposure
Fuel Type BP8DRB282

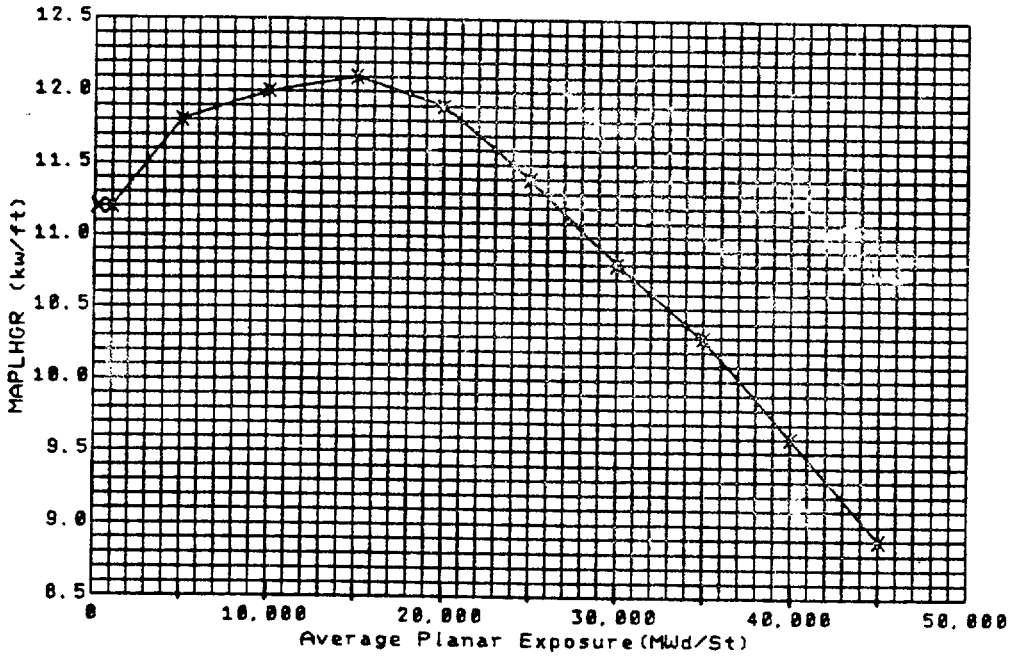
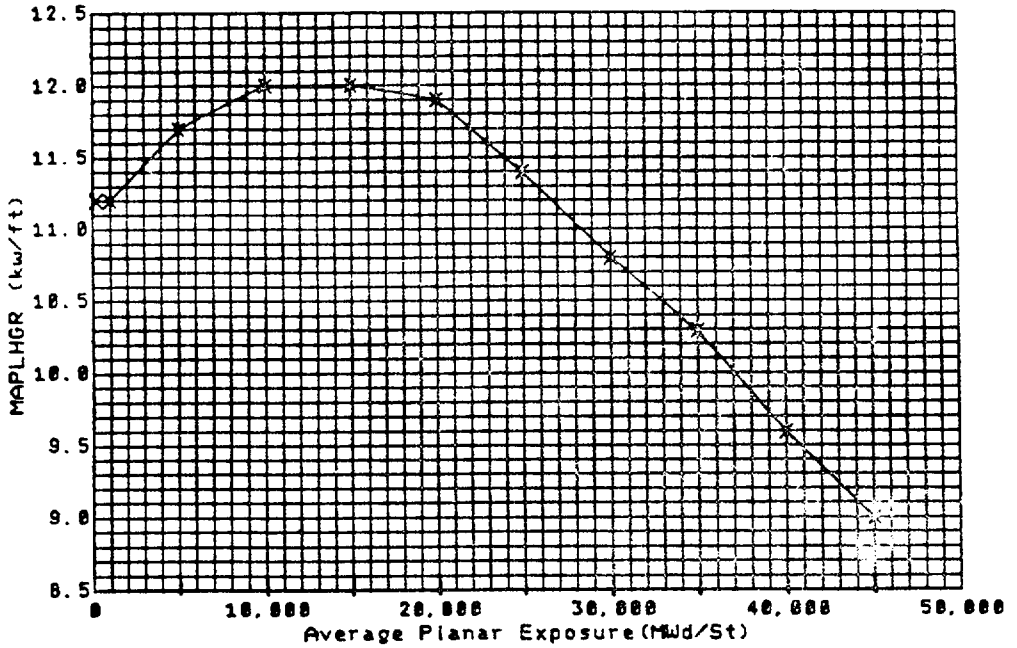


Figure 3.5-1
Sheet 3 of 6

MAPLHGR VS. Average Planar Exposure
Fuel Type BP8DRB283H



MAPLHGR VS. Average Planar Exposure
Fuel Type P8DGB284

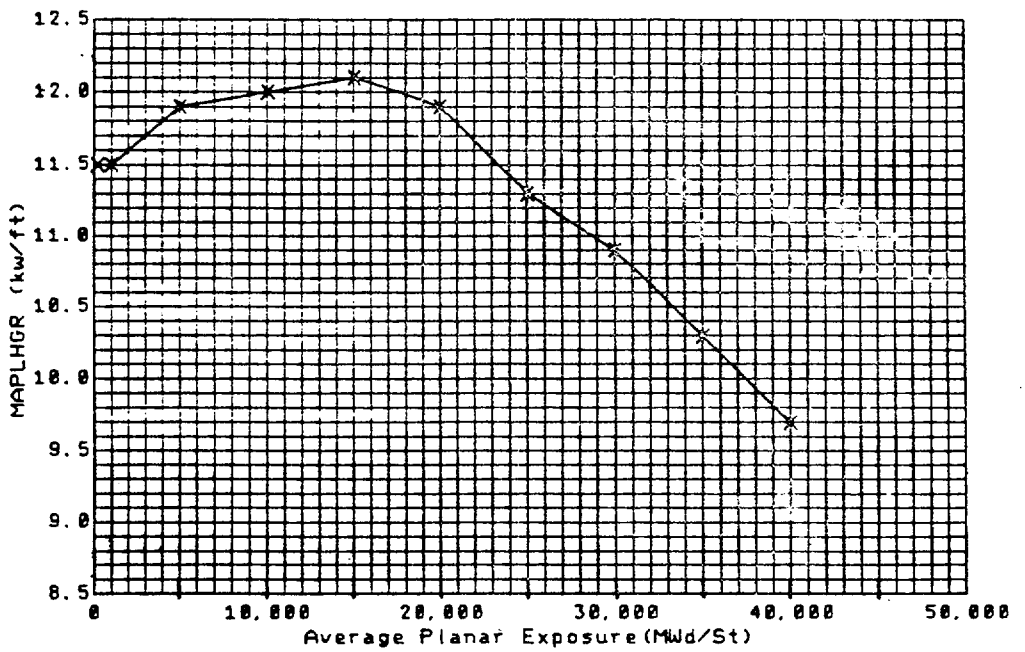


Figure 3.5-1
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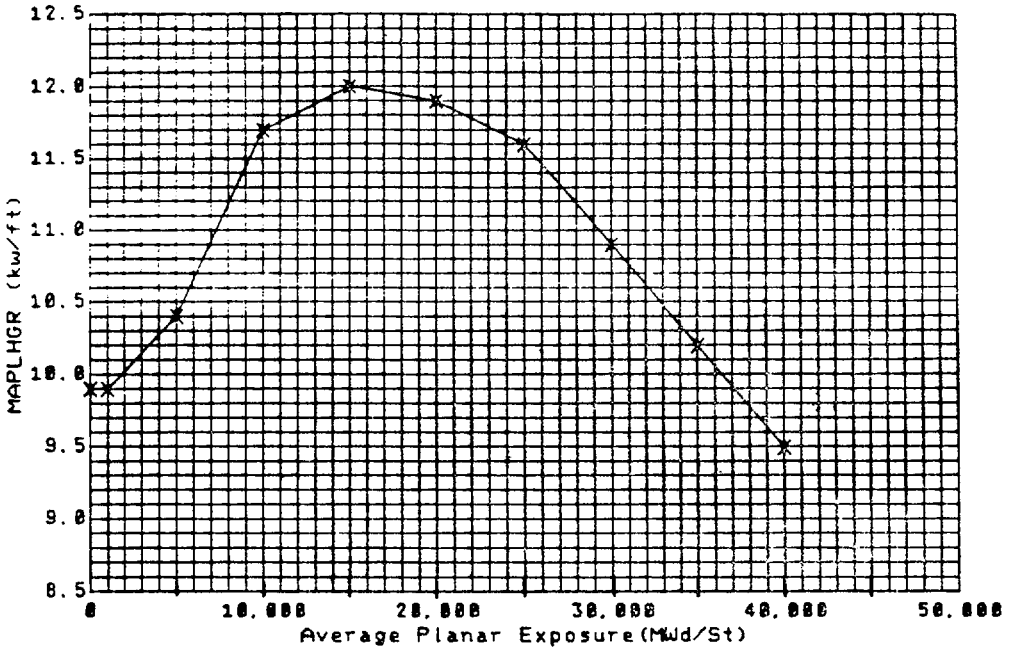
MAPLHGR VS. Average Planar Exposure
Fuel Type P8DGB298



MAPLHGR VS. Average Planar Exposure
Fuel Type BP8DRB299L

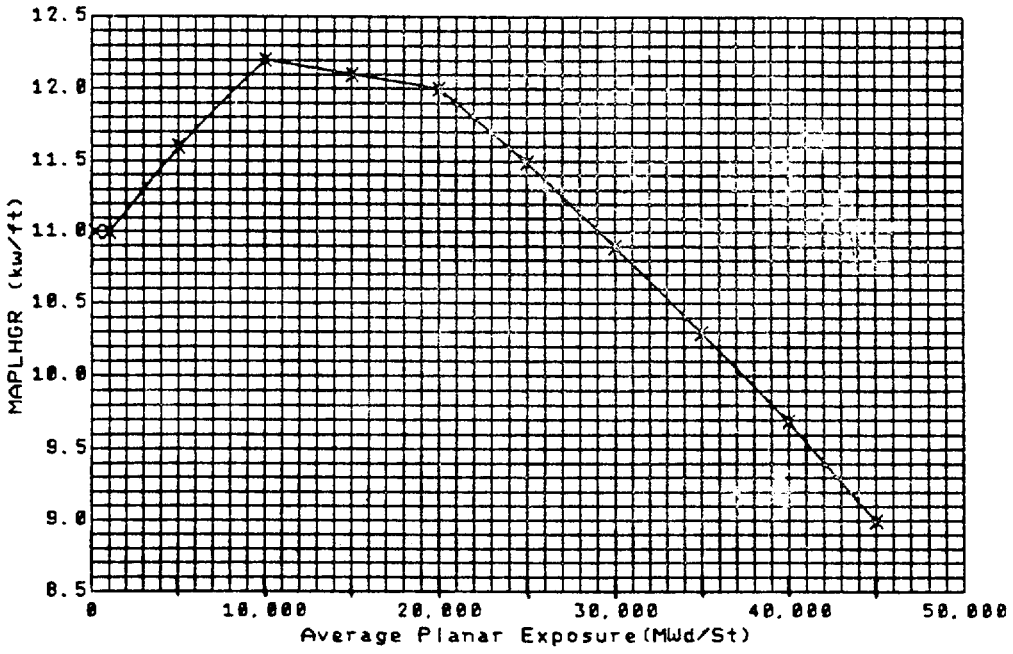


Figure 3.5-1
Sheet 5 of 6

MAPLHGR VS. Average Planar Exposure
Fuel Type BP8DRB299

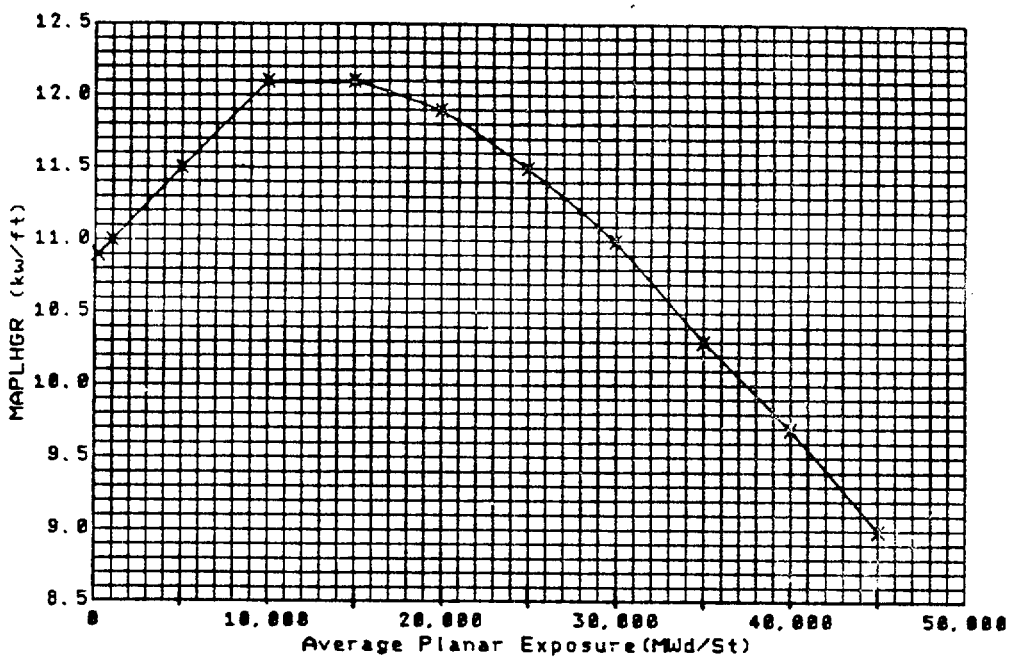


Figure 3.5-1
Sheet 6 of 6

G. Jet Pumps

1. Whenever the reactor is in the Startup/Hot Standby or Run modes, all jet pumps shall be intact, and all operating jet pumps shall be operable. If it is determined that a jet pump is inoperable, an orderly shutdown shall be initiated and the reactor shall be in a cold shutdown condition within 24 hours.

2. Flow indication from each of the 20 jet pumps shall be verified prior to initiation of reactor startup from a cold shutdown condition.

3. The indicated core flow is the sum of the flow indication from each of the 20 jet pumps. If flow indication failure occurs for two or more jet pumps, immediate corrective action shall be taken. If flow indication for all but one jet pump cannot be obtained within 12 hours, an orderly shutdown shall be initiated and the reactor shall be in a cold shutdown condition within 24 hours.

H. Recirculation Pump Flow Limitations

1. Whenever both recirculation pumps are in operation, pump speeds shall be maintained within 10% of each other when power level is greater than 80% and within 15% of each other when power level is less than 80%.

2. If Specification 3.6.H.1 cannot be met, one recirculation pump shall be tripped.

G. Jet Pumps

1. Whenever there is recirculation flow with the reactor in the Startup/Hot Standby or Run modes, jet pump integrity and operability shall be checked daily by verifying that the following two conditions do not occur simultaneously:

   a. The recirculation pump flow differs by more than 10% from the established speed-flow characteristics.

   b. The indicated total core flow is more than 10% greater than the core flow value derived from established core plate DP-core flow relationships.

2. Additionally, when operating with one recirculation pump with the equalizer valves closed, the diffuser to lower plenum differential pressure shall be checked daily, and the differential pressure of any jet pump in the idle loop shall not vary by more than 10% from established patterns.

3. The baseline data required to evaluate the conditions in Specifications 4.6.G.1 and 4.6.G.2 will be acquired each operating cycle.

H. Recirculation Pump Flow Limitations

Recirculation pumps speed shall be checked daily for mismatch.

3. Prior to Single Loop Operation for more than 24 hours, the following restrictions are required:

   a. The MCPR Safety Limit shall be increased by 0.01. (T.S. 1.1A);

   b. The MCPR Operating Limit shall be increased by 0.01. (T.S. 3.5.K);

   c. The MAPLHGR Operating Limit shall be reduced by a multiplicative factor of 0.84. (T.S. 3.5.I);

   d. The flow biased APRM Scram and Rod Block Setpoints shall be reduced by 3.5% to read as follows:

      T.S. 2.1.A.1;
      $S \leq .58WD + 58.5$

      T.S. 2.1.A.1; *
      $S \leq (.58WD + 58.5)$ FRP/MFLPD

      T.S. 2.1.B;
      $S \leq .58WD + 46.5$

      T.S. 2.1.B;*
      $S \leq (.58WD + 46.5)$ FRP/MFLPD

      T.S. 3.2.C (Table 3.2-3);*
      APRM upscale $\leq$ (.58WD + 46.5) FRP/MFLPD

* In the event that MFLPD exceeds FRP.

   e. The flow biased RBM Rod Block setpoints shall be reduced by 4.0% to read as follows:

      T.S. 3.2.C (Table 3.2-3);
      RBM Upscale $\leq .65WD + 38$

   f. The suction valve in the idle loop shall be closed and electrically isolated except when the idle loop is being prepared for return to service.

I. Shock Suppressors (Snubbers)

1. During all modes of operation except Shutdown and Refuel, all snubbers listed in Table 3.6-1 shall be operable except as noted in 3.6.1.2 following.

2. From and after the time that a snubber is determined to be inoperable, continued reactor operation is permissible during the succeeding 72 hours only if the snubber is sooner made operable.

3. If the requirements of 3.6.1.1 and 3.6.1.2 cannot be met, and orderly shutdown shall be initiated and the reactor shall be in a cold shutdown condition within 36 hours.

4. If a snubber is determined to be inoperable while the reactor is in the Shutdwon or Refuel mode, the snubber shall be made operable prior to reactor start-up.

5. Snubbers may be added to safety-related systems without prior license Amendment to Table 3.6-1 provided that a revision to Table 3.6-1 is included with the next license amendment request.

I. Shock Suppressors (Snubbers)

The following surveillance requirements apply to all snubbers listed in Table 3.6-1.

1. Visual inspections shall be performed in accordance with the following schedule utilizing the acceptance criteria given by Specification 4.6.1.2.

Number of Snubbers Found Inoperable During Inspection or During Inspection Interval	Next Required Inspection Interval
0	18 months ± 25%
1	12 months ± 25%
2	6 months ± 25%
3, 4	124 days ± 25%
5, 6, 7	62 days ± 25%
≥ 8	31 days ± 25%

The required inspection interval shall not be lengthened more than one step at a time.

Snubbers may be categorized in two groups, 'accessible' or 'inaccessible' based on their accessibility for inspection during reactor operation. These two groups may be inspected independently according to the above schedule.

G. Jet Pumps

Failure of a jet pump nozzle assembly holddown mechanism, nozzle assembly, and/or riser increases the cross-sectional flow area for blowdown following the postulated design-basis double-ended recirculation line break. Therefore, if a failure occurs, repairs must be made to assure the validity of the calculated consequences.

The following factors form the basis for the surveillance requirements:

1. A break in a jet pump decreases the flow resistance characteristic of the external piping loop causing the recirculation pump to operate at a higher flow condition when compared to previous operation.

2. The change in flow rate of the failed jet pump produces a change in the indicated flow rate of that pump relative to the other pumps in that loop. Comparison of the data with a normal relationship or pattern provides the indication necessary to detect a failed jet pump.

3. The jet pump flow deviation pattern derived from the diffuser to lower plenum differential pressure readings will be used to further evaluate jet pump operability in the event that the jet pumps fail the tests in Sections 4.6.G.1 and 2.

Agreement of indicated core flow with established power-core flow relationships provides the most assurance that recirculation flow is not bypassing the core through inactive or broken jet pumps. This bypass flow is reverse with respect to normal jet flow. The indicated total core flow is a summation of the flow indications for the 20 individual jet pumps. The total core flow measuring instrumentation sums reverse jet pump flow as though it were forward flow. Thus, the indicated flow is higher than actual core flow by at least twice the normal flow through any backflowing pump. Reactivity inventory is known to a high degree of confidence so that even if a jet pump failure occurred during a shutdown period, subsequent power ascension would promptly demonstrate abnormal control rod withdrawal for any power-flow operating map point.

A nozzle-riser system failure could also generate the coincident failure of a jet pump body; however, the converse is not true. The lack of any substantial stress in the jet pump body makes failure impossible without an initial nozzle riser system failure.

H. Recirculation Pump Flow Limitation

The LPCI loop selection logic is described in the SAR, Section 6.2.4.2.5. For some limited low probability accidents with the recirculation loop operating with large speed differences, it is possible for the logic to select the wrong loop for injection. For these limited conditions, the core spray itself is adequate to prevent fuel temperatures from exceeding allowable limits. However, to limit the probability even further, a procedural limitation has been placed on the allowable variation in speed between the recirculation pumps.

The licensee's analyses indicate that above 80% power the loop select logic could not be expected to function at a speed differential of 15%. Below 80% power, the loop select logic would not be expected to function at a speed differential of 20%. This specification provides a margin of 5% in pump speed differential before a problem could arise. If the reactor is operating on one pump, the loop select logic trips that pump before making the loop selection.

Analyses have been performed which support indefinite single loop operation provided the appropriate restrictions are implemented within 24 hours. The MCPR Safety Limit has been increased by 0.01 to account for core flow and TIP reading uncertainties which are used in the statistical analysis of the safety limit. The MCPR Operating Limit has also been increased by 0.01 to maintain the same margin to the safety limit as during Dual Loop operation.

The flow biased scram and rod block setpoints are reduced to account for uncertainties associated with backflow through the idle jet pumps when the operating recirculation pump is above 20 - 40% of rated speed. This assures that the flow biased trips and blocks occur at conservative neutron flux levels for a given core flow.

The multiplicative 0.84 reduction of the MAPLHGR Operating Limit accounts for more rapid loss of core flow during some LOCA events when operating in Single Loop than during Dual Loop. The closure of the suction valve in the idle loop prevents the loss of LPCI flow through the idle recirculation pump into the downcomer.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 95 TO FACILITY OPERATING LICENSE NO. DPR-30

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

QUAD CITIES NUCLEAR POWER STATION, UNIT 2

DOCKET NO. 50-265

1.0 INTRODUCTION

By letter dated September 18, 1986 (Ref. 1), Commonwealth Edison Company (CECo) proposed to amend Appendix A of Facility Operating Licensee DPR-30. This would accommodate the Cycle 9 reload and incorporate single loop operation (SLO) provisions in the body of the Technical Specifications (TS) for Quad Cities 2.

2.0 CYCLE 9 RELOAD EVALUATION

One hundred fifty-two fresh fuel assemblies are scheduled to be loaded for Cycle 9 operation. The staff review is discussed below.

2.1 Fuel Design

The fresh fuel (88 BP8DRB299L and 64 BP8DRB299) is the General Electric Company (GE) 8x8 barrier type. It has been previously approved (Amendment 13 to Reference 2) and we conclude that the fuel assemblies are acceptable for inclusion in the Quad Cities 2 Cycle 9 core. The 152 new assemblies will reside with 572 irradiated 8x8 assemblies of prior GE designs presently in the core.

2.2 Nuclear Design

The nuclear design and analysis of the proposed reload has been performed by the methods described in GESTAR II. That methodology has been approved for use in the design and analysis of reloads in BWR reactors and its use is acceptable for this reload.

2.3 Thermal-Hydraulic Design

The objective of the review of the thermal-hydraulic design of the core for Cycle 9 operation is to confirm that acceptable methods are used, and to assure that there is an acceptable margin of safety from conditions which could lead to fuel damage during normal operation and anticipated transients, and to

assure that the core is not susceptible to thermal-hydraulic instability. A discussion of the review follows.

An operating limit Minimum Critical Power Ratio (MCPR) and a safety limit MCPR is imposed in the TS to assure that 99.9 percent of the fuel rods in the core will not experience boiling transition during normal operation and anticipated operational transients. As stated in Reference 1,the approved safety limit MCPR for the Quad Cities 2 reload core is 1.07. The safety limit of 1.07 was used for the Cycle 9 analyses.

To assure that the fuel cladding integrity safety limit MCPR will not be violated during any anticipated transient, the most limiting events have been reanalyzed for this reload (Reference 3) by the licensee, in order to determine which event results in the largest reduction in MCPR (ΔCPR). The operating limit MCPR for each fuel type was then established from the ΔCPR and ODYN option B and the safety limit MCPR. The operating limit MCPR, 1.38, for Cycle 9 increased by 0.04 (0.03 + 0.01 margin) over the value for the previous Cycle 8. The added margin is to accommodate potential future cycle increases in the required ΔCPR.

We find that, since approved methods (GESTAR II) were used and the results show an acceptable margin of safety from conditions which could lead to fuel damage during any anticipated operational transient, the thermal-hydraulic design of the Cycle 9 core is acceptable.

Generic Letter 86-02 informed BWR licensees of the technical resolution of Generic Issue B-19 (Thermal Hydraulic Stability) and cautioned licensees to examine each core reload to assure that an acceptable stability margin exists. The licensee provided the results of a stability analysis for Quad Cities 2 Cycle 9. The calculated core stability decay ratio was 0.56 for the least stable operating point. The staff accepts this core stability decay ratio as representative of a stable thermal hydraulic system.

2.4 Transient and Accident Analyses

Transient and accident analysis methods are the approved GE methods described in GESTAR II.

Core wide transient analysis included the events of load rejection without bypass (LRWOBP), loss of 145°F feedwater heating and feedwater controller failure. The limiting transient, based on ODYN with option B is the LRWOBP resulting in a MCPR of 1.37. The licensee will use an operating limit MCPR for the Cycle 9 core of 1.38. This represents an increase of 0.04 from the previous MCPR limiting condition of operation. We find this acceptable.

Limiting Pressurization Event - Analyses with main steam isolation valve closure with indirect (flux) scram and no relief valve credit show that the resulting pressures are within the TS safety limit for the steam dome pressure and the ASME vessel overpressurization limit. We find this acceptable.

Rod Withdrawal Error - This event was analyzed on a generic basis. The staff has approved the generic methodology and results. This has also been incorporated into GESTAR II and approved by the staff. The licensee stated that the analysis provided assurance that the 1.07 MCPR safety limit would not be violated at the 95/95 probability/confidence level. A Rod Block Monitor set point of 107 and a corresponding ΔCPR of 0.22 was chosen. The resulting ΔCPR is bounded by the LRWOBP event. We find this acceptable.

Fuel Loading Error - A worst case bundle misorientation was analyzed and included an NRC imposed variable water gap penalty. This event was bounded by the LRWOBP event. We find this acceptable.

Rod Drop Accident (RDA) was not specifically analyzed. Quad Cities 2 uses a Banked Position Withdrawal Sequence for control rod withdrawal. For plants using this system the RDA event has been statistically analyzed generically and it was found that with a high degree of confidence the peak fuel enthalpy would not approach the NRC required limit of 280 cal/gm for this event. This approach and analysis has been approved by the NRC (Reference 2). This approach is acceptable for Quad Cities 2.

Loss of Coolant Accident (LOCA) - LOCA analyses, were performed to provide Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) values for the new reload fuel assemblies (BP8DRB299L and BP8DRB299). The analyses were performed with approved methodologies as described in GESTAR II. The curve for fuel type P8DRB282 was also extended to 40,000 MWD/STU. Since peak pellet burnup values yielding MAPLHGR values which correspond to the burnup limits of this fuel have been previously approved (Reference 2), the staff finds the extension to 40,000 MWD/STU as acceptable.

Fuel Handling Accident - This accident was not addressed by the licensee. The MAPLHGR curves for the fresh GE fuel types in the proposed TS have exposure limits to 45,000 MWD/STU. The NRC staff specifically reviewed on a generic basis a GE Topical Report on extended burnup methodology, NEDE-22148-P. Our Safety Evaluation (SE) on the GE report identified a concern with regard to the radiological consequence evaluation of the Fuel Handling Accident involving GE fuel assemblies with batch average exposure values greater than 38,000 MWD/MTU (34,500 MWD/STU). The MAPLHGR figures provide limits on the maximum burnup for a fuel segment. From this, the staff has estimated batch average exposure to be less than the 34,500 MWD/STU. We conclude that this type of accident will have insignificant effects on radiological consequences of the event.

3.0 SINGLE LOOP OPERATION (SLO) EVALUATION

In 1981, the NRC approved restricted SLO at Quad Cities 2 for power levels limited to 50% of rated. The licensee has proposed to delete those restrictions from the license and incorporate more appropriate conditions for SLO in the body of the TS. The staff review is discussed below.

3.1 Thermal Hydraulic Stability in Single Loop Operation

We have evaluated the licensee's proposed TS changes relating to core stability in SLO. The calculated core stability decay ratio at the point of minimum stability (the intersection of the natural circulation line and the extended APRM block line) for this unit is 0.56. This is indicative of a stable core since it is substantially less than the accepted value of 0.8 (for approved GE methods). Further, previous cores for Quad Cities 2 have a history of stable operation and low calculated stability decay ratios.

The licensee has concluded that stability monitoring surveillance provisions are not required for Quad Cities 2 SLO TS since it is demonstrably stable. USNRC Generic Letter 86-09 is cited to justify this position for BWR/3s. While the staff agrees that this position is justifiable for operating Cycle 9, we do not agree that Generic Letter 86-09 supports the approval of permanent SLO without the inclusion of stability surveillance requirements in low flow operating regions. Recent operating experience at a foreign BWR-3 plant has shown that instabilities do occur in BWR-3 reactor types under some circumstances of core design and operating conditions. While the staff accepts the proposed SLO TS without surveillance provisions for Cycle 9, the licensee is cautioned to reevaluate the need for stability surveillance specifications in future operating cycles based on the stability characteristics of the proposed operation. This determination can be made by the licensee based on calculations or other evidence which demonstrates that the low stability decay ratio is being maintained in future reload core designs.

3.2 Accidents (Other Than Loss of Coolant Accident) and Transients Affected by One Recirculation Loop Out of Service

3.2.1 One Pump Seizure Accident

The licensee states that the one-pump seizure accident is a relatively mild event during two recirculation pump operation. Similar analyses were performed to determine the impact this accident would have on one recirculation pump operation. These analyses were performed using NRC approved models for a large core BWR/4 plant (Ref. 4). The analyses assumed steady-state operation, with the added condition of one inactive recirculation loop, at the following initial conditions:

a. Thermal Power = 75% and core flow = 58% of rated.

b. Thermal Power = 82% and core flow = 58% of rated.

These conditions were chosen because they represent reasonable upper limits of SLO within existing MAPLHGR and MCPR limits at the same maximum pump speed. Pump seizure was simulated with the single operating pump going to zero speed instantaneously.

The anticipated sequence of events following a recirculation pump seizure which occurs during plant operation with the alternate recirculation loop out of service is as follows:

a. The recirculation loop flow in the loop in which the pump seizure occurs drops instantaneously to zero.

b. Core voids increase which results in a negative reactivity insertion and sharp decrease in neutron flux.

c. Heat flux drops more slowly because of the fuel time constant.

d. Neutron flux, heat flux, reactor water level, steam flow, and feedwater flow all exhibit transient behavior. However, it is not anticipated that the increase in water level will cause a turbine trip and result in scram.

It is expected that the transient will terminate at a condition of natural circulation and an orderly reactor shutdown will be accomplished. There will also be a small decrease in system pressure.

The licensee concludes that the MCPR for the pump seizure accident for the large core BWR/4 plant was determined to be greater than the fuel cladding integrity safety limit; therefore, no fuel failures were postulated to occur as a result of this analyzed event. The licensee further states that the results are applicable to Quad Cities 2. NRC staff agrees with the licensee's conclusion.

3.2.2 Abnormal Transients

The highest power attainable during SLO is expected to be between 18 and 28% less than rated two loop thermal power. To assure that abnormal transients initiated from SLO are conservatively bounded by two loop analyses the licensee has proposed that the TS include the following:

a. Increasing the safety limit MCPR (Minimum Critical Power Ratio) and the operating limit MCPR by 0.01. This is to account for increased uncertainties in core flow and tip readings during SLO. This is acceptable.

b. An adjustment of the APRM scram and Rod Block and RBM flow biased setpoints. This is to account for reverse flow in the idle loop jet pumps during SLO which alters the normal two loop drive flow to core flow relationship. The licensee states that if the correction is not made, the result of a transient during SLO would be a flow biased trip occurring at a higher neutron flux to core flow ratio than planned. The staff concurs.

c. Isolating the idle recirculation loop and closing the crosstie (equalizer) lines. This will result in forward or reverse flow in the idle jet pumps being dependent on the speed of the operating recirculating pump. The staff concurs.

3.3 Loss of Coolant Accident (LOCA)

General Electric (GE) performed a single loop operation analysis for LOCA. The licensee states that evaluation of these calculations (that are performed utilizing staff approved methodology outlined in NEDO-20566-2 Rev. 1) indicates that a multiplier of 0.84 for 8x8R and P8x8R fuel types should be applied to the MAPLHGR limits for single loop operation of Quad Cities 2. Since an approved methodology has been used we find the use of these MAPLHGR multipliers to be acceptable.

4.0 PROPOSED TS CHANGES

The proposed TS changes are as follows:

1. Deletion of the existing license condition for SLO as described in Amendment No. 66, Section 3.J. This is acceptable, since, as discussed below, SLO is to be incorporated into the body of the TS.

2. Editorial change on pg ii of the Table of Contents. This is acceptable.

3. Addition of definitions of SLO and Dual Loop Operation (DLO) to page 1.0-5 of DEFINITIONS. This is acceptable.

4. Revision of Figure 2.1-1. This incorporates SLO and DLO scram and rod block settings and is acceptable.

5. Revision of Figure 2.1-3 to reflect the extended load limit analysis previously implemented. This is acceptable.

6. Revised TS 3.5.K to incorporate Cycle 9 MCPR limit. This is acceptable.

7. Deleted reference to LHGR waiver for barrier ramp test in TS 3.5.J. This is acceptable.

8. Figure 3.5-1, sheets 1-6, "MAPLHGR vs. Average Planar Exposure", were replotted and rearranged. Fuel types 8DRB265L, 8D250 and 8D262 were deleted. Fuel types BP8DRB299L and BP8DRB299 were added. The average planar exposure for fuel type P8DRB282 was extended to 40,000 MWD/STU. The deleted fuels are no longer used and the added fuel is part of the reload listed and approved in GESTAR II. This is acceptable.

9. Change of title for TS 3.6.H and TS 4.6.H to "Recirculation Pump Flow Limitations" from "Recirculation Pump Flow Mismatch". This is acceptable. The change in TS 4.6.G.1.b is more definitive and is therefore acceptable.

10. Revised TS 3.6.H.3 for SLO: The licensee stated that the operational limits, as discussed below, would be implemented "During Single Loop Operation for more than 24 hours ...." The staff considers this statement to be ambiguous and for clarification, has revised it to state "Prior to Single Loop Operation for more than 24 hours ...." Discussions with the licensee confirmed that the clarification is consistent with the original intent. The restrictions follow:

a. The MCPR safety limit and operating limit will be increased by 0.01.

b. The MAPLHGR operating limit to be reduced by a factor of 0.84.

c. The APRM Scram and Rod Block and RBM flow biased setpoints are to be reduced.

d. The suction valve in the idle loop shall be closed and electrically isolated except when the idle loop is being prepared for return to service.

In addition, the licensee agreed that the required adjustments for TS 3.6.H.3 could be completed in less than 24 hours, which the staff considers to be excessive. The licensee, by letter (Ref. 6) has committed to incorporate into the plant operating procedures the following additional conditions for SLO: (1) the required adjustments are to be accomplished within 12 hours of the start of SLO, and (2) the recirculation system controls will be placed in the manual flow control mode. In conjunction with implementation of the committed operating procedures, we find the proposed revisions to the TS for SLO to be acceptable.

4.1 Jet Pump Monitoring

The existing license condition for SLO includes a surveillance of core plate Δp noise and was not included in the proposed TS. The purpose of this monitoring is to detect excessive jet pump vibration which is of concern to the staff. At the staff's request, the licensee agreed to retain this surveillance in the Quad Cities 2 procedures as a means to monitor the jet pump (Ref. 5). This is acceptable since the licensee continues to retain a TS for jet pumps.

5.0 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 and changes to the surveillance requirements. 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.

6.0 CONCLUSIONS

We have 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 the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 REFERENCES

1. Letter, J. R. Wojnarowski (Commonwealth Edison) to H. R. Denton (NRC) dated September 18, 1986.

2. NEDE-24011-A-7, August 1985, "General Electric Standard Application for Reactor Fuel," (GESTAR II).

3. "Supplemental Reload Licensing Submittal for Quad Cities Nuclear Power Station Unit 2, Reload 8 (Cycle 9)," General Electric Company Report 23A4758 Class 1, July 1986.

4. Dresden Nuclear Power Station Units 2 and 3 and Quad Cities Nuclear Power Station Units 1 and 2 Single Loop Operation, General Electric Company Report NEDO-24807, November 1980.

5. Letter I. M. Johnson (Commonwealth Edison) to H. R. Denton (NRC) dated December 10, 1986.

6. Letter M. S. Turbak (Commonwealth Edison) to H. R. Denton (NRC) dated December 23, 1986.

Principal Contributor: D. Katze, T. Rotella

Dated: January 16, 1987

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

January 16, 1987

MEMORANDUM FOR: Sholly Coordinator

FROM: John A. Zwolinski, Director
BWR Directorate #1, DBL

SUBJECT: REQUEST FOR PUBLICATION IN BIWEEKLY FR NOTICE - NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE (TAC 63037)

Commonwealth Edison Company, Docket No. 50-265, Quad Cities Nuclear Power Station, Unit 2, Rock Island County, Illinois

Date of application for amendment: September 18, 1986, as clarified December 10 and 23, 1986.

Brief description of amendment: The amendment reflects Cycle 9 reload fuel transient analysis and amends the license to provide for Single Loop Operation as part of the Technical Specifications and not a specific License Condition.

Date of issuance: January 16, 1987

Effective date: January 16, 1987

Amendment Nos.: 95

Facility Operating License No. DPR-30. Amendments revised the license and the Technical Specifications.

Date of initial notice in Federal Register: November 5, 1986 (51 FR 40278). By letters dated December 10 and 23, 1986, Commonwealth Edison submitted clarifying information and written confirmation of commitments made to NRC regarding related plant operation. These submittals did not significantly change the initial application nor did they change the initial no significant hazards consideration determination. Therefore, no renotice of the application was warranted.

The Commission's related evaluation of the amendment is contained in a Safety Evaluation dated January 16, 1987.

No significant hazards consideration comments received: No.

Local Public Document Room location: Moline Public Library, 504 - 17th Street, Moline, Illinois 61265.

Original signed by

John A. Zwolinski, Director
BWR Project Directorate #1, DBL

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