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Dockets Nos.: 50-237
50-249
50-254
and 50-265

JAN 30 1978

Commonwealth Edison Company
ATTN: Mr. Cordell Reed
Assistant Vice President
P. O. Box 767
Chicago, Illinois 60690

Gentlemen:

In response to the balance of your request dated September 17, 1975, and supplements dated December 8, 1975, April 23, September 29, October 20, December 7, 1976, February 18 and December 12, 1977, the Commission has issued the enclosed Amendment Nos. and to Facility Operating License Nos. DPR-19 and DPR-25 for Units Nos. 2 and 3 of the Dresden Nuclear Power Station, and Amendment Nos. and to Facility Operating License Nos. DPR-29 and DPR-30 for Units Nos. 1 and 2 of the Quad Cities Nuclear Station.

The amendments authorize modification of the spent fuel pools at Dresden Station Units Nos. 2 and 3 to accommodate increased storage of spent fuel from Dresden Station and modification of both spent fuel pools at Quad Cities Station Units Nos. 1 and 2 to accommodate spent fuel from Quad Cities Station. In addition, the amendments authorize storage of spent fuel discharged from any Dresden unit in the spent fuel pool of either Dresden Units Nos. 2 or 3, and the storage of spent fuel discharged from either Quad Cities unit in either Quad Cities spent fuel pool.

Copies of the Safety Evaluation, the Environmental Impact Appraisal, and Notice of Issuance and Negative Declaration are also enclosed.

Sincerely,

Original Signed by
Don K. Davis
Don K. Davis, Acting Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosures and cc: See next page

Concurrence subject to comments on preceding copy Clare!

OFFICE	ORB#2:DOR	ORB#2:DOR	ORB#2:DOR	OELD	AC-ORB#2:DOR	ADOR:DOR
SURNAME	RDiggs	RBevan	POConnor	S. TREBY	DKDavis	KGoller
DATE	1/30/78	1/30/78	1/20/78	1/26/78	1/27/78	1-30-78

NRC FORM 318 (9-76) NRCM 0240

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976 — 626-624

Enclosures:
1. Amendment No. 34 to DPR-19
2. Amendment No. 31 to DPR-25
3. Amendment No. 43 to DPR-29
4. Amendment No. 41 to DPR-30
5. Safety Evaluation
6. Environmental Impact Appraisal
7. Notice of Issuance/Negative Declaration

cc w/enclosures: See next page

cc w/enclosures:
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Rock Island County Board
of Supervisors
Rock Island County Court House
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Branch (AW-459)
Office of Radiation Programs
U. S. Environmental Protection Agency
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U. S. Environmental Protection Agency
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ATTN: EIS COORDINATOR
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Mr. B. B. Stephenson
Plant Superintendent
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Mr. William Waters
Chairman, Board of Supervisors
of Grundy County
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Morris, Illinois 60450

Morris Public Library
604 Liberty Street
Morris, Illinois 60451

- w/cy of CECo filings on subject since 4/23/76

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

COMMONWEALTH EDISON COMPANY

DOCKET NO. 50-237

DRESDEN NUCLEAR POWER STATION UNIT NO. 2

AMENDMENT TO PROVISIONAL OPERATING LICENSE

Amendment No. 34
License No. DPR-19

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

   A. The application for amendment by Commonwealth Edison Company (the licensee) dated September 17, 1975, as supplemented and amended by filings dated December 8, 1975; April 23, September 29, October 20, December 7, 1976; February 18 and December 12, 1977, 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, Facility License No. DPR-19 is hereby amended to revise paragraph 2.E to read as follows:

   2.E. Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of Dresden Nuclear Power Station, Units Nos. 1, 2, and 3.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Karl R. Goller

Karl R. Goller, Assistant Director
for Operating Reactors
Division of Operating Reactors

Date of Issuance: January 30, 1978

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

COMMONWEALTH EDISON COMPANY

DOCKET NO. 50-249

DRESDEN NUCLEAR POWER STATION UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 31
License No. DPR-25

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

A. The application for amendment by Commonwealth Edison Company (the licensee) dated September 17, 1975, as supplemented and amended by filings dated December 8, 1975; April 23, September 29, October 20, December 7, 1976; February 18 and December 12, 1977, 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, Facility License No. DPR-25 is hereby amended to revise paragraph 2.E to read as follows:

   2.E. Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of Dresden Nuclear Power Station, Units Nos. 1, 2, and 3.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Karl R. Goller

Karl R. Goller, Assistant Director
for Operating Reactors
Division of Operating Reactors

Date of Issuance: January 30, 1978

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

COMMONWEALTH EDISON COMPANY
AND
IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

DOCKET NO. 50-254

QUAD CITIES NUCLEAR POWER STATION UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 43
License No. DPR-29

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

   A. The application for amendment by Commonwealth Edison Company (the licensee) dated September 17, 1975, as supplemented and amended by filings dated December 8, 1975; April 23, September 29, October 20, December 7, 1976; February 18 and December 12, 1977, 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, Facility License No. DPR-29 is hereby amended to revise paragraph 2.F to read as follows:

   2.F. Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of Quad Cities Nuclear Power Station, Unit Nos. 1 and 2.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Karl R. Goller

Karl R. Goller, Assistant Director
for Operating Reactors
Division of Operating Reactors

Date of Issuance: January 30, 1978

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 NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 41
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 17, 1975, as supplemented and amended by filings dated December 8, 1975; April 23, September 29, October 20, December 7, 1976; February 18 and December 12, 1977, 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, Facility License No. DPR-30 is hereby amended to revise paragraph 2.E to read as follows:

   2.E. Pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of Quad Cities Nuclear Power Station, Unit Nos. 1 and 2.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Karl R. Goller

Karl R. Goller, Assistant Director
for Operating Reactors
Division of Operating Reactors

Date of Issuance: January 30, 1978

SAFETY EVALUATION

BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING

AMENDMENT NO. 34 TO FACILITY OPERATING LICENSE NO. 19
AMENDMENT NO. 31 TO FACILITY OPERATING LICENSE NO. 25
AMENDMENT NO. 43 TO FACILITY OPERATING LICENSE NO. 29
AMENDMENT NO. 41 TO FACILITY OPERATING LICENSE NO. 30

COMMONWEALTH EDISON COMPANY
DRESDEN STATION UNIT NOS. 2 AND 3
QUAD CITIES STATION UNIT NOS. 1 AND 2

DOCKET NOS. 50-237 AND 50-249
DOCKET NOS. 50-254 AND 50-265

1.0 INTRODUCTION

By application dated September 17, 1975, and supplements dated December 8, 1975, April 23, September 29, October 20 and December 7, 1976; February 18 and December 12, 1977, the Commonwealth Edison Company (CECo) requested amendments to increase the spent fuel pool storage capacities of Dresden Units 2 and 3 from 1160 to 1420 fuel assemblies and of Quad Cities Units 1 and 2 from 1140 to 1460 fuel assemblies. This application consists of a description and safety analysis of the proposed modification described in Special Report No. 43, entitled Dresden Station Fuel Storage Pool Modification and Special Report No. 18, entitled Quad Cities Station Fuel Pool Modification; supplements to these reports, entitled Dresden and Quad Cities Stations Fuel Storage Pool Modification Supplement to Special Reports Nos. 18 and 43; and responses dated April 23, September 29, and October 20, 1976 to our requests for additional information.

In addition, the amendments would permit the storage of spent fuel assemblies from any Dresden Station Unit in the spent fuel pools of either Dresden Station Unit 2 or Unit 3 and permit the storage of spent fuel assemblies from either Quad Cities Station Unit 1 or 2 in either Quad Cities spent fuel pool.

2.0 DISCUSSION

2.1 Criticality Considerations

The thirteen additional racks in each of the two Dresden pools, and sixteen additional racks in each of the two Quad Cities pools would be installed in accordance with the proposed modifications. These are identical to the racks which are presently in the pools. The racks are made of 3/16 inch thick aluminum alloy, and they are designed to hold the fuel assemblies on a nominal 6.5 x 12 inch pitch under safe shutdown earthquake accelerations. With this pitch, there are only small water gaps between the fuel assemblies in the 6.5 inch direction but about 5 1/2 inch water gaps between the fuel assemblies in the 12 inch direction. The fuel region volume fraction in this storage lattice for fuel assemblies taken from Dresden Units 2 and 3 and Quad Cities Units 1 and 2 is 0.34.

The proposed modification of the spent fuel pools for the Dresden Station does not include any change in the Unit 1 pool. Instead, CECo proposes to use the additional capacity in the Units 2 and 3 pools to take the overflow of fuel assemblies from Unit 1. Since the Unit 1 fuel assemblies are smaller than those of Units 2 and 3, CECo proposes to use an aluminum alloy adapter to hold the Unit 1 fuel assemblies in a central position in the Unit 2 and 3 storage racks. The fuel region volume fraction for fuel assemblies from Unit 1 in the Unit 2 and 3 racks is 0.22.

The Nuclear Services Corporation (NSC) of Campbell, California, performed the criticality analysis for these fully loaded racks. They used the CHEETAH computer program to obtain the four group cross sections for diffusion theory calculations by the CITATION program.

The criticality analyses for this array were made assuming:

1. an infinite array of unirradiated fuel assemblies with the highest U-235 enrichment and no burnable poison;

2. pure, unborated water in the pool; and

3. a temperature of 100°C.

Calculations made for Dresden Unit 1 fuel assemblies in these racks, using the proposed adapter, assumed a maximum U-235 enrichment of 2.34%, which corresponds to a fuel loading of 9.7 grams of U-235 per axial centimeter of fuel assembly.

The analyses performed in the FSAR's for Dresden 2 and 3 and for Quad Cities 1 and 2 ($k_\infty = 0.83$) were made for an assumed infinite array of assemblies. Consequently, the calculated neutron multiplication factor, as stated in the FSAR's for Dresden 2 and 3 and for Quad Cities 1 and 2, will not change as more fuel assemblies are put into additional racks in the pool.

For unirradiated fuel assemblies with a fuel loading of 9.7 grams of U-235 per axial centimeter of fuel assembly and no burnable poison, the infinite neutron multiplication factor, K_∞, is calculated to be 0.76. The exclusion of water from the water gap between the assemblies could change this factor, but this is a highly improbable situation due to the open design of the racks.

Conclusion

We conclude that when any number of Dresden Unit 1 fuel assemblies having no more than 9.7 grams of U-235 (corresponding to maximum enrichment of 2.34%) per axial centimeter of fuel assembly are centrally positioned in Unit 2 or 3 fuel storage rack locations by the proposed adapters, the neutron multiplication factor for the pool will be much less than the NRC limit of 0.95. Since the calculations in the FSAR for Dresden 2 and 3 and Quad Cities 1 and 2 were performed for an infinite array of fuel assemblies, this stated maximum neutron multiplication factor is independent of the number of fuel assemblies in the fuel pool. Therefore, we conclude that

the FSAR criticality analysis (i.e., $k_\infty = 0.83$) remains valid for the fuel pools with the additional proposed numbers of fuel racks installed and filled with spent fuel assemblies. On the basis of the above, we find that, from the standpoint of criticality, there is reasonable assurance that the health and safety of the public will not be endangered by the installation of the proposed additional racks or by their use in the proposed manner.

2.2 Spent Fuel Cooling

In its submittal, CECo stated that for both Dresden Units 2 and 3 and Quad Cities Units 1 and 2, the fuel storage pool for each unit at each station has a separate cooling system, and that each of these systems is designed to remove a minimum of 2.14 MW of heat during normal refueling and storage. In the event that a full core of fuel has to be discharged to the pool, the shutdown cooling system will be connected in parallel with the fuel pool cooling system. The system is designed for the 3,000 gallons per minute of water through the cross connection from the fuel pool to the shutdown cooling system to provide a minimum of 3.5 MW of additional cooling to keep the fuel pool temperature below 125°F for normal operation and 150°F for a full core off-load. CECo also calculates that, for both the Dresden and Quad Cities Units, the maximum incremental heat load that could be added by the spent fuel assemblies in the additional storage racks is about 1% of the original nominal design basis load of 8.7 MW. In response to our request, CECo showed that this additional heat load would increase the bulk water outlet temperature by about 2°F when only one pool cooling system is operating.

Our comparison of the design minimum heat removal capability of 2.14 MW with the total decay energy curve of the NRC Standard Review Plan, "Technical Position APCSB 9-2", shows that CECo's calculations of the decay heat loads are adequately conservative. We also find that using the additional racks for the same core off loading sequences as are used now will not alter these required in-core cooling times.

For this expanded spent fuel storage capacity and for the storage of fuel from the Dresden and Quad Cities reactors, we find that for the normal refueling case, with the spent fuel cooling system operating as designed, the outlet water from the fuel pool will not exceed 127°F; and that with a minimum in-core cooling time of 30 days, the outlet water temperature can

be kept below 140°F for the full core off-load. We find that in the unlikely event that all fuel pool cooling is lost, there would be sufficient time to either make repairs or to provide an alternate source of cool make-up water for the spent fuel pool. We conclude that there is reasonable assurance that the health and safety of the public will not be endangered by the use of this system in the proposed manner.

2.3 Installation of Racks & Fuel Handling

These aluminum racks weigh less than one ton each in air. After they are positioned in the pool by the crane, they are secured to the floor by one inch swing bolts.

In order to reduce the probability of having a handling accident with heavy crane loads, CECo has modified its crane systems and modes of crane operation at both Dresden and Quad Cities stations to make them single failure proof.

Based on our considerations the 100 ton modified single failure proof cranes recently installed at the Dresden and Quad Cities stations, we find that the probability of a cask drop resulting in increased neutron multiplication factor in the fuel pool during installation of the racks to be remote. We find also that the likelihood of an underwater rack handling accident reducing the fuel assembly spacing in any of the other racks in the pool is remote. Similarly, even though the addition of racks will reduce the spacing between fuel storage locations and the spent fuel cask, the use of the single failure proof crane, in conjunction with the handling experience gained over the years makes the probability of a cask handling accident remote. A generic review on spent fuel storage will consider the load handling accident, and any further problems identified there will be addressed.

The licensee will continue to use shipping casks for transfer of fuel between the Dresden 2 and Dresden 3 fuel pools, and will use such casks also for transfer of spent fuel from Dresden 1 to the Unit 2 and Unit 3 pools.

We conclude that there is reasonable assurance that the health and safety of the public will not be endangered by the installation of the additional racks or by the fuel assembly handling.

2.4 Structural and Mechanical Considerations

The increase in spent fuel storage capacity in the Dresden Units 2 and 3, and in the Quad Cities Units 1 and 2, spent fuel pools will be accomplished by using existing spare rack spaces and by replacing control blade racks with fuel racks as required. Since no expansion is proposed for the Dresden Unit 1 fuel pool, the spent fuel overflow from Unit 1 will be stored in the Dresden Units 2 and 3 pools by using adapters as necessary to allow the smaller fuel to be placed in racks designed for the larger fuel.

Each new fuel storage rack is made of aluminum and is designed to store 20 fuel assemblies each. The new racks will be identical to the racks already installed in each pool. The racks will be secured to the floor of the pool by one inch swing bolts (four per rack) which are already provided in each position. Each rack was originally designed to be free standing and does not rely on any lateral restraint from the pool walls or adjacent rack structures. The licensee has also determined that the racks will not impact the pool walls for the worst loading condition which includes the effects of the design basis earthquake and that the addition of new racks does not add any load to the existing racks.

The original design load for the spent fuel pool included a uniform load of 2000 psf for the racks and fuel assemblies on the entire pool slab area. The proposed modification will maintain the loading of the fuel pool within this design limit. The licensee has also determined that no significant increase in maximum pool temperature will result from the planned increase in the number of fuel storage positions, therefore, the effects of temperature gradients on the pool structures will remain unchanged.

The analysis, design, fabrication and installation of the new fuel racks are in accordance with the accepted criteria for Class I structures and equipment. Furthermore, the proposed modifications will not have any adverse effects on the existing fuel storage racks and the fuel pool structure. We find that the fuel pool modifications proposed by the licensee for both Dresden Units 2 and 3 and Quad Cities Units 1 and 2 are acceptable.

Any problems associated with longer storage of fuel in the pool, such as possible corrosion of stored fuel, additional need for controls on water chemistry, or other, will be addressed in the generic review, as appropriate.

2.5 Radiological Considerations

We have reviewed the licensees plans for installation and use of additional spent fuel storage capacity in the fuel pools for Dresden 2 and 3 and Quad Cities 1 and 2, and have estimated the increment in onsite occupational dose resulting from the proposed increase in spent fuel storage capacity on the basis of information provided by the licensee and by using realistic assumptions for occupancy times and for dose rates in the spent fuel pool

vicinity due to radioactive nuclides in the water. The spent fuel assemblies themselves contribute a negligible amount of exposure in the pool area because of the shielding effect of the water.

The amount of radiation exposure resulting from the proposed action results in a negligible increment of occupational dose. The occupational radiation exposure associated with installing the racks in the pools is conservatively estimated at 3 man-rem for the Dresden Station and 12 man-rem for the Quad Cities Station. This operation is expected to be performed only once during the lifetime of the station and will therefore represent a very small fraction of the total man-rem burden from occupational exposure.

Based on present and projected operations in the spent fuel pool area, we estimate that the proposed modifications will add less than one percent to the total annual occupational radiation dose at the Dresden and Quad Cities Stations. The slight increase in occupational radiation exposure will not affect the licensee's ability to maintain individual occupational doses to as low as reasonably achievable and within the limits of 10 CFR 20. From the above considerations, we conclude that the proposed installation of the additional spent fuel storage capacity at the Dresden and Quad Cities stations and the storing of additional fuel in the pools as proposed, will not result in any significant increases in doses received by occupational workers.

The only change in offsite dose would be that associated with the small incremental increase in effluents released from the facilities as a result of the proposed action. As discussed in Section 5.3 of the Environmental Impact Appraisal, the additional total body dose that might be received by an individual or population within a 50 mile radius of either of the stations is less than 0.001 mrem/yr and 0.005 man-rem/yr, respectively, and is thus far less than the normal variation in dose received by this population from normal background radiation. The incremental population doses thus resulting from the proposed action are insignificant.

3.0 Summary

Our evaluation supports the conclusion that the proposed additions to the spent fuel storage capacity at Dresden Units 2 and 3 and at Quad Cities Units 1 and 2 are acceptable because:

(1) The physical design of the new storage racks will preclude criticality for any credible moderating condition.

(2) The cooling system for each of the spent fuel pools has adequate cooling capacity.

(3) The installation and use of the proposed fuel handling racks can be accomplished safely.

(4) The structural design and the materials of construction are adequate.

(5) The increase in radiation doses due to the storage of additional fuel in the pools and the associated fuel handling would be negligible.

4.0 Conclusion

We have concluded, based on the considerations discussed above, that: 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 these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Date: January 30, 1978

ENVIRONMENTAL IMPACT APPRAISAL
BY THE
OFFICE OF NUCLEAR REACTOR REGULATION
RELATING TO A MODIFICATION
TO THE SPENT FUEL POOL
AMENDMENT NO. TO DPR 19
AMENDMENT NO. TO DPR 25
AMENDMENT NO. TO DPR 29
AMENDMENT NO. TO DPR 30
COMMONWEALTH EDISON COMPANY
DRESDEN STATION UNITS 2 AND 3
QUAD CITIES STATION UNITS 1 AND 2
DOCKET NOS. 50-237 AND 50-249
DOCKET NOS. 50-254 AND 50-265

Date: January 30, 1978

1.0 Description of Proposed Action

In their submittal of September 17, 1975, supplemented by letters dated December 8, 1975, April 23, 1976, September 29, 1976 and October 20, 1976, Commonwealth Edison Company (the licensee) requested approval of the NRC for amendments to Facility Operating Licenses No. DPR-19, No. DPR-25, No. DPR-29 and No. DPR-30 for the Dresden Nuclear Generating Station, Units 2 and 3, and the Quad Cities Nuclear Generating Station Units 1 and 2 (the facilities). These amendments to the licenses concern the proposed expansion of the storage capacity of the spent fuel pools (SFP) for these four units.

In the submittal of April 23, 1976, the licensee also requested approval for the storage of Dresden Units 1, 2, and 3 irradiated fuel in the Quad Cities Units 1 and 2 spent fuel pools and, if necessary, the storage of Quad Cities Units 1 and 2 irradiated fuel in the Dresden Units 2 and 3 spent fuel pools. By letter dated December 12, 1977 that portion of the licensee's request proposing interfacility transfer of spent fuel between the Dresden Station and Quad Cities Station spent fuel pools was withdrawn.

2.0 Need for Increased Storage Capacity

The Dresden Station of Commonwealth Edison Company includes two 800 MWe and one 200 MWe nuclear generating units. Fuel storage pools are provided for each of the generating units. Currently there are 1,160 storage spaces in the spent fuel pools for Dresden Units 2 and 3 and 672 spaces in the SFP for Dresden Unit 1. Dresden 2 and 3 have 724 fuel assemblies in each core while Dresden 1 has 464 fuel assemblies. Each pool has storage for approximately 1 3/5 cores.

The Quad Cities Generating Station of Commonwealth Edison Company consists of two 800 MWe nuclear generating units. Fuel storage pools are provided for each of the units. Currently there are 1140 storage spaces in the spent fuel pools for Quad Cities Units 1 and 2. Each of these units has 724 fuel assemblies in a full core. Each SFP has storage for approximately 1 3/5 cores. The storage pools for Units 1 and 2 are connected by a canal so that fuel is readily transferred between pools.

The modifications evaluated in this environmental impact appraisal are the proposals by the licensee to increase the pool storage capacity from 1160 to 1420 spaces in each of the Dresden Units 2 and 3 spent fuel pools and to increase the pool storage capacity from 1140 to 1460 spaces in each of the Quad Cities Units 1 and 2 spent fuel pools.

The licensee proposes to increase the storage capacity of the Dresden Units 2 and 3 spent fuel pools by installing 13 new storage racks in each pool. The new racks at Dresden are the same in design as the 58 racks that are already installed in each pool. The proposed increase in storage capacity of the Quad Cities Units 1 and 2 SFPs would be accomplished by installing 16 new storage racks in each pool. The new racks at Quad Cities are the same in design as the 57 racks that are currently installed in each pool at that facility. In all four pools, space for the new racks would be made available by utilizing the spare rack spaces in each pool and by replacing control blade racks. No changes are proposed for the Dresden Unit 1 fuel pool.

With the current storage capacity and refueling schedules for Dresden Units 2 and 3, storage capacity for an emergency full core discharge will not be available after 1981. The proposed modification at Dresden would extend the storage capacity for a full core discharge through 1984. With no additional transfers of spent fuel from the Dresden station the proposed modification will probably provide storage space for normal refuelings through 1987. In our evaluation we considered the impacts which may result from storing an additional 260 spent fuel assemblies in each of the Unit 2 and 3 spent fuel pools (a 22% increase in each pool). With the fuel management cycle being evaluated, the proposed increase in storage capacity could extend the period for storing all fuel from the Dresden station on site for an additional two to three years.

With the existing racks, the storage capacity of Quad Cities Units 1 and 2 SFPs is 2280 fuel assemblies. With the projected refueling schedule and the existing racks, there would not be room in the Quad Cities spent fuel pools for a full core discharge after 1981. By adding an additional 640 storage spaces (a 28% increase), the proposed modification would provide storage space to accommodate a full core discharge, if necessary, through the spring of 1985 and store the spent fuel associated with normal refueling through mid 1988.

The proposed modifications to the Dresden Units 2 and 3 and Quad Cities Units 1 and 2 spent fuel pools will not alter their external physical geometry or require additional modifications to the SFP cooling or purification systems. The proposed modification does not affect the quantity of uranium fuel utilized in the reactors, the rate of spent fuel generation or the total quantity of spent fuel generated during the anticipated operating lifetime of the facility. The proposed modification will increase the number of spent fuel assemblies stored in the SFPs and the length of time that some of the fuel assemblies will be stored in the pools.

3.0 Fuel Reprocessing History

Currently, spent fuel is not being reprocessed on a commercial basis in the United States. The Nuclear Fuel Services (NFS) plant at West Valley, New York, was shut down in 1972 for alterations and expansions; on September 22, 1976, NFS informed the Commission that they were withdrawing from the nuclear fuel reprocessing business. The Allied General Nuclear Services (AGNS) proposed plant in Barnwell, South Carolina, is not licensed to operate.

The General Electric Company's (GE) Midwest Fuel Recovery Plant (MFRP) in Morris, Illinois is in a decommissioned condition. Although no plants are licensed for reprocessing fuel, the storage pool at Morris, Illinois and the storage pool at West Valley, New York (on land owned by the State of New York and leased to NFS thru 1980) are licensed to store spent fuel. The storage pool at West Valley is not full but NFS is presently not accepting any additional spent fuel for storage, even from those power generating facilities that had contractual arrangements with NFS. Construction of the AGNS receiving and storage station has been completed. AGNS has applied for - but has not been granted - a license to receive and store irradiated fuel assemblies in the storage pool at Barnwell prior to a decision on the licensing action relating to the separation facility.

4.0 The Plants

The Dresden Nuclear Power Station and the Quad Cities Nuclear Power Station are described in the Final Environmental Statement (FES) issued by the Commission in November 1973 and September 1972 respectively. Each station has two Boiling Water Reactors (BWR's), Dresden Unit Nos. 2 and 3 and Quad Cities Units Nos. 1 and 2, each of which produces approximately 800 megawatts net electrical output (MWe). In addition, the Dresden Nuclear Power Station also has an additional boiling water reactor, Dresden Unit No. 1, which produces approximately 200 MWe.

Pertinent descriptions of principal features are summarized below to aid the reader in following the evaluations in subsequent sections of this appraisal.

4.1 Fuel Inventory

The Quad Cities Unit Nos. 1 and 2 and Dresden Unit Nos. 2 and 3 reactor cores each contains 724 fuel assemblies. A fuel assembly consists of a fuel bundle and the channel which surrounds it. The fuel assemblies are about 5.4 in. square by about 14.7 ft. long. A fuel

bundle contains fuel rods which are spaced and supported in either a square 7x7 or 8x8 array by the lower and upper tie plates. Each fuel rod consists of fuel pellets stacked in a Zircaloy-2 cladding tube which is evacuated, back-filled with helium, and sealed by welding Zircaloy end plugs in each end. About one-fourth of the assemblies are removed from the reactor and replaced with new fuel each operating cycle.

4.2 Station Cooling Water Systems

The Quad Cities Unit Nos 1 and 2 and Dresden Unit Nos. 2 and 3 designs incorporate spray canals in their Condenser Cooling Water Systems. The heated water leaving the condensers is pumped into the canal. The canal has floating spray modules which pump water flowing in the canal through spray nozzles and the spray falls back into the canal. The warm water is thus brought into direct contact with the air with a resultant transfer of heat from the water to the atmosphere via sensible and latent heat transfer mechanisms. The cold water flows from the canal back to the screen house for recirculation through the condensers.

The Station Service Water System is designed to provide water from the river to various heat exchangers in the turbine and reactor auxiliary equipment cooling systems, the reactor shutdown cooling system and miscellaneous services. Heated service water returned from the intermediate cooling services is piped to the circulating water system.

The station service water cools the Reactor Building Closed Cooling Water System heat exchangers. The Reactor Building Closed Cooling Water System in turn provides cooling water to equipment within the primary containment, the reactor water cleanup system non-regenerative heat exchanger, cleanup system pump coolers, sample coolers and fuel pool heat exchangers.

4.3 Radioactive Wastes

Waste handling and treatment systems are designed to collect and process gaseous, liquid and solid waste that might contain radioactive material. The waste handling and treatment systems are evaluated in Section 3.5 of the Dresden FES and Section III.D of the Quad Cities FES. There will be no change in these Sections of the FES as a result of the proposed modification.

4.4 Purpose of SFP

The SFP at Quad-Cities and Dresden were designed to store spent fuel assemblies prior to shipment to a reprocessing facility. These assemblies

may be transferred from the reactor core to the SFP during a core refueling, or to allow for inspection and/or modification to core internals. The latter may require the removal and storage of up to a full core. The assemblies are initially intensely radioactive due to their fission product content and have a high thermal output. They are stored in the SFP to allow for radioactive and thermal decay.

The major portion of decay occurs during the 150-day period following removal from the reactor core. After this period, the assemblies may be withdrawn and placed into a heavily shielded fuel cask for offsite shipment. Space permitting, the assemblies may be stored for an additional period allowing continued fission product decay and thermal cooling prior to shipment.

4.5 Spent Fuel Pool Cooling and Cleanup System

The spent fuel pools for Quad-Cities and Dresden are provided with a cooling loop which removes decay heat from fuel stored in the SFP. The Fuel Pool Cooling and Cleanup Systems were designed to maintain the SFP water temperature less than or equal to 125°F during normal refueling operations and less than or equal to 150°F during full core discharge situations.

The existing SFP Cooling and Cleanup Systems each consists of two 700 gpm circulating pumps, two heat exchangers, two filter-demineralizers, and the required piping to circulate it through the heat exchangers and filter-demineralizers and return it to the pool. Fuel pool water is continuously recirculated except during the period when the reactor well and dryer/ separator pit are being drained. Pool water clarity and purity is maintained by a combination of filtering and ion exchange processes. Particulate and soluble material is removed from the circulated water by the pressure precoat filter-demineralizer units in which a finely divided disposable filter medium is supported on permanent filter elements. The spent filter medium is replaced periodically and the basis for replacement is chemical exhaustion of the demineralizer resin.

5.0 Environmental Impacts of Proposed Action

5.1 Land Use

The Quad-Cities and Dresden SFP's are located between the two reactors at each station. The proposed modification will not alter the external physical geometry of the SFP. No additional commitment of land is required.

5.2 Water Use

There will be no significant change in plant water usage as a result of the proposed modification. As discussed subsequently, storing additional spent fuel in the SFP will slightly increase the heat load on the SFP cooling system, which is transferred to the Reactor Building Closed Cooling Water System and thence to the Plant Service Water System. The modification will not change the flow rates within these cooling systems. With the increased spent fuel storage, normal refueling sequences, without a full core discharge, will result in a pool stabilization temperature below the 125°F used as a design basis in the Final Safety Analysis Report (FSAR). The maximum expected heat load occurs after discharge of a full core. The SFP cooling system has adequate design capacity following discharge of a full core to maintain the pool water temperature below the 150°F design value in the FSAR even with the increased storage of spent fuel associated with the proposed modification. Since the temperature of the SFP water during normal refueling operations will remain below 125°F, the rate of evaporation and thus the need for makeup water will not be significantly changed by the proposed modification.

5.3 Radiological
5.3.1 Introduction

The potential offsite radiological environmental impact associated with the expansion (resulting from an incremental addition in the long-lived radioactive effluents released from the facilities) was evaluated and determined to be environmentally insignificant as addressed below.

During the storage of the spent fuel under water, radioactive nuclides may be released to the water from the surface of the assemblies or from defects in the fuel cladding. The primary impact of such radioactive nuclides is their contribution to radiation levels to which workers in and near the SFP would be exposed. In addition, volatile fission product nuclides might be released through defects in the fuel cladding, mainly noble gases (xenon and krypton), tritium and the iodine isotopes.

Experience indicates that there is little radionuclide leakage from spent fuel stored in pools after the fuel has cooled for several months. The predominance of radionuclides in the spent fuel pool water appears to be radionuclides that were present in the reactor coolant system prior to refueling (which become mixed with the water in the spent fuel pool during refueling operations) or crud dislodged from the surface of the spent fuel during transfer. During and after refueling, the spent fuel pool cleanup system reduces the radioactivity concentrations considerably. It is believed that most failed fuel

contains small, pinhole-like perforations in the fuel cladding at reactor operating conditions of approximately 800°F. A few weeks after refueling, the spent fuel cools in the spent fuel pool so that the fuel rod temperature is relatively cool, approximately 180°F. This substantial temperature reduction should reduce the rate of release of fission products from the fuel pellets and decrease the gas pressure in the gap between pellets and clad, thereby tending to retain the fission products within the cladding. In addition, most of the gaseous fission products have short half-lives and decay to insignificant levels within a few months. Based on the operational reports submitted by the licensees and discussions with the operators, there has not been any significant leakage of fission products from spent light water reactor fuel stored in the Midwest Fuel Recovery Plant (MFRP) at Morris, Illinois, or at Nuclear Fuel Services' (NFS) storage pool at West Valley, New York. Spent fuel has been stored in these two pools which, while it was in a reactor, was determined to have significant leakage and was therefore removed from the core. After storage in the onsite spent fuel pool, this fuel was later shipped to either MFRP or NFS for extended storage. Although the fuel exhibited significant leakage at reactor operating conditions, there was no significant leakage from this fuel in the offsite storage facility.

5.3.2 Radioactive Material Released to Atmosphere

With respect to gaseous releases, since short-lived noble gases in the spent fuel will have decayed to negligible amounts after a year of storage, the only significant noble gas isotope remaining in the SFP and attributable to storing additional assemblies for a longer period of time would be Krypton-85. We have assumed that 0.36% of all fuel rods have cladding defects which permit the escape of fission product gases. As discussed previously, experience has demonstrated that after spent fuel has decayed for 4 to 6 months, there is not significant release of fission products from defected fuel. However, to upper bound any potential releases, we assumed that the fission product gases escape on a relatively linear basis with time. On this basis, we have conservatively estimated that an additional 42 curies per year of Krypton-85 may be released from each of the four SFP's when the modified pools are completely filled. The fuel storage pool area is continuously ventilated. This air is normally released through the reactor building vent. If the facilities do eventually release an additional 84 curies per year of Kr-85 from each site as a result of the proposed modifications, the increase would result in an additional offsite total body dose to an individual of less than 0.001 mrem/year. This dose is insignificant when compared to the approximately 100 mrem/year that an individual receives from natural background radiation. The calculated total body dose to the estimated population within a

50-mile radius of the plants is less than 0.005 man-rem/year, which is less than the natural fluctuations in the dose this population would receive from background radiation. Under our conservative assumptions, these exposures would represent less than a 0.01% increase in the exposures from the plants evaluated in the FES for each station for the individual and the population. Thus, we conclude that the proposed modification will not have any significant impact on radiation levels to persons offsite.

Assuming that the spent fuel will be stored onsite for several years, Iodine-131 releases from spent fuel assemblies will not be significantly increased by the expansion of the fuel storage capacity since the Iodine-131 inventory in the fuel will decay to negligible levels between each annual refueling. The iodines are removed from the SFP water by the SFP cleanup system or through decay as a result of their relatively short half lives.

The impact of airborne releases of tritium as a result of SFP water evaporation was examined. Since the temperature of the pool water will normally be maintained below 125°F, it is not expected that there will be any significant change in evaporation rates and the release of tritium as a result of the proposed modification from that previously evaluated. Most airborne releases from the plant result from leakage of reactor coolant which contains tritium and iodine in higher concentrations than the spent fuel pool. Therefore, even if there were a slightly higher evaporation rate from the spent fuel pool, the increase in tritium and iodine released from the plant as a result of the increase in stored spent fuel would be small compared to the amount normally released from the plant and that which was previously evaluated.

5.3.3 Solid Radioactive Wastes

Operating experience at Quad-Cities and Dresden has demonstrated that the filter-demineralizers in the SFP purification system are effective in maintaining water purity and low radionuclide concentrations. The activity is high during refueling operations and decreases as the pool water is processed through the filter-demineralizer. The additional radioactivity that may be released to the SFP water by storing more spent assemblies in the pool may result in more frequent replacement of the filter-demineralizer. However, the increase in radioactivity, if any, should be minor because the additional spent fuel to be stored is relatively cool, thermally, and radionuclides in the fuel will have decayed significantly. There should be no significant increase in solid radioactive wastes as a result of the proposed action.

5.3.4 Radioactivity Released to Receiving Waters

There should not be an increase in the liquid release of radionuclides from the station as a result of the proposed modification. The amount of radioactivity on the SFP cleanup filter-demineralizer resins might slightly increase due to the additional spent fuel in the pool but this increase of radioactivity should not be released in liquid effluents from the station. The resins will remove insoluble and soluble radioactive matter from the SFP water. The resins are periodically flushed with water to the waste sludge tank of the solid waste system but are not regenerated. The water used to transfer the spent resin is decanted from the tank and returned to the liquid radwaste system for processing. The soluble radioactivity will be retained on the resins. The insoluble radioactive matter should settle to the bottom of the tank. If any activity should be transferred from the spent resin to this flush water, it would be removed by the liquid radwaste system. After processing in the radwaste system, there should not be an increase in the amount of radioactivity released to the environment in liquid effluents as a result of the proposed modification.

5.3.5 Occupational Exposures

We have estimated the increment in onsite occupational dose resulting from the proposed increase in stored fuel assemblies on the basis of information supplied by the licensee and by utilizing realistic assumptions for occupancy times and for dose rates in the spent fuel area from radionuclide concentrations in the SFP water. The spent fuel assemblies themselves contribute a negligible amount to dose rates in the pool area because of the depth of water shielding the fuel. The occupational radiation exposure resulting from the proposed action represents a negligible burden. Based on present and projected operations in the spent fuel pool area, we estimate that the proposed modification will add less than one percent to the total annual occupational radiation exposure burden at these facilities. The small increase in radiation exposure will not affect the licensee's ability to maintain individual occupational doses to as low as is reasonable achievable and within the limits of 10 CFR 20. Thus, we conclude that storing additional fuel in the SFP will not result in any significant increase in doses received by occupational workers.

5.3.6 Evaluation of Radiological Impact

As discussed above, the proposed modification does not significantly change the radiological impact evaluated in the FES for each of the two stations.

5.4 Nonradiological Effluents

There will be no change in the chemical or biocidal effluents from the plant as a result of the proposed modification.

The only potential offsite nonradiological environmental impact that could arise from this proposed action would be an additional discharge of heat, mainly to the atmosphere and, to a lesser extent, the Illinois and Mississippi Rivers. Storing spent fuel in the SFP for a longer period of time will add more heat to the SFP water. The spent fuel pool heat exchangers are cooled by the Reactor Building Closed Cooling Water System which in turn is cooled by the Plant Service Water System.

An evaluation of the augmented spent fuel storage facility was made to determine the effects of the increased heat generation on the plant cooling water systems, and ultimately, on the environment. The maximum heat load on the Reactor Building Closed Cooling Water System is during shutdown of the reactor plant, such as during a refueling shutdown. However, when the reactor is shutdown, heat rejection to the condenser circulating water system is greatly reduced. During reactor operation, heat rejection from the condensers to the circulating water is over 1,000 times higher than the maximum incremental heat load due to the proposed modification. In the closed-cycle mode of operation, after heat rejection to the atmosphere from the spray system and by surface evaporation, any change in the temperature of the cooling tower blowdown (due to the incremental heat load from the proposed modification) should not be detectable. In the open-cycle mode of operation, the small additional heat load from the SFP cooling system will be less than 0.1% of the total heat load on the Circulating and Service Water Systems and will have a negligible ecological impact.

5.5 Impacts on the Community

No environmental impacts on the environs outside the spent fuel storage building are expected during installation of the new racks. The impacts within this building are expected to be limited to those normally associated with metal working activities. No significant environmental impact on the community is expected to result from the proposed action.

6.0 Environmental Impact of Postulated Accidents

The overhead handling systems used for moving shielded casks in the area of the SFPs are provided with a sufficiently high degree of redundancy that the probability of a cask and/or heavy load handling accident which can damage the pool water-tight integrity is small enough to preclude consideration of that event. The generic review now in preparation will address any problems of fuel cask handling that might be identified in that review.

7.0 Alternatives

In regard to this licensing action, the staff has considered the following alternatives: (1) shipment of spent fuel to a fuel reprocessing facility, (2) shipment of spent fuel to a separate fuel storage facility, (3) shipment of spent fuel to another reactor site, and (4) ceasing operation of the facility.

7.1 Reprocessing of Spent Fuel

As discussed earlier, none of the three commercial reprocessing facilities in the U.S. are currently operating. The General Electric Company's Midwest Fuel Recovery Plant (MFRP) at Morris, Illinois is in a decommissioned condition. On September 22, 1976, Nuclear Fuel Services, Inc. (NFS) informed the Nuclear Regulatory Commission that they were "withdrawing from the nuclear fuel reprocessing business." The Allied General Nuclear Services (AGNS) reprocessing plant received a construction permit on December 18, 1970. In October 1973, AGNS applied for an operating license for the separation facility; construction of the separation facility is essentially complete. On July 3, 1974, AGNS applied for a materials license to receive and store up to 400 MTU in spent fuel in the onsite storage pool, on which construction has been completed. Hearings on the materials license application have not been completed.

In 1976, Exxon Nuclear Company, Inc. submitted an application for a proposed Nuclear Fuel Recovery and Recycling Center (NFRRC) to be located at Oak Ridge, Tennessee. The plant would include a storage pool that could store up to 7,000 MTU in spent fuel.

On April 7, 1977, the President issued a statement outlining his policy on continued development of nuclear energy in the U.S. The President stated that: "We will defer indefinitely the commercial reprocessing and recycling of the plutonium produced in the U.S. nuclear power programs. From our own experience, we have concluded that a viable and economic nuclear power program can be sustained without such reprocessing and recycling."

The Nuclear Regulatory Commission issued an order dated December 30, 1977, terminating proceedings to license reprocessing facilities.

The licensee Commonwealth Company, had intended to reprocess the spent fuel to recover and recycle the uranium and plutonium in the fuel. Due to a change in national policy and circumstances beyond Commonwealth Edison's control, reprocessing of the spent fuel is not an available option at this time.

7.2 Independent Spent Fuel Storage Installation

An alternative to expansion of onsite spent fuel pool storage is the construction of new "independent spent fuel storage installations" (ISFSI). Such installations could provide storage space in excess of 1,000 MTU of spent fuel. This is far greater than the capacities of onsite storage pools. Fuel storage pools at GE Morris and NFS are functioning as ISFSIs although this was not the original design intent. Likewise, if the receiving and storage station at AGNS is licensed to accept spent fuel, it would be functioning as an ISFSI until the separations facility is licensed to operate.

The licensee for the GE facility at Morris, Ill. was amended on December 3, 1975 to increase the storage capacity to about 750 MTU; as of April 1, 1977, approximately 259 MTU was stored in the pool in the form of 1,055 assemblies. The staff has discussed the status of storage space at Morris Operations (MO) with GE personnel. We have been informed that GE is primarily operating the MO facility to store either fuel owned by GE (which had been leased to utilities on an emergency basis) or fuel which GE had previously contracted to reprocess. We were informed that the present GE policy is not to accept spent fuel for storage except for that fuel for which GE has a previous commitment.

The NFS facility has capacity for about 260 MTU, with approximately 170 MTU presently stored in the pool. The storage pool at West Valley, New York is on land owned by the State of New York and leased to NFS thru 1980. Although the storage pool at West Valley is not full, since NFS withdrew from the fuel reprocessing business, correspondence we have received indicates that they are not at present accepting additional spent fuel for storage even from these reactor facilities with which they had contracts.

With respect to construction of new ISFSIs, Regulatory Guide 3.24, "Guidance on the License Application, Siting, Design, and Plant Protection for an Independent Spent Fuel Storage Installation," issued in December 1974, recognizes the possible need for ISFSIs and provides recommended criteria and requirements for water-cooled ISFSIs. Pertinent sections of 10 CFR Parts 19, 20, 30, 40, 51, 70, 71 and 73 would also apply.

The staff has estimated that at least five years would be required for completion of an independent fuel storage facility. This estimate assumes one year for preliminary design; one year for preparation of the license application, Environmental Report, and licensing review in parallel with one year for detail design; two and one-half years for construction and receipt of an operating license; and one-half year for plant and equipment testing and startup.

Industry proposals for independent spent fuel storage facilities are scarce to date. In late 1974, E. R. Johnson Associates, Inc. and Merrill Lynch, Pierce, Fenner and Smith, Inc. issued a series of joint proposals to a number of electric utility companies having nuclear plants in operation or contemplated for operation, offering to provide independent storage services for spent nuclear fuel. A paper on this proposed project was presented at the American Nuclear Society meeting in November 1975. In 1974, E. R. Johnson Associates estimated their construction cost at approximately $9,000 per spent fuel assembly.

Several licensees have evaluated construction of a separate independent spent fuel storage facility and have provided cost estimates. Commonwealth Edison estimated the construction cost to build a fuel storage facility at about $10,000 per fuel assembly. To this would be added costs for maintenance, operation, safeguards, security, interest on investment, overhead, transportation and other costs.

On December 2, 1976, Stone and Webster Corporation submitted a topical report requesting approval for a standard design for an independent spent fuel storage facility. No specific locations were proposed, although the design is based on location near a nuclear power facility. No estimated costs for fuel storage were included in the topical report.

On a short term basis (i.e., prior to 1983) an independent spent fuel storage installation is not a viable alternative based on cost or availability in time to meet the licensee's needs. It is also unlikely that the total environmental impacts of constructing an independent facility and shipment of spent fuel would be less than the minor impacts associated with the proposed action.

In the long-term, the U. S. Department of Energy (USDOE) is modifying its program for nuclear waste management to include design and evaluation of a retrievable storage facility to increase Government storage at central locations for unreprocessed spent fuel rods. As announced in the President's energy policy statement of April 29, 1977, the Government is committed to provide a retrievable, long-term storage facility for nuclear wastes by 1985. On October 18, 1977, USDOE announced a new "spent nuclear fuel policy." USDOE will determine industry interest in providing interim fuel storage services on a contract basis. If adequate private storage services cannot be provided, the Government will provide interim storage facilities. It was announced by USDOE at a public meeting held on October 26, 1977, that this interim storage is expected to be available in the 1981-1982 time frame.

7.3 Storage at Another Reactor Site

In addition to Dresden and Quad Cities stations, the licensee owns and operates the Zion Station which has two pressurized water reactor units. There is at present some unused storage space in the Zion spent fuel storage pools. Such space is intended to store fuel from the Zion units and the storage racks are not compatible with BWR spent fuel.

The alternative of storage at another nuclear power station not owned and operated by the licensee is also not realistic. According to a survey conducted and documented by the Energy Research and Development Agency, up to 46 percent of the operating nuclear power plants will lose the ability to refuel during the period 1975-1984 without additional spent fuel storage pool expansions or access to offsite storage facilities. Thus, the licensee cannot rely on any other power facility to provide additonal storage capability except on a short-term emergency basis. If space were available in another reactor facility, the cost would probably be comparable to the cost of storage at a commercial storage facility.

In the absence of a general policy regarding interfacility transfer and storage of spent fuel, such action is being decided on a case-by-case basis and would not afford the timely relief needed here.

Storage at another reactor site is not a realistic alternative at this time, or in the foreseeable future.

7.4 Shutdown of Facility

If the Dresden and Quad Cities Units were forced to shutdown for lack of space to store spent fuel, there would be the loss of the economic benefit from the facility (generation of electric energy) and a cost associated with purchase of replacement energy and maintaining the facility in a standby condition far in excess of the cost of the proposed modification.

From information gained from the licensee, the staff estimates that the combined loss of revenues from the idle units would be about $130,000,000/ yr.

7.5 Summary of Alternatives

In summary, the alternatives (1) to (3) described above are presently not available to the licensee or could not be made available in time to meet the licensee's need. Assuming the nonavailability of alternatives (1) to (3), CECo would be forced to either shutdown or request additional spent fuel storage capacity. Even if available, alternatives (2) and (3) do not provide the operating flexibility of the proposed action and are likely be more expensive than the proposed modification.

Alternative (4), ceasing operation of the facility, would be much more expensive than the proposed action because of the need to provide replacement power. In addition to the economic advantages of the proposed action, we have determined that the expansion of the storage capacities of the spent fuel pools for the Dresden and Quad Cities facilities would have a negligible environmental impact.

8.0 Evaluation of Proposed Action

8.1 Unavoidable Adverse Environmental Impacts

8.1.1 Physical Impacts

As discussed above, expansion of the storage capacity of the SFP would not result in any significant unavoidable adverse environmental impacts on the land, water, air or biota of the area.

8.1.2 Radiological Impacts

Expansion of the storage capacity of the SFP will not create any significant additional radiological effects. As discussed in Section 5.3, the additional total body dose that might be received by an individual or the estimated population within a 50 mile radius is less than 0.001 mrem/yr and 0.005 man-rem/yr, respectively, and is less than the natural fluctuations in the dose this population would receive from background radiation. Operation of the plant with additional spent fuel in the SFP is not expected to increase the occupational radiation exposure by more than one percent of the present total annual occupational exposure at this facility.

8.2 Relationships Between Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Expansion of the storage capacity of the SFP will not change the evaluation of long-term uses of the land as described in the FES for the Dresden and Quad Cities facilities. In the short term, the proposed modification would permit the expected benefits (i.e., production of electrical energy) to continue.

8.3 Irreversible and Irretrievable Commitments of Resources

8.3.1 Water, Land and Air Resources

The proposed action will not result in any significant change in the commitments of water, land and air resources as identified in the FES for the Dresden and the Quad Cities facilities. No additional allocation of land would be made; the land area now used for the SFP would be used more efficiently by adopting the proposed action.

8.3.2 Material Resources

In the submittal of September 29, 1976, the licensee stated that the proposed modifications will commit about 24 tons at aluminum for the Dresden spent fuel storage racks, and about 29 tons for the Quad Cities spent fuel storage racks. The amounts at other materials consumed by and committed to the proposed action are minimal. The 53 tons of aluminum thus committed is a small fraction of the total amount of the 5,000,000 tons produced annually in the U.S. Furthermore, the material thus committed is, in principal, almost entirely recoverable.

The longer term storage of spent fuel assemblies withdraws the unburned uranium from the fuel cycle for a longer period of time. Its usefulness as a resource in the future, however, is not changed. The provision of longer onsite storage does not result in any cumulative effects due to plant operation since the throughput of materials does not change. Thus the same quantity of radioactive material will have been produced when averaged over the life of the plant. This licensing action would not constitute a commitment of resources that would affect the alternatives available to other nuclear power plants or other actions that might be taken by the industry in the future to alleviate fuel storage problems. No other resources need be allocated because the other design characteristics of the SFP remain unchanged.

8.4 Commission Policy Statement Regarding Spent Fuel Storage

On September 16, 1975, the Commission announced (40 F. R. 42801) its intent to prepare a generic environmental impact statement on handling the storage of spent fuel from light water reactors. In this notice, it also announced its conclusion that it would not be in the public interest to defer all licensing actions intended to ameliorate a possible shortage of spent fuel storage capacity pending completion of the generic environmental impact statement.

The Commission directed that in the consideration of any such proposed licensing action, the following five specific factors should be applied, balanced, and weighed in the context of the required environmental statement or appraisal.

a. Is it likely that the licensing action here proposed would have a utility that is independent of the utility of other licensing actions designed to ameliorate a possible shortage of spent fuel capacity?

Dresden Units 2 and 3 have 724 fuel assemblies in each core while Dresden Unit 1 has 464 fuel assemblies. Dresden Units 1, 2 and 3

achieved initial criticality on October 15, 1959, January 7, 1970 and January 31, 1971, respectively. Unit 1 is in its eleventh operating cycle, Unit 2 is in its sixth, and Unit 3 is in its fifth operating cycle. As designed, a total of 58 standard BWR fuel storage racks were installed in the Units 2 and 3 pools. The racks are made of aluminum and are designed to store 20 spent fuel elements each.

Like Dresden Units 2 and 3, Quad Cities Units 1 and 2 have 724 fuel assemblies in each core. Comparison of fuel characteristics for the four plants shows that all four units use identical fuel and that expected burnup is comparable. Quad Cities Unit 1 achieved initial criticality on October 18, 1971 followed by Unit 2 on April 26, 1972. Units 1 and 2 are both in their third fuel cycle. As designed, a total of 57 standard BWR fuel storage racks were installed in the Units 1 and 2 pools. The racks are similar to those in Dresden Units 2 and 3; they are fabricated from aluminum and will each store 20 spent fuel assemblies.

The racks in the spent fuel pools for Dresden Units 2 and 3 and Quad Cities Units 1 and 2 are secured to the floor of the pool by one inch swing bolts (four per rack) which facilitates installation and removal. Some of the space in each pool is occupied by control blade storage racks which fit the same positions as the fuel storage racks and are also bolted to the SFP floor with swing bolts. The spent fuel pools for Dresden Units 1, 2 and 3 and Quad Cities Units 1 and 2 were designed on the basis that a fuel cycle would be in existence that would only require storage of spent fuel for a year prior to shipment to a reprocessing facility. The design bases (Section 10.1.1, Final Safety Analysis Report) assumed that a normal reactor refueling would involve replacement of 25 percent of the core. Therefore, a pool storage capacity for 1160 assemblies in Dresden Units 2 and 3 and 1140 assemblies in Quad Cities Units 1 and 2 (spaces for about 1 3/5 cores in each unit) was considered adequate. This permitted complete unloading of the reactor for maintenance or inspection even if the spent fuel from the two previous refuelings were in the pool. Additional space in each SFP was provided for underwater storage of used control rods, flow channels and other reactor components.

Storage capacity for an emergency full core discharge will not be available after 1981 at Dresden and Quad Cities. The proposed modifications to the spent fuel storage pools could extend the storage capacity to 1987 at Dresden and to 1988 at Quad Cities. If expansion of the SFP capacity is not approved or if alternate storage facilities are not available, Commonwealth Edison Company would have to shutdown the Dresden and Quad Cities facilities by the mid 1980's.

Spent fuel reprocessing facilities cannot assuredly be available to Commonwealth Edison within the next few years so that no spent fuel can be shipped for reprocessing. The proposed licensing action would provide the licensee with additional operating flexibility which is desirable even if adequate offsite storage facilities eventually become available.

We have concluded that a need for additional spent fuel storage capacity exists at Dresden Units 2 and 3 and Quad Cities Units 1 and 2 which is independent of the utility of other licensing actions designed to ameliorate a possible shortage of spent fuel capacity.

b. Is it likely that the taking of the action here proposed prior to the preparation of the generic statement would constitute a commitment of resources that would tend to significantly foreclose the alternatives available with respect to any other licensing actions designed to ameliorate a possible shortage of spent fuel storage capacity?

In our review of this proposed action, we have considered commitment of both material and nonmaterial resources. The material resources considered are those to be committed in expanding the capacity of the spent fuel storage pools at the Dresden and Quad Cities station.

The proposed fuel storage pool modifications require a relatively insignificant commitment of material resources. In the case of Dresden, about 24 tons of aluminum will be used for the spent fuel storage racks. In the case of Quad Cities, about 29 tons of aluminum will be used for the spent fuel storage racks. No poison material or stainless steel is used in the fuel storage racks. The amount of aluminum produced annually in the U.S. is approximately 5,000,000 short tons. This material is not considered to be in short supply in this country. The amount of aluminum required for fabrication of the new racks is a small amount of this resource consumed annually in the United States.

We conclude that the amount of material required for the new racks at Dresden and Quad Cities is insignificant and does not represent an irreversible commitment of natural resources.

This licensing action would not constitute a commitment of resources that would affect the alternatives available to other nuclear power plants or other actions that might be taken by the industry in the future to alleviate fuel storage problems. No other resources need be allocated because the other design characteristics of the SFP remain unchanged. No additional allocation of land would be made; the land area now used for the spent fuel pools would be used more efficiently by reducing the unused areas in the pools.

The increased storage capacity of the Dresden Units 2 and 3 and Quad Cities Units 1 and 2 spent fuel pools was considered as a nonmaterial resource and was evaluated relative to proposed similar licensing actions within a one year period (the time we estimate is necessary to complete the generic environmental statement) at other nuclear power plants, fuel reprocessing facilities and fuel storage facilities. We have determined that the proposed expansion in the storage capacity of the SFP is only an action to allow continued operation and to provide additional operational flexibility at these facilities, and will not affect similar licensing actions at other nuclear power plants.

We conclude that the expansion of the storage capacity of the spent fuel pools at Dresden Units 2 and 3 and Quad Cities Units 1 and 2 prior to the preparation of the generic statement does not constitute a commitment of either material or nonmaterial resources that would tend to significantly foreclose the alternatives available with respect to any other individual licensing actions designed to ameliorate a possible shortage of spent fuel storage capacity.

c. Can the environmental impacts associated with the licensing action here proposed be adequately addressed within the context of the present application without overlooking any cumulative environmental impacts?

The spent fuel pools at the Dresden and Quad Cities facilities were designed principally to store spent fuel assemblies prior to shipment to a reprocessing facility. These assemblies are transferred from the reactor core to the SFP during a core refueling or to allow for inspection and/or modification to core internals. This may require the removal and storage of up to a full core. The assemblies are initially intensely radioactive due to their fission product content and have a high thermal output. They are stored in the SFP to allow for radioactive and thermal decay.

The major portion of decay occurs during the 150 day period following removal from the reactor core. After this period, the assemblies may be withdrawn from the spent fuel pool by placing them into a heavily shielded fuel cask for offsite shipment. Space permitting, the assemblies may be stored in the spent fuel pool for an additional period of time which will allow continued fission product decay and thermal cooling prior to shipment.

In this appraisal, we have considered potential non-radiological and radiological impacts at the Dresden facility from: 1) installation of 13 new racks in the Dresden Units 2 and 3 SFP's and 2) subsequent operation with up to 1420 spent fuel assemblies stored in each of the

Unit 2 and 3 SFP's. The 2840 spent fuel assemblies in the Units 2 and 3 spent fuel pools will include assemblies from Dresden Units 1, 2 and 3. The potential nonradiological and radiological impacts evaluated at the Quad Cities facility were those resulting from 1) installation of 16 new racks in the Quad Cities Units 1 and 2 SFPs and 2) subsequent operation with up to 1460 spent fuel assemblies from the Quad Cities reactors stored in the Units 1 and 2 SFPs.

The new SFP storage racks will be fabricated offsite. No environmental impacts on the environs outside the spent fuel storage buildings were identified during the installation of the new racks in the SFP's. The impacts within the buildings are expected to be limited to those normally associated with metal working activities.

No significant environmental impacts, either onsite or offsite, could be identified as resulting from operation of the expanded spent fuel pools at these facilities.

The only potential offsite nonradiological environmental impact that could arise from this proposed action would be an additional discharge of heat to the recirculating canals and lake used as the source of plant cooling at Dresden and the additional discharge of heat to the spray canals at Quad Cities. Storing spent fuel in the SFP for a longer period of time will add more heat to the SFP water. The spent fuel pool heat exchangers in each unit are cooled by the reactor building closed cooling water system which in turn is cooled by the service water cooling system. The 22% to 28% expansion of the spent fuel storage in each pool increases the decay heat generation load by about 300,000 Btu per hour. Compared to the existing heat load on the service water cooling system and the total heat load rejected to the cooling lake and spray canal by the once through circulating water systems, the small additional heat load from the SFP cooling systems (attributable to the storage of additional spent fuel) will represent less than 0.01% of the total station heat load and will have a negligible impact on the environment.

Regarding the potential onsite and offsite radiological impact, we have estimated the increment in onsite occupational dose resulting from the proposed increase in stored fuel assemblies on the basis of information supplied by the licensee, and by utilizing realistic assumptions for occupancy times and dose rates in the spent fuel pool area from radionuclide concentrations in the SFP water. The spent fuel assemblies themselves contribute a negligible amount to dose rates in the pool area because of the depth of water shielding the fuel. Our analysis indicates that the occupational radiation exposure

resulting from the proposed action represents a negligible burden. Based on present and projected operations in the spent fuel pool area, the proposed modification would add less than one percent to the total annual occupational radiation exposure burden at this facility. The small increase in radiation exposure will not affect the licensee's ability to maintain individual occupational doses to as low as reasonably achievable levels and within the limits of 10 CFR 20. Thus, we conclude that storing additional fuel in the SFP will not result in any significant increase in doses received by occupational workers.

Assuming that the spent fuel will be stored onsite for several years (rather than shipped offsite after 6 to 12 months storage as originally planned), Iodine-131 releases will not be significantly increased by the expansion of the fuel storage capacity since the Iodine-131 inventory in the fuel will decay to negligible levels between each annual refueling. Storing additional spent fuel assemblies is not expected to increase the bulk water temperature above the 125°F used in the design analysis during normal refuelings or above 150°F during a full core off-load. Since the temperature of the pool water will normally be maintained below 125°F, it is not expected that there will be any significant change in evaporation rates and the release of tritium as a result of the proposed modification.

For the Dresden Units 2 and 3 and Quad Cities Units 1 and 2 SFPs, the licensee has replaced the trolley on the overhead crane with a new trolley designed essentially to the single failure criteria in proposed Regulatory Guide 1.104. The licensee is restricting the path of travel of the crane and spent fuel cask so that the cask passes over the minimum amount of safety related equipment. Therefore, no accident involving release of radioactivity due to spent fuel cask or heavy load drops need be considered.

We have considered the potential cumulative environmental impacts associated with the expansion of the SFP at Dresden Units 2 and 3 and Quad Cities Unit 1 and 2, and have concluded that these actions will not significantly affect the quality of the human environment during either normal operation of the expanded spent fuel pools, the transfer of spent fuel between the pools at each of the stations, or under postulated fuel handling accident conditions.

d. Have all technical issues which have arisen during the review of this application been resolved within that context?

This impact appraisal and the accompanying safety evaluation report point out that all reasonable concerns regarding health, safety and environmental impacts have been addressed and resolved.

e. Would a deferral or severe restriction on this licensing action result in substantial harm to the public interest?

We have determined that there are significant economic advantages associated with the proposed action and that expansion of the storage capacity of the SFP will have a negligible environmental impact. Accordingly, deferral or severe restriction of the action here proposed would result in substantial harm to the public interest.

In addition, the added spent fuel storage space is needed in order to accommodate a full core offload from Dresden Unit No. 3 at the upcoming (February 1978) refueling outage. The full core offload is necessary to perform safety related surveillance with a minimal occupational exposure.

9.0 Benefit-Cost Balance

This section summarizes and compares the cost and the benefits resulting from the proposed modification to those that would be derived from the selection and implementation of each alternative. The table below presents a tabular comparison of these costs and benefits. The benefits derived from three of these alternatives is the continued operation of the Dresden and Quad Cities stations and production of electrical energy. The remaining alternatives (i.e., reprocessing of the spent fuel or storage at other nuclear plants) are not possible at this time or in the foreseeable future except on a short term emergency basis and, therefore, have no associated cost or benefit.

From examination of the table, it can be seen that the most cost-effective alternative is the proposed spent fuel pool modifications. As evaluated in the proceeding sections, the environmental impacts associated with the proposed modification would not be significantly changed from those analyzed in the Final Environmental Statements for the Dresden and Quad Cities stations.

10.0 Basis and Conclusion for not Preparing an Environmental Impact Statement

We have reviewed this proposed facility modification relative to the requirements set forth in 10 CFR Part 51 and the Council of Environmental Quality's Guidelines, 40 CFR 1500.6 and have applied, weighed, and balanced the five factors specified by the Nuclear Regulatory Commission in 40 CFR 42801. We have determined that the proposed license amendments will not significantly affect the quality of the human environment and that there will be no significant environmental impact attributable to the proposed action beyond that which has already been predicted and described in the Commission's Final Environmental Statements for the Dresden and Quad Cities facilities, dated November 1973 and September 1972, respectively. Therefore, the Commission has found that an environmental impact statement need not be prepared, and that pursuant to 10 CFR 51.5(c), the issuance of a negative declaration to this effect is appropriate.

SUMMARY OF COST-BENEFITS

Alternative	Cost	Benefit
Reprocessing of Spent Fuel	-	None-this alternative is not available either now or in the foreseeable future.
Increase storage capacity of spent fuel pools	$1500/assembly	Continued operation of Dresden and Quad Cities stations and production of electrical energy.
Storage at Independent Facility	$10,000/assembly plus shipping cost and maintanence costs	Continued operation of Dresden and Quad Cities stations and production of electrical energy. This alternative is not available now.
Storage at Reprocessor's Facility	$2000/yr. per assembly plus shipping costs*	Continued operation of Dresden and Quad Cities stations and production of electrical energy.
Storage at Other Nuclear Plants	-	None - This alternative is not likely to be available.
Reactor Shutdown	about $170 million/yr**	None - No production of electrical energy.

*In order to use this alternative a minimum commitment of ten to twelve years of storage is required.

**This does not include costs of maintaining the plant in a standby condition, decommissioning costs etc.

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NOS. 50-237, 50-249, 50-254 AND 50-265

COMMONWEALTH EDISON COMPANY
AND
IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

NOTICE OF ISSUANCE OF AMENDMENTS TO FACILITY OPERATING LICENSES AND NEGATIVE DECLARATION

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment Nos. 34 , 31, 43, and 41 to Facility Operating License Nos. DPR-19, DPR-25, DPR-29 and DPR-30 (respectively), issued to the Commonwealth Edison Company (and, in the matter of License Nos. DPR-29 and DPR-30, the Iowa-Illinois Gas and Electric Company), which revised the licenses for operation of Unit Nos. 2 and 3 of the Dresden Nuclear Power Station (located in Grundy County, Illinois) and Unit Nos. 1 and 2 of the Quad Cities Nuclear Power Station (located in Rock Island County, Illinois). These amendments are effective as of their date of issuance.

The amendments authorize modification of the spent fuel pools at Dresden Station Unit Nos. 2 and 3 to accommodate increased storage of spent fuel from Dresden Station and modification of both spent fuel pools at Quad Cities Station Unit Nos. 1 and 2 to accommodate spent fuel from Quad Cities Station. In addition, the amendments authorize storage of spent fuel discharged from any Dresden Unit in the spent fuel pool of either Dresden Unit Nos. 2 or 3, and the storage of spent fuel discharged from either Quad Cities unit in either Quad Cities spent fuel pool.

The Commonwealth Edison Company's (the licensee) request to permit storage of Dresden and Quad Cities Stations fuels in either the storage pools of Dresden Unit Nos. 2 and 3 or Quad Cities Unit Nos. 1 and 2 was not authorized as proposed in the Commission's earlier notices of the below listed dates and Federal Register citations since the licensee withdrew this portion of the application.

The application, as supplemented and amended, for the amendments complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendments. Notice of Consideration of Proposed Modification to Facility Spent Fuel Storage Pool in connection with these amendments was published in the Federal Register on August 5, 1976 (41 F.R. 32798 for Dresden Unit Nos. 1 and 2, and 41 F.R. 32799 for Quad Cities Unit Nos. 1 and 2). No request for a hearing or petition for leave to intervene was filed following notice of the proposed action.

The Commission has prepared an Environmental Impact Appraisal of the action being authorized and has concluded that an environmental impact statement for this particular action is not warranted because there will be no environmental impact attributable to the action significantly greater than that which has been predicted and described

in the Commission's Final Environmental Statement for the Quad Cities facility dated September 1972 and the Dresden facility dated November 1973, and the action will not significantly affect the quality of the human environment.

For further details with respect to this action, see (1) the application for amendment dated September 17, 1975 and supplements thereto dated December 8, 1975, April 23, September 29, October 20, December 7, 1976, February 18, and December 12, 1977, (2) Amendment Nos. 34 , and 31 to License Nos. DPR-19 and DPR-25, and Amendment Nos. 43 , and 41 to License Nos. DPR-29 and DPR-30, (3) the Commission's concurrently issued related Safety Evaluation, and (4) the Commission's concurrently issued Environmental Impact Appraisal. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C., and for those items relating to Dresden Unit Nos. 2 and 3 at the Morris Public Library, 604 Liberty Street, Morris, Illinois 60450, and for those items relating to Quad Cities Unit Nos. 1 and 2 at the Moline Public Library, 504 17th Street, Moline, Illinois 60625. A copy of items (2), (3) and (4) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 30th day of January, 1978.

FOR THE NUCLEAR REGULATORY COMMISSION

Don K. Davis, Acting Chief
Operating Reactors Branch #2
Division of Operating Reactors