

ILLINOIS POLLUTION CONTROL BOARD
November 23, 1971

In the Matter of:)
)
Application of Commonwealth) PCB 70-21
Edison Company for a Permit)
for Dresden Unit 3, Dresden)
Nuclear Power Station)

Opinion of the Board (by Mr. Kissel):

On March 3, 1971, this Board issued a permit to Commonwealth Edison Company ("Edison") to allow it to operate Dresden Unit 3 a nuclear power generating station near Morris, Illinois. The Board's previous opinions detail the facts and reasons behind the issuance of the permit and the conditions contained therein, and those reasons and facts will not be repeated here, except as relevant to this particular part of the permit proceeding. The permit required that Edison submit certain reports concerning the installation of control equipment for gaseous radioactive emissions, liquid radioactive discharges and heated water discharges as detailed in the following paragraphs of the permit:

"3(b) The permittee shall within thirty (30) days after the issuance of this permit submit to the IPCB a written program with a time schedule for controlling the liquid radioactive discharges up to the amounts set forth in paragraph 3(a) of this permit from Dresden Unit III without the use of dilution water.

"4(b) Within thirty (30) months from the date of issuance of this permit, permittee shall construct and install facilities on Dresden Unit 3 to reduce gaseous radioactive emissions permitted by paragraph 4(a) of this permit by a factor of fifty (50). Within thirty (30) days after the date of the issuance of this permit, permittee shall submit a written program to the IPCB for designing, constructing and installing the control facilities required by this paragraph. Said written program shall include a detailed description of the proposed facilities, the times when the design, purchase, installation and construction of the facilities shall be completed and any other information as would be needed by the IPCB to properly evaluate the amount of time needed by the permittee and its contractors, if any, to complete said facilities.

"5(b) Permittee in the operation of Dresden Unit 3 shall comply with the thermal discharge requirements of SWB-8 as interpreted in the opinion of the Board. In order to assure such compliance, permittee shall submit the following information to the Board within thirty (30) days from this date:

1. Engineering information and costs on the kinds of additional facilities, if any, required to meet the standard covering heated discharges allowing for a mixing zone of 600 feet.

2. The time required to construct the additional facilities referred to in paragraph 1.

3. If additional time is required, the reasons why, in accordance with the variance provisions of the Environmental Protection Act and of the Board's Procedural Rules, operation of Dresden Unit 3 should be permitted during said construction."

Edison filed the "thirty day" report on April 13, 1971. It not only contained the many alternate programs called for by the conditions of the permit, but also contained a request by Edison to reform certain of the other conditions of the permit, that is, those dealing with the permitted gaseous emissions before control equipment is installed and the use of an emission reduction (instead of a dose reduction) factor as a measure of the effectiveness of the radioactive gaseous emission control equipment. After receiving the detailed Edison report, the Board requested that the Institute for Environmental Quality (the "Institute") employ the services of experts who could review the report and offer expert comments on the various alternatives proposed by Edison. The Institute did hire three persons well qualified to review the report -- Dr. Hermen Cember of Northwestern University, Dr. James Leonard of the University of Cincinnati and Dr. Henry Bremer, President of Datagraphics, Inc. The Institute's experts did, in fact, file written reports which contained a detailed examination of the Edison alternatives. When Edison received the reports, it requested a hearing be held so that the various alternatives could be aired in a public forum. A hearing was held on October 19 and 20, in Chicago, Illinois.

There are three basic areas in which the Board must make decisions as a result of the most recent hearings in this case: 1) The gaseous emission control equipment which must be installed by Edison; 2) the liquid radioactive control equipment to be installed by Edison; and 3) the futher controls, if any, to be installed in order to reduce the thermal input into the Illinois River. Each of these areas will be considered separately, although there is a relationship between some of the issues.

[Gaseous Radioactive Controls]

Before reaching the actual control equipment discussion, it is necessary to discuss the interim radioactive emission limits imposed as a condition in the original permit issued to Edison. The permit provided in paragraph 4(a) as follows:

"The release rates of gross beta-gamma radioactivity of gaseous effluent released to the environs from Dresden Unit 3 shall not exceed a monthly average release rate of twenty-five thousand (25,000) microcuries per second and on no occasion shall the emissions exceed one hundred thousand (100,000) microcuries per second."

This part of the permit was taken almost directly from the testimony of an Edison witness who testified, in essence, that an annual average emission rate at the Dresden 3 unit of 25,000 microcuries per second at the Dresden plant would be "average to good" fuel performance. An instantaneous emission of more than 100,000 microcuries per second would indicate "fair to poor" fuel performance. While the witness himself did not feel that an instantaneous emission rate should be adopted, the Board felt that this was a point at which emissions should be limited because we did not wish to encourage Edison to continue to allow "poor" fuel performance. Since the original Dresden 3 hearings, there has been much testimony by General Electric and Edison personnel about paragraph 4(a) of the Dresden 3 Permit. In a hearing on the application for a permit to operate two identical boiling water reactor power generating units at Quad Cities, the same witness who had previously substantiated the emission levels in paragraph 4(a) of the Dresden 3 Permit, testified that what he meant to say at the Dresden hearing was that the emission level of 25,000 microcuries per second was an average to be sustained "over the years" and was not meant to be an annual average. His testimony in the Dresden 3 hearing, however, was contrary. (See, Transcript of Original Hearing, December 9, 1970, page 480). Be that as it may, we are convinced, based upon new testimony in the Quad Cities hearing and the most recent hearings on the hardware to be installed at Dresden, that a new emission level should be set for the gaseous radioactive emissions prior to the installation of control equipment. The Quad Cities testimony demonstrated that a realistic emission level would be 80,000 microcuries per second as an annual average for the operation of one unit essentially identical to Dresden 3, and this was adopted as the interim emission level in the recently issued permit for the Quad Cities plant. See Permit

and Opinion of the Board, In the Matter of the Joint Application of Commonwealth Edison Company and Iowa-Illinois Gas & Electric Company (Quad Cities Permit), PCB 71-20, decided November 15, 1971. In the Quad Cities case the single unit emission level of 80,000 microcuries per second would produce a fencepost dose of about 157 millirem per year. The testimony in the Dresden 3 hearing demonstrated that the 80,000 microcurie emission from one unit would result in a fencepost dose of about 44 millirem per year. Of course, the fencepost dose is normally reduced by a factor of three because no one lives at the fencepost twenty-four hours a day, 365 days a year. With this factor reduction, the actual emission rate and dose to the public is still very low even at the emission level of 80,000 microcuries per year, considering the fact that background radiation provides a yearly dose to the public of about 100 millirem.

The most recent hearing on the Dresden 3 hardware produced testimony that the expected annual average emission rate at Dresden 3, assuming the unit operated at full power for the entire year, is 90,000 microcuries per year. The number was obtained by looking at the actual performance of the two large Dresden units, 2 and 3, at less than full power levels, and applying a computed factor increase of the emissions for operation at full power. According to Mr. Stiede, the 90,000 microcurie emission level could be sustained on a monthly basis, and as far as a yearly average is concerned, the unit can be expected to be operated about 75% of the time; therefore, an annual average of 67,500 microcuries per second could be maintained. We think that this level of emission is very close to the one proposed in the Quad Cities application hearing and in order to assure greater leeway, we adopt the Quad Cities standard for Dresden. We, therefore, believe that based upon the new testimony of the actual performance of the units at Dresden, paragraph 4(a) of the permit should be amended as follows:

"Gross beta-gamma radioactivity of gaseous emissions released to the atmosphere from Dresden Unit 3 shall not exceed an annual average of 80,000 microcuries per second."

The rates of emission at this level will not cause a significant increase of the dose to the population around the plant.

With the establishment of a new interim emission rate for Dresden 3, we do believe that the action level suggested by Edison at the Quad Cities hearing should also be adopted for Dresden 3 for the same reasons as outlined in the Quad Cities opinion. We therefore will require that if the gaseous radioactive emissions from Dresden 3 exceed 37,500 microcuries per second at any time, Edison shall initiate operating procedures, to the extent permitted without interrupting electric service, to reduce such release.

In the original permit Edison was required to construct gaseous emission control facilities within thirty (30) months from the date the permit was issued, which facilities would reduce the "gaseous radioactive emissions . . . by a factor of fifty (50)." Paragraph 4(b) of the Dresden 3 Permit. The intent of that paragraph was to require that Edison construct, install and operate the catalytic recombiner and eight charcoal beds to treat the air ejector effluent. This, according to Edison, would result in an emission reduction by a factor of 40 and a dose reduction by a factor of 80. Edison has already begun its program to install this equipment, and, in fact, the completion date will be earlier than originally anticipated -- the present completion date now hoped for by Edison is April 1, 1973, and we will hold them to that date. We will also modify the language of paragraph 4(b) to be consistent with the rate at which gaseous radioactivity will be emitted from the air ejector system and the gland seal system. Since Edison has testified that the recombiner and eight charcoal beds will result in an emission reduction factor of 40, and since the record shows that as an annual average Edison can achieve an air ejector emission rate of 80,000 microcuries per second, we will require that after the installation and operation of the control equipment -- which will be no later than April 1, 1973 -- Edison shall not emit more than 2000 microcuries per second gross beta-gamma activity from the air ejector off gas system. In addition, the gland seal system will result in emissions of about 1000 microcuries per second on an annual average, so that paragraph 4(b) will be modified to read as follows:

"By April 1, 1973, Edison shall have completed the installation of a catalytic recombiner and eight charcoal bed system, as outlined in the record of this proceeding, to treat the air ejector effluent. On and after that date, gaseous radioactive emissions from Dresden Unit 3 shall not exceed an annual average of 3000 microcuries per second. The latter emission limit shall include emissions from the gland seal."

[Liquid Radioactive Controls]

The Permit originally issued to Edison for the operation of Dresden 3 provided that the liquid radioactive emissions from the Dresden 3 facility should not exceed 10^{-7} microcuries per liter. Further, paragraph 3(b) provided as follows:

"The permittee shall within thirty (30) days after the issuance of this permit submit to the IPCB a written program with a time schedule for controlling the liquid radioactive discharges up to the amounts set forth in paragraph 3(a) of this permit from Dresden Unit III without the use of dilution water."

In its "thirty-day" report Edison detailed for alternative systems which it indicated would meet the Board's requirements under the above quoted condition of the permit.

Alternate 1 is entitled, "Liquid Waste Dilution Station with Closed Cycle Lake". This system involves a closed-cycle lake operation with sprays for Units 2 and 3 and the installation of a dilution station for Unit 1 condenser cooling water discharge. There would be no need for major modifications to the presently radwaste system. At a dilution station on the north side of the Dresden Unit 2-3 intake canal, 250,000 gallons per minute (gpm) would be piped to the Unit 1 discharge canal where it would mix with the existing 190,000 gpm of cooling water from Unit 1. In addition, the 50,000 gpm of blowdown water from the lake would be piped to the Unit 1 discharge canal and mixed with the cooling water before discharge into the river. Units 2 and 3 discharge line would be rerouted to the Unit 1 canal and discharged into the canal to provide distribution of the waste across the canal. The waste would be mixed with the cooling water as it passed down the canal and would be released along with the Unit 1 liquid waste to the river at an activity level of 100 picocuries per liter, for the combined releases from all units. The 50,000 gpm blowdown will benefit management of the lake by limiting the buildup of impurities in the lake. The installed cost of the dilution station, and related costs, will be \$2,898,000 and the operating costs will be \$130,000. These costs would be in addition to the cost of \$12,500,000 which is common to all alternates proposed by Edison. The time for completion of this alternate would be twenty-six months.

Alternate 2 is entitled, "300,000 GPM Continuous Discharge of Cooling Lake Water for Dilution of Liquid Waste". Under this system the liquid radwaste would not be changed from its present design. The water use system of the plant would be changed to require that only 300,000 gpm of water from the facility would be discharged to the river. This would require that the plant reuse either 700,000 gpm for six-pump operation and 420,000 gpm for four-pump operation. The discharge flow would travel through the existing Units 2 and 3 discharge canal to the river and would be discharged through a diffuser pipe. Under certain circumstances Dresden Unit 1 will have to be reduced in operation in order to meet the present SWB-8 standards. The cost to install this system would be \$1,903,000 with operating costs of \$40,000.

Alternate 3 is entitled, "Maximum Recycle Liquid Waste System with Closed Cycle Lake". This system would result in compliance of the radioactive standard of 100 picocuries per liter with a minimum blowdown of 50,000 gpm which blowdown is only necessary to assure proper operation of the lake. The present waste collection system

would not be changed, but additions would be made. The floor drain subsystem would be modified to permit recycling of most of the effluent. This would be accomplished by the addition of two deep bed demineralizers after the floor drain filter. These demineralizers would provide ion exchange treatment. The water so treated could be returned to the condensate storage tank for recycling. A small amount of the recycled water, however, will not meet the condensate purity standards and would have to be discharged to the canal. A floor drain surge tank would be added to serve as a contingency collector. Also as part of this proposed Alternate, the existing concentrators in the chemical waste subsystem would be utilized to remove dissolved impurities for solidification. The concentrator distillates would go to the collector subsystem for further treatment and recycling, and the waste salts will be drummed as solid wastes. This system would reduce the radioactivity from 1.2 microcuries per second to approximately .009 microcuries per second, and this estimate is based upon fuel performance which would be approximately 0.1 microcuries per second. Thus, this alternate would allow for meeting the proposed effluent standard with the 50,000 gpm blowdown, which is necessary for the proper operation of the cooling lake. According to Edison's estimate, the total exposure from Dresden Units 2 and 3 to a person using river water as drinking water for his entire liquid intake is 0.0038 millirem per year. This alternate would also use the diffuser pipe for the Unit 1 discharge. The installation cost of this equipment will be \$2,946,000 with operating cost of \$165,000 per year. This system could be completed within 21 months.

Alternate 4 is entitled, "Maximum Treatment Liquid Waste System with Closed Cycle Lake". The waste collector system will remain as is presently designed except that there will be a contingency collection system. There will be two parallel demineralizers installed and a line from the floor drain sample tanks to the contingency subsystem. All floor drain wastes complete recycling, but there will be a small amount not able to be recycled. This small amount will be routed to the contingency subsystem. In the chemical waste subsystem the chemical wastes will be concentrated, and not discharged. In the decontamination subsystem, the wastes will be connected to the solid waste system, mixed with cement and drummed. The contingency subsystem is completely new and will allow the discharge of 100 picocuries per liter without the use of dilution. This system will include a floor drain surge tank, two 20-gpm concentrators, two 500-gallon distillate tanks, two demineralizers with 10 ft.³ of ion exchange resin each and two 30,000-gallon sample tanks. There will be a large contingency collector tank of approximately 200,000 gallons. As has been previously stated, the discharge of radioactive liquid wastes would be met before mixing with the blowdown water. Unit 1, in this alternate as well, would have its discharge routed through a diffuser pipe. The installation cost of this alternate would be \$4,498,000 and the operating cost would be \$300,000.

In providing to the Board the four Alternates for treatment of liquid radioactive wastes and heated water discharges, Edison has complied fully with the condition of the permit requiring these submissions. The first opinion of the Board in the Dresden 3 case did make the point that dilution should not be used as an alternative to the treatment of liquid radioactive wastes. We feel that although dilution water is still used, Alternate 3, the "Maximum Recycle" alternative, is the perfect blend of applying present technology with economic reasonableness for keeping the level of liquid radioactive discharges at a "safe" one. Alternate 4 does comply with the "no dilution" concept, but we believe that the additional capital costs for Alternate 4 (over \$2 million) is simply not worth the minimal reduction gained by using Alternate 4 over Alternate 3. We will, therefore, order the installation of Alternate 3, as described in the record, and in addition will require that the decontamination solutions be sent to solid waste disposal by putting the wastes into cement and drumming it for disposal. This recommendation was made by one of the Institute's consultants and seems a reasonable one.

Edison also raises the point that tritium should be handled differently in the permit and we agree. We, therefore, modify the permit and substitute the following paragraphs for paragraphs 3(a) and 3(b):

"(a) Radioactivity in liquid effluents shall be controlled so that the annual average gross beta-gamma radioactivity, excluding tritium, discharged to the Illinois River shall not exceed 1×10^{-7} microcuries per cubic centimeter (100 picocuries per liter) and annual average tritium activity discharged to the Illinois River shall not exceed 3×10^{-4} microcuries per cubic centimeter.

"(b) Edison shall immediately begin to install the system described in the April 13 report as the maximum recycle system (Alternate 3), a system which would require that the decontamination solutions be drummed and disposed of as a solid waste. Installation of the system as required herein shall be completed by September 1, 1973, and thereafter the emission limits of paragraph 4(a), herein, shall apply to the blowdown of the cooling lake."

[Heated Water Controls]

Under the Dresden permit Edison was required to submit to the Board a plan for bringing the heated water discharges from the Dresden 3 plant into compliance with the standards of SWB-8. Since the issuance of the permit Edison has put the cooling lake into operation and has installed 98 spray modules in the canals at the Dresden facility. Even with those installations Edison has admitted that its heated water discharges will not meet the SWB-8 standards all the time. As stated by Mr. Ellis of Edison, the discharge from Dresden will meet the 93°F. temperature at all times, but will not meet the 5°F. after the 600' mixing zone in the winter months under certain conditions. However, when Alternate 3 is completed by September 1, 1973, and the cooling lake is being operated closed cycle, and the discharge is passed through a diffuser, these conditions will be met.

It is obvious that using Alternate 3, which is basically the closed cycle operation of the cooling lake, Edison has met the Board's request that it find a method to meet the standards in SWB-8. From the uncontradicted evidence, all discharges, even that of Dresden 1, will meet the standards of SWB-8, when the closed cycle system is installed in September of 1973. This is indeed an example of compliance with the wishes of the Board.

Edison asks that it be granted a variance to fully operate the Dresden units, even though during certain times in the winter it will not meet the 5°F. limitation at the end of the 600' mixing zone. To be granted a variance Edison must prove, as we have said, that compliance with the Rules, SWB-8 in this instance, would impose an arbitrary or unreasonable hardship. We believe that Edison has proved that such a hardship exists here. The harm to the River will be minimal because the violations of the temperature standards will occur only in the wintertime, when the system is best able to take the additional heat. To require a cutback in the operation of the units could mean that electric power will not be available when the system demands it. For the little amount of damage, if any, that will occur as a result of the slight breach of the Rules, we do not feel that it is worth controlling that discharge by requiring that the production of power be cut back. The cost would be too high, and therefore, we grant the variance from the 5° limitation of SWB-8 during the winter months until November 23, 1972. Edison can, if it desires, file a petition to extend that variance until September 1, 1973, so long as the petition is filed not later than ninety (90) days before November 23, 1972. It is our intent at this time to allow the variance until the cooling lake is in operation, but the Act does not allow variances longer than one year.

One other point concerning heated water discharges must be dealt with. On September 24, 1971, Edison directed a letter to the Board, in the nature of a petition for variance, asking for a variance covering heat discharges to the Illinois River because the cooling lake may not have operated by October 1, 1971, the date originally set by the Board. Since the testimony by Mr. Ellis is that the cooling lake is operating, the question of the variance requested in the letter of September 24, 1971 is now moot and therefore will be denied as such.

[Emergency Core Cooling]

The subject of the emergency core cooling systems in Dresden Unit 3 were not really dealt with in any of the hearings specifically related to that Unit. However, the Board has had hearings related to that matter in the Quad Cities application. Since each Quad Cities unit is almost a "carbon copy" of the Dresden Unit 3, the testimony gained on the subject of core cooling in the Quad Cities case is certainly applicable here. In the Quad Cities opinion, we concluded the following after reviewing the testimony on the subject of core cooling:

"While we shall maintain a continuing concern for this and all other matters related to possible radiation hazards, and while we shall provide that the permit may be modified or revoked if this is proved necessary by new information, we do not perceive a justification today for withholding the permit."

In essence, then, we feel that the core cooling problem may be a real one and needs close supervision. It is for this reason that the Dresden Unit 3 permit is herein modified to require reporting of any activation, whether spurious or real, of the emergency core cooling system. This information, when provided and analyzed, will provide the basis, perhaps, for decisions in the area of emergency core cooling.

While we do not feel the evidence warrants any more action than reporting of activation of the emergency core cooling systems, we do know from the evidence in the Quad Cities record that the Dresden Unit 3 should not be operated if any of the emergency core cooling systems are unable to operate. This will be a condition of the permit, for to do otherwise would create a radiation risk which the public should not be forced to accept.

This opinion constitutes the findings of fact and conclusions of law of the Board.

O R D E R

Based upon the testimony and exhibits in the record, the Board hereby orders the following:

1. The Permit issued by the Board to Edison on March 3, 1971 for the operation of Dresden Unit 3 is hereby amended as follows:

(a) Paragraphs 4(a) and 4(b) of the original permit are hereby replaced by the following paragraphs:

"4(a) Gross beta-gamma radioactivity of gaseous emissions released to the atmosphere from Dresden Unit 3 shall not exceed an annual average of 80,000 microcuries per second.

"4(b) If gaseous radioactive emissions at any time exceed 37,500 microcuries per second from Dresden Unit 3, Edison shall initiate operating procedures, to the extent permitted without interrupting electric service, to reduce such release.

"4(c) By April 1, 1973, Edison shall have completed the installation of a catalytic recombiner and eight (8) charcoal bed system, as outlined in the record of this proceeding, to treat the air ejector effluent. On and after that date gaseous radioactive emissions from Dresden Unit 3 shall not exceed an annual average of 3000 microcuries per second. The latter emission limit shall include emissions from the gland seal."

(b) Paragraphs 3(a) and 3(b) of the original permit are hereby replaced by the following paragraphs:

"3(a) Radioactivity in liquid effluents shall be controlled so that the annual average gross beta-gamma radioactivity, excluding tritium, discharged to the Illinois-River shall not exceed 1×10^{-7} microcuries per cubic centimeter (100 picocuries per liter) and annual average tritium activity discharged to the Illinois River shall not exceed 3×10^{-4} microcuries per cubic centimeter.

"3(b) Edison shall immediately begin to install the system described in the April 13 report as the "maximum recycle" system (Alternate 3) plus a system which would require the decontamination solutions be drummed and disposed of as a solid waste. Installation of the system as required herein shall be completed by September 1, 1973, and thereafter the emission limits of paragraph 4(a), herein, shall apply to the blowdown of the cooling lake."

(c) Paragraph 7 of the original permit is hereby replaced by the following paragraphs:

"7(a) Permittee shall cooperate to the full extent necessary with the Environmental Protection Agency and the Illinois Department of Public Health for purposes of development by those agencies of an adequate and effective emergency protection plan designed to immediately control and minimize the effects of any accidental release of unexpectedly large quantities of radioactivity from the Dresden Unit 3 nuclear generating plant. In particular, Edison shall immediately notify both the Environmental Protection Agency and the Illinois Department of Public Health of any uncontrolled release of unexpectedly large quantities of radioactivity to the offsite air and/or water environment due to operational failure of any of the power plant systems, and shall report monthly to the Board and the Environmental Protection Agency any activation of the emergency core cooling system, whether spurious or real, exclusive of testing.

"7(b) Edison shall not operate Dresden Unit 3 if any of the emergency core cooling systems are unable to operate."

2. Edison is hereby granted a variance from the 5° F. limitation of SWB-8 during the winter months under the following conditions:

(a) The variance shall end on November 23, 1972; and

(b) If Edison seeks to extend the variance beyond that date to September of 1973 when it is contemplated that the cooling lake will be operated closed cycle, Edison shall file a petition for variance with the Board not later than ninety (90) days prior to November 23, 1972.

I, Christan Moffett, Acting Clerk of the Pollution Control Board, certify that the Board adopted the above Opinion and Order this 23 day of November, 1971.


Christan Moffett
Acting Clerk