



Consumers
Power
Company

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DAS 8-82

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Office of Nuclear Reactor Regulation
Division of Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

MIDLAND PROJECT
MIDLAND DOCKET NOS 50-329, 50-330
RESPONSE TO DES-OL COMMENTS
FILE: 0505.5 SERIAL: 17231

In response to the April 22 letter from Elinor G Adensam, Chief Licensing Branch Number 4, attached are three signed originals and 40 additional copies of Consumers Power Company's responses on comments received by the NRC on the Draft Environmental Statement (DES). These responses address the comments in the 20 comment letters transmitted to the Company by the NRC.

Two additional comment letters were transmitted to Consumers via the May 6, 1982 letter from Elinor G Adensam. The Company will respond to these two letters under separate cover.

Thank you for the opportunity to respond to these comment letters.

R A Wells, Executive Manager

For: J W Cook

RAW/DAS/fms

CC RJCook, Midland Resident Inspector
RHernan, US NRC
DBMiller, Midland Construction (3)
RWHuston, Washington

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In the Matter of)
CONSUMERS POWER COMPANY)
Application for Reactor)
Construction Permit and)
Operating License)

Midland Plant Units 1 and 2
Docket No 50-329
Docket No 50-330

APPLICANT'S RESPONSE (MAY 21, 1982)

TO

20 DES-OL COMMENT LETTERS

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RAYMOND M DONAHUE (2/24/82)

1.A COMMENT: USE OF He IN LIEU OF H

I think that helium gas should be used for cooling the turbine in place of hydrogen. The practice of using hydrogen has been due to the high thermal conductivity of the gas (7.13 as compared to air at 1). The explosive hazard of this use is exemplified by the recent hydrogen explosion at the Consumers Power Palisades Nuclear Plant. The hydrogen there was used to cool the turbine.

Helium which has a thermal conductivity of 6.23 is an inert gas and non-flammable. Helium has long ago replaced hydrogen as the carrier gas in thermal conductivity detectors in gas chromatographs.

RESPONSE

The turbine-generators for the Midland Plant were designed by General Electric and are sized appropriately for the use of hydrogen as the cooling medium for the generator. Hydrogen has been used for several decades as a cooling medium in generators and when handled properly it is a safe and reliable cooling medium. The hydrogen monitoring and control system is designed to prevent an explosive mixture from developing within the generator. Furthermore, as a safeguard, the generator is structurally designed to remain intact in the unlikely event of an internal explosion.

The recent hydrogen explosion at the Consumers Power Palisades Nuclear Power Plant was an isolated incident and is not a representative model of the operating experience regarding hydrogen as a generator cooling medium. This incident was the result of a very localized gas release from the generator and did not present a threat to the safety of the plant.

The comment suggests a correlation between the Midland Plant generator's cooling gas and a gas chromatograph's carrier gas, a faulty comparison as shown by the following comparison:

<u>Generator Cooling Gas</u>	<u>Gas Chromatograph Carrier Gas</u>
1. Used for removal of large heat quantities from massive stationery and rotating components	Used for removal of small heat quantities from small temperature element
2. High-gas flows are utilized by design	Very low carrier gas flows are utilized by design
3. The gas is recycled continuously through the generator	The carrier gas passes through the gas chromatograph once and then is expelled.

Contrary to the statement "the practice of using hydrogen has been due to the high thermal conductivity of the gas," this is not the only factor involved in

1.A (Continued)

the selection of hydrogen as a cooling medium. Two other factors which require consideration are specific heat capacity and windage losses. The better cooling medium will have higher specific heat capacity and lower windage losses. The specific heat capacity for hydrogen is more than double that of helium. The windage loss of hydrogen is less than that of helium. Therefore, a generator that is designed for hydrogen cooling could not be adapted to less efficient helium cooling.

The Midland generator will utilize hydrogen as the cooling medium which is the state-of-the-art practice for safety and efficiency.

PEGGY E ROTH (no date)

2.A COMMENT: RADIATION HEALTH EFFECTS

The report states that the radiation risks are acceptable or that 12 chances in 100 are acceptable. My comment on this issue is that many prominent health physisists (sic) and scientists report that no amounts of radiation is safe-how do you and "only engineers", know what will happen in our body systems after 20 years exposure even in small amounts?

RESPONSE

We are unable to identify the origin of the quote of "12 chances in 100." The DES identifies the personal risk for early fatalities due to accidents in Figure 5-10. Examination of this figure shows that for distances greater than approximately 1-1/2 miles from the Plant that personal risk of an early fatality is less than 5×10^{-9} /reactor-year or, in other terms, on an annual basis "5 chances in 1 billion," not "12 chances in 100." Also, on Figure 5-11 of the DES, the personal risk of latent cancer fatality is identified as less than 5×10^{-9} per reactor-year for distances greater than approximately 2-1/2 miles from the Plant or in other terms "5 chances in 1 billion" on an annualized basis.

While the relationship between radiation dose and biological effect among humans is not known precisely for all levels of radiation, the major uncertainty exists at very low dose levels. At these low levels, background radiation and its variations are comparable to the dose being considered for nuclear power plants. Such is the case for Midland where the projected annual doses are more than an order of magnitude below that of background. In lieu of a precise relationship between dose and biological effects, a linear non-threshold extrapolation is conservatively assumed for radiation protection purposes. The DES estimates of radiation exposure and dose effects are based on this model and related Consumers Power estimates are in general agreement with those of the DES.

PEGGY E ROTH (no date)

2.B COMMENT: EVACUATION PLANNING

Evacuation: The plan is a joke. It is good only on paper, would you try just getting out Eastman, Saginaw or Route 10 at 4:30 daily?

RESPONSE

There is no evidence presented in the comment to suggest that the current Midland evacuation "plan is a joke." However, to assure that the plan best protects the public's health and safety in the unlikely event that the plan will ever be utilized, the Michigan State Police and local law enforcement agencies are in the process of reviewing the current plan to ascertain if changes are necessary. The plan then will be revised accordingly to assure that adequate procedures are in place prior to fuel load of the first Midland unit. Note that the plan is not in force for normal traffic control and, therefore, cannot be compared to any heavy traffic that may now occur at 4:30.

For a short discussion on the authority and description of actions to be considered in developing an evacuation plan, please refer to Attachment A. Specifically, an evacuation plan designates areas which are likely to require evacuation and establishes primary and alternate evacuation routes. Additionally, a plan includes procedures for orderly access to, progress along, and exit from evacuation routes.

MARJORIE KRUGER (3/11/82)

3.A COMMENT: RADIATION/CHEMICAL SYNERGISM

1. Should not have been built in an industrial populated area
 - a. No one knows what combination of chemicals and radiation together will do.

RESPONSE

Synergism was discussed extensively in the Construction Permit hearings with Dr Meierotto, a biologist, Dr Nordahl, a biologist and Dr Sternglass, a physicist, testifying for the Mapletown Intervenors and Dr Rust, Professor of Pharmacology and Radiobiology, Dr Eisenbud, Professor of Environmental Medicine, and Dr Whipple, Professor of Radiological Health, testifying for the Applicant. The following was concluded:

"Viewed in the light most favorable to Intervenors, and without considering the countervailing evidence of Applicant and the Staff, the evidence fails to establish that, at the levels of concentration involved here, there will be any interaction which would tend to increase radiation effects from the Plant, or the chemical effects from the Plant, or the chemical effects from Dow. And when one considers the testimony of Applicant and Staff witnesses, the evidence is overwhelming against a finding of "synergism".⁽¹⁾

Consumers Power finds no reference of consideration of the synergism question in the DES. Since the question has been considered formally with the conclusions as stated above, it is our opinion that a reference to the Board's findings in the DES could shed light on the issue and avoid repetitive questions in this area.

REFERENCES

1. Atomic Safety and Licensing Board, Initial Decision, December 14, 1972; Paragraphs 64-66.

MARJORIE KRUGER (3/11/82)

3.B COMMENT: PLANT SITING

1. Should not have been built in an industrial populated area
- b. Population is several hundred thousand in combined Midland, Saginaw, Bay City area.

RESPONSE

This is a Construction Permit Stage issue and was fully considered in the Consumers Power hearings. The Midland Plant Site meets the requirements of 10 CFR 100 which deals with plant siting. The Atomic Safety and Licensing Board (ASLB) concluded the following: "The residential population within the zone is well within acceptable limits. ...the Board finds the population zone satisfactory."⁽¹⁾

"The Midland plant has been partially annexed as the most southern part of the city; however, that portion of the city of Midland within 1-1/3 miles of the plant consists almost entirely of the Dow Chemical Company industrial complex. Therefore, the population center distance meets the 10 CFR 100 requirement that it be at least 1-1/3 times the distance from the reactor to the outer boundary of the low population zone."⁽²⁾

An important feature of the Plant is its dual-purpose nature. In addition to supplying electricity for the Consumers Power system, the Plant will produce process steam for use by Dow. Given this dual-purpose nature for the Plant, the ASLB stated the following: "We conclude then that there is no preferable alternative (location)."⁽³⁾

REFERENCE:

1. Atomic Safety and Licensing Board, Initial Decision, December 14, 1972; Paragraph 16.
2. FSAR, Section 2.1.3.5; p 2.1-9
3. Atomic Safety and Licensing Board, Initial Decision, December 14, 1972; Paragraph 76.

MARJORIE KRUGER (3/11/82)

3.C COMMENT: BIOACCUMULATION

2. Releases of radiation will be in Tittabawassee River and on to Lake Huron
 - a. question the build up in the "chain of life"

RESPONSE

The effects of build up (bioaccumulation) are accounted for in determining the radiation exposure to man due to Plant operation. Specifically, Regulatory Guide 1.109 bioaccumulation factors are used. Appendix C of the DES, Section C.1 describes the calculation approach and refers the reader to Regulatory Guide 1.109 for a detailed discussion of the dose calculations. Regulatory Guide 1.109 discusses bioaccumulation factors in depth, and tabulates values used for various elements which range up to a factor of 100,000 times greater than the observed water concentration. Thus, bioaccumulation effects have been considered fully in DES calculations of offsite radiological consequences due to routine Plant operation.

In addition to these calculational considerations, radiological monitoring will be performed by Consumers Power to check fish, aquatic plants, zooplankton, phytoplankton, benthos and other constituents of the "chain of life" for abnormal concentrations of radioactivity. Observations at other operating nuclear power plants have confirmed that the bioaccumulation factors used in these calculations are conservative.

MARJORIE KRUGER (3/11/82)

3.D(1) COMMENT: ROUTINE RAD RELEASE EFFECTS-FARMING

3. Releases of radiation into air

- a. question long-term effect on Saginaw Valley farming, "best in Michigan".

RESPONSE

The effects of routine radioactive releases into the air are considered in assessing the environmental consequences of Plant operation. Evaluations of projected airborne releases have been performed by Consumers Power Company and are substantially in agreement with those of the DES.

The dose calculation models used to evaluate routine air releases from the Plant take into account radioactive deposition on farms. Annual milk production, meat production, and vegetable production within 50 miles of the Plant are accounted for in these calculations.

No adverse effects on crops have been observed due to routine operations of similar sized nuclear facilities which operate in farming areas. As discussed in Section 5.9.3.4 of the DES (pp 5-30 through 5-32), environmental monitoring is in progress and will continue throughout Plant operation. Currently, vegetable crops are sampled at 15 locations around the Plant site.

MARJORIE KRUGER (3/11/82)

3.D(2) COMMENT: ROUTINE RAD RELEASE EFFECTS-RIVER FLOW DILUTION

4. Tittabawassee River is very low in dry periods.

a. Question on releases-concentrated in small amount of flow.

RESPONSE

Routine discharges of liquid radioactive effluents are regulated at the point of discharge to unrestricted areas. As a consequence, river flow is not considered in meeting the radiological limitations of 10 CFR 20. If considered, river flow, whether high or low, acts to further dilute discharge concentrations.

MARJORIE KRUGER (3/11/82)

3.D(3) COMMENT: ROUTINE RAD RELEASE EFFECTS-FOG INTERACTION

5. Nuclear Plant cooling ponds will generate much fog in the area
 - b. Danger of concentration of low level radiation

RESPONSE

Based on the nature of the cooling pond fog, the elevation of routine radioactive airborne releases, and the lack of evidence of such effects at other nuclear power plants, no significant interaction between cooling pond fog and low-level radioactive releases are expected during Plant operation. For a more detailed discussion on the subject, refer to Attachment B.

MARJORIE KRUGER (3/11/82)

3.E COMMENT: COOLING POND FOG

5. Nuclear plant cooling ponds will generate much fog in the area
 - a. danger of driving

RESPONSE

Based on field studies completed for cooling ponds located at the Baldwin and Dresden Plants, steam fog resulting from operation of the Midland Plant pond is not expected to have a significant effect on vehicle traffic. For example, steam fog was observed to occur 40 percent and 49 percent of the time at Baldwin and Dresden respectively. These observations were made over a nineteen to sixteen month period of time encompassing two fogging seasons. Rolling annual fog frequencies are 26% (Fall 1976-Summer 1977) and 32% (Spring 1977-Winter 1977-78) at Baldwin, with 40% (Winter 1971-72-Fall 1972) and 47% (Spring 1972-Winter 1972-73) at Dresden. Of these observed fogging days, 62 percent of the fogs observed at Baldwin had a downwind extent of 20 feet or less, and less than 10 percent of the fogs extended for more than 0.1 mile. At Dresden, less than 5 percent of the steam fog extended a distance of 100 feet or more from the pond. Thus, while fogging will occur over the Midland pond, it is expected⁽¹⁾ that it will remain very localized and have a minimal effect on traffic.

The Dresden study indicated that on those infrequent occasions when fogging did extend a significant distance from the plant, the fog tended rise as the distance from the pond increased. Thus, while the fog may have extended some distance from the plant, the effects on traffic were minimal since the fog was elevated above the roadway.⁽²⁾

Also, refer to our responses to the V Castellanos Comment (8.B) and the L M Hallberg Comment (9.C).

REFERENCES

1. Atmospheric Effects of Cooling Lakes, EPRI EA-1762. (A summary of this report is attached to the response to Comment 9.C.)
2. Report on Meteorological Aspects of Operating the Cooling Pond and Sprays at the Dresden Nuclear Power Station, Murray and Trettel Inc, Chicago, IL, August 1973, 1001-5.

MARJORIE KRUGER (3/11/82)

3.F COMMENT: WILDLIFE IN COOLING POND

6. Cooling ponds will attract wildlife that will go elsewhere.

a. question advisability of hunters eating game.

RESPONSE

Radiological releases to the atmosphere and to the Tittabawassee River are regulated by the NRC. There are no radiological discharges above normal background to the cooling pond. In evaluating the radiological consequences of Plant operation, dose commitment calculations are performed which account for human consumption of fish and wildlife that are exposed to routine radioactive releases from the Plant. In the calculation for the maximally exposed individual, it is assumed that this individual consumes well above average quantities of the potentially affected foods. Such species as fish, invertebrates, algae, muskrat, racoon, heron, and duck are factored into the dose model. As noted by Table C.6 of the DES, fish consumption is calculated to be the limiting case. Table C.6 calculates the annual dose commitment to the maximally exposed individual as 0.15 mrem due to fish consumption. Based on the results of these calculations, there should be no concern on the part of hunters or fishermen with respect to Plant produced consequences of eating game.

WILLIAM A THIBODEAU (3/23/82)

4.A COMMENT: DECOMMISSIONING COST

I am writing to question the contents of Section 5.11, "Decommissioning," of the NRC's Preliminary Draft Report on the Environmental Impact of the Midland (Michigan) Plant. The statement, "The technology for decommissioning nuclear facilities is well in hand and, although technical improvements in decommissioning techniques are to be expected, at the present time decommissioning can be performed safely and at reasonable cost...", is a particularly bothersome comment. What principles of syllogistic reasoning and scientific analysis were used in determining the cost of decommissioning this facility as "reasonable"? Is the public, and especially the Consumers Power ratepayer, to assume that the cost of decommissioning equal to, and in all likelihood, in far excess of the original construction costs, is "reasonable"?

Is the reviewer of the Preliminary Draft Report expected to endorse the assumption that "...Decommissioning costs for reactors are a small fraction of the present-worth commissioning costs..." after being referred to NUREG-0586, "Draft Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities", which indicates that the Elk River, Minnesota plant cost \$.2 million more than the original construction cost of \$6 million?

Using the formula suggested in NUREG-0586, one can easily estimate an approximate cost of decommissioning the Midland nuclear facility as well beyond \$4 billion. Construction costs to date are \$3.39 billion and will undoubtedly exceed \$4 billion by the time the plant goes on line in 1983 or 1984. Did the NRC factor in the impact of inflation in their estimate? Was the fact that the Midland plant is much larger than the Elk River facility and therefore will require greater decommissioning costs, included in the analysis? If so, how is it possible the NRC could refer to these exorbitant costs as "reasonable"?

RESPONSE

The Company estimates the decommissioning cost of Midland, Units 1&2 to be \$235 million in 1984 dollars. In other words, if the Midland Units are decommissioned in 1984, it will cost the Company \$235 million. Obviously, at a later date the cost will be much higher simply because of the increased cost due to inflation. For example, if the Midland Units are decommissioned after 40 years of operation in the year 2024, with a projected inflation rate of 7% per year compounded annually, the 1984 estimate of \$235 million will be \$3,500 million, a figure higher than the cost of \$3,390 million to build the units in 1984. The comment cites the example of decommissioning cost of \$6.2 million for Elk River Plant compared to \$6.0 million for original construction. This fails to take into consideration the fact that the two processes were carried out in two different time frames as much as 30-40 years apart.

The Company's estimate of \$235 million (in 1984 dollars) for Midland decommissioning is based on the immediate dismantling/prompt removal method and also includes the cost of removal of nonnuclear structures and safe disposal of contaminated material from the site.

ANDREA K WILSON (no date)

5.A COMMENT: RADIATION HEALTH EFFECTS

...There is new evidence that may invalidate the conclusions of the radiological impact section of the DES. The risk estimates and radiation toxicity levels may be understated and there may be, after all, significant environmental and safety objections.

...The cancer mortality data from Hiroshima are considered the most valuable in the world. In an attempt to define radiation risks these data have been the basis for the widely recognized BEIR III report however, there is recent evidence from research being initiated by physicists William Loewe and Edgar Mendelsohn at the Lawrence Livermore National Laboratory in California and from work at the Oak Ridge National Laboratory in Tennessee that previous calculations on radiation data from the atomic blasts at Hiroshima and Nagasaki are in error.

Until recent months it was thought that the Hiroshima blast produced a high LET (neutron) radiation. New evidence now indicates that most of the cancer caused by these bombs came from low LET (gamma) radiation, considered less dangerous than the high LET form. Since the effects on human health from the blast remain the same, one must conclude that the gamma rays were more toxic than had been thought.

Most significant is that these studies will have a direct bearing on the conclusions of health effects from nuclear reactors, which are gamma ray emitters.

Edward Radford, an epidemiologist at the University of Pittsburgh and the committee chairman for the BEIR III report considers the BEIR 1980 report obsolete and expects that the probabilities it gives for the risk of dying of cancer after exposure to gamma radiation will be doubled. Likewise, he thinks the probabilities for contracting any form of cancer after irradiation will be quadrupled (Science, May 22, 1981).

The credibility of BEIR report is in serious jeopardy and 120 scientists who met last September 1981 have agreed that dose estimates should be revised in light of new research done at Livermore, two other national laboratories, and two private consulting firms (Science, October 2, 1981). It should also be noted that several radiation protection organizations cited as references in the DES are also reevaluating their assessments based on these current findings.

Should the Livermore revision be found correct, the modified version of the BEIR III report would no longer be valid (Bulletin of Atomic Scientists, June-July 1981). Hence, the basis of the public health assessments as stated in the DES would also be considered invalid...

5.A (Continued)

RESPONSE

The contention that "new evidence" may invalidate the conclusions of the radiological impact section of the DES appears to be based on two articles from the May 22 and October 2, 1981 issues of the magazine, Science.^(3,4) Unfortunately, an article in Science containing a response letter by the authors of the "new evidence" was not also referenced. In that letter Loewe and Mendelsohn took exception to conclusions made in Science based on their Hiroshima and Nagasaki dosimetry studies and concluded that, "We fail to see how our work can be a basis for assigning a greater hazard to gamma radiation."⁽¹⁾ For a more detailed discussion on this topic, refer to Attachment C on BEIR III and the Research of Loewe and Mendelsohn.

In contrast to the subject contention, the BEIR report, which is one of sixty-seven references contained in Section 5 of the DES, is not seriously being considered for suspension. Furthermore, the implications of the Loewe and Mendelsohn studies if any are far from resolved. There has even been some suggestion that this new data may support a lower risk estimate for low doses of gamma radiation, as would be present during routine power plant operation. For lack of "new evidence" definitively mandating a substantive change to radiation protection standards, the estimates of radiological impacts in the DES are based on the best information currently available.

REFERENCES:

1. "Radiation Estimates," Letters, Science, Vol 213, July 3, 1981.
2. "New A-Bomb Data Shown to Radiation Experts," Science, Vol 212, June 19, 1981.
3. "New A-Bomb Studies Alter Radiation Estimates," Science, Vol 212, May 22, 1981.
4. "Japanese A-Bomb Data Will Be Revised," Science, Vol 214, October 2, 1981.

DIANE HEBERT (3/24/82)

6.A COMMENT: ELECTRIC DEMAND

...First of all Consumers Power's electric demand has been drastically reduced, mostly due to the effectiveness of conservation efforts. Mr Gordon Heins, of Consumers Power, testified under oath in 1977 that his company had 37% excess electrical capacity at that time.

Residential growth declined to 1.9% during the 1973-79 period. This was down from 7.3% (1965-73). Commercial sales declined to 2.9% (1973-79) down from 9.5% (1965-73). Industrial demand declined to 2.3% (1973-79) down from 5.1% (1965-73).

RESPONSE

The NRC has determined that need for power shall not be considered in the operating license environmental review of a facility. (1) Nonetheless, the Company and the NRC have determined that Midland operation is necessary to meet expected demand and reserve requirements, to provide operational cost savings, and to decrease the Company's dependence on coal fuel supply.

Consumers Power's electrical demand has not decreased in recent years. Compared with the previous ten years, demand growth has decreased. However, there is no evidence that the decline in the growth rate is "mostly due to the effectiveness of conservation efforts." Temporary economic factors have played a major role in reduced demand growth.

The commenter does not understand Mr Heins testimony. First, the reserve reference was for the Michigan Electric Coordinated System (Consumers and Detroit Edison), not just Consumers Power. Further, while the installed reserve was 37%, as Mr Heins testified, none of it was excess capacity. In fact, all of this reserve was utilized and additionally voltage reductions ("brownouts") were necessary to keep people supplied with power on one day in January 1977. If the 37% reserve had not been available, the severe weather and generation outages experienced certainly would have lead to worse problems like blackouts. (2)

REFERENCES

1. 47FR 12940-12943, March 26, 1982.
2. Midland Suspension Hearing, Transcript, January 20, 21, 1977, p 1844, 1845.

DIANE HERBERT (3/24/82)

6.B COMMENT: ELECTRIC GROWTH RATES AND PLANT CANCELLATIONS

These figures are fairly representative of electric demand throughout the country. As a result many utilities have scrapped plans, or cancelled construction, of nuclear plants.

RESPONSE

It is inaccurate to compare Michigan's recent decline in economic and electrical growth with the rest of the country. Not solely by coincidence, electrical growth rates in the South have been well above average for the Nation, while Michigan has continued to lose business and jobs to that area.

The comment concludes a cause and effect relationship between reduced load growth projections and utility decisions to "scrap" the construction of nuclear plants. At best this reflects a very shallow analysis of the causes of construction delays and cancellation of planned nuclear additions.

A report published by the US General Accounting Office⁽¹⁾ outlines five reasons for power plant cancellations and delays:

1. The decline in the rate of increase in demand for electricity.
2. Difficulty in financing power plant construction.
3. Utility frustration with uncoordinated, cumbersome, complex and slow regulatory system by which local, State and Federal regulatory bodies must approve various aspects of the plants construction.
4. Problems surrounding the acceptability and future of nuclear power.
5. Construction problems (lack of construction materials, lack of skilled craftspeople, low productivity).

As a consequence of unit delays and cancellations, this same report identified the following major consequences:

1. Increasing oil consumption, making the US more dependent on foreign sources (the report cites a number of examples of increased oil consumption and higher electricity which have already occurred).
2. Jeopardizing the industry's ability to provide uninterrupted electrical service.
3. Increasing electric rates as consumers bear the added cost of delays.

A report published by the Department of Energy⁽²⁾ which specifically addresses the financial problems faced by utilities further reinforces the conclusion that unit delays and cancellations are not due solely to decreased load growth

6.B (Continued)

rates and that the consequences of such cancellations and delays will cause higher customer costs in the long run.

Finally, the comment is incorrect in its implication that cessation of nuclear plant additions is occurring. "The wave of delays and cancellations that has washed over the nuclear program makes it easy to overlook the fact that more reactors are scheduled to come on line in the US during the next decade than are now operating."⁽³⁾

REFERENCES

1. Comptroller General's Report to the Congress: Electric Power Plant Cancellations and Delays, General Accounting Office, December 8, 1980.
2. Impacts of Financial Constraints on the Electric Utility Industry, DOE/EIA-0311, US Department of Energy, December 1981.
3. Annual Generation Construction Survey, Electric World, January 1982

DIANE HEBERT (3/24/82)

6.C COMMENT: RESERVE MARGIN

Nationwide, the utility industry has twice as much generating capacity in reserve as the back-up of 15-20% that is deemed a prudent margin of safety.

RESPONSE

Though some may believe this to be a prudent margin of safety, it is not unreasonable that nationwide the reserve margin is about twice that. This is due mainly to diversity of load and the economics of adding nuclear and coal-fired capacity in areas that are heavily oil dependent. Furthermore, nationwide resources are largely irrelevant to the supply of power for the people of Michigan.

DIANE HEBERT (3/24/82)

6.D COMMENT: CAPACITY FACTOR

The cost effectiveness figures shown for operating the Midland Nuclear Plant, in the DES, are absurd. Firstly, the 55% performance capacity for a five year period is unrealistic, considering the background of Consumers Power Company.

RESPONSE

As reported in "Licensed Operating Reactors Status Summary Report," NUREG-0020, Vol 6, No 1 January 1982, the median capacity factor for large PWRs in 1981, excluding units starting up was 66% - which is greater than the 58% value quoted for Midland.

DIANE HEBERT (3/24/82)

6.E COMMENT: CONSTRUCTION COST

The DES report has also chosen to ignore construction costs. Can we seriously ignore 3.39 billion dollars, that we, as ratepayers, will be held financially responsible for?

RESPONSE

The operating license DES is not the proper forum for arguing the prudence of the Company's investment in the Midland facility. The NRC has, in the DES, carried out its regulatory responsibility under NEPA by considering the environmental costs of operation against reasonable alternatives, including non-operation.

DIANE HEBERT (3/24/82)

6.F COMMENT: KOMANOFF REPORT

...A report by Charles Komanoff, Komanoff Energy Associates, clearly outlines the manipulation of facts and figures by the nuclear industry, designed to show cost effectiveness for nuclear energy. Step by step, Mr. Komanoff is able to show how the Atomic Industrial Forum (AIF) was able to come up with its totally unrealistic cost figures in their 1979 survey.

The AIF survey,

1. failed to make sufficient allowance for waste and decommissioning;
2. excluded lower cost coal plants operated by the country's two largest coal-burning utilities (American Electric Power and TVA);
3. penalized other coal-fired plants for being used below their potential capacity, due to excess generating capacity.

Moreover, the AIF omitted the nuclear plants with (sic) the highest construction costs (21 omitted reactors). The 21 omitted reactors cost an average of 60% more to construct, and produced 19% less electricity per unit of capacity than the 39 reactors included in the AIF survey.

Are we supposed to sit back and accept this kind of manipulative study?

Komanoff concludes in his 1979 report, "Nuclear Power Costs; Past, Present, Future" that;

1. The capital costs of nuclear plants completed today average approximately 1-1/2-2 times those of new coal plants, causing total generating costs to be slightly higher for new nuclear plants than for coal;
2. Based on trends prior to the Three Mile Island accident capital costs for plants undertaken today will be twice as high for nuclear as for coal with scrubbers, so that nuclear generating costs will average 60% more than coal.

By the end of 1978 the "typical" new nuclear plant was 49% more expensive to build than a new coal plant, with a scrubber, and 90% costlier than a coal plant without a scrubber.

RESPONSE

Without commenting on the validity of the Komanoff study itself, we can easily point out that it is totally irrelevant to the question of Midland. It appears to solely address new nuclear and coal units. Midland, however, is over 70% complete. A statistical analysis such as Komanoff's will not reflect the realistic situation encountered in construction of Midland. This is especially true when the dual purpose nature of the Plant is considered.

DIANE HEBERT (3/24/82)

6.G COMMENT: RATE INCREASES

Michigan's economy cannot stand the burden of the rate increases that will be necessary for the construction and operation of the Midland Nuclear Plant.
(At least 30 percent)

RESPONSE

There is no evidence cited in support of this totally unfounded allegation.

Consumers Power Company's 1981 studies indicate that the net incremental effect of Midland being placed into service will be an increase to the typical residential customer's bill in 1985 of 10 to 15%. This is a result of an increase in the base rates of 20 to 25% to recover the additional fixed charges, operation and maintenance costs and decommissioning costs associated with the Midland Plant and a fuel savings of 10 to 15% due to the significantly lower nuclear fuel costs.

DIANE HEBERT (3/24/82)

6.H COMMENT: ENERGY COSTS AND MICHIGAN BUSINESS CLIMATE

Many Michigan companies have already cited high energy costs in our state as a reason for not expanding, and perhaps leaving Michigan altogether.

We surely cannot believe that with another large rate increase on the horizon, we will enhance the business climate of Michigan.

RESPONSE:

In a January 1982 typical bill analysis completed by the Edison Electric Institute, the average industrial customer on our system of 1,000 kW and 400,000 kWh per month paid only 2-1/2% more than the national average. In addition, this analysis did not include the effect of the very liberal on-peak hours and four-weekly averaging which would have the effect of lowering the Consumers Power bill. With respect to industrial customers moving out of state because of high energy costs, another study completed by the Edison Electric Institute computes energy costs as a percentage of the value of the product. This study shows that energy costs only comprise 0.4 to 3.0% of the value of the product, depending upon the industry, and on average only represent 1.2%. Since these costs represent such a small proportion of the value of the product, it is not likely that they would be the determining factor in causing industry to move from the state.

Generally the most important parameters that an industry evaluates in the location of the plant facilities are as follows:

1. The availability of labor, especially skilled, if required.
2. The cost of labor.
3. The accessibility to markets and raw materials.
4. Transportation costs.
5. Corporate taxes.
6. Availability of financing.
7. Energy and environmental impact.
8. Quality of life.

The ranking of these parameters for specific industries vary in relative importance and they will even change with individual companies within an industry.

A study by Roger W Schmenner, Associate Professor, Graduate School of Business Administration, Duke University, dated October 1980 regarding The Location

6.H (Continued)

Decisions of Large Multi-Plant Companies does not identify utility services as a controlling concern of companies in indentifying, regions, states and other metropolitan areas as potential acceptable plant sites.

DIANE HEBERT (3/24/82)

6.I COMMENT: GENERAL PUBLIC UTILITIES

General Public Utilities (owners of Three Mile Island) recently scrapped plans for three large power plants. By this action, they hope to save customers 1.2 billion dollars over the next 30 years.

They have instead proposed an electricity conservation and allocation plan, putting their energy costs at \$250.00 per Kilowatt, as opposed to \$1,750.00 per Kilowatt, if they had proceeded with the plants.

This plan will also save an estimated 200 million barrels of imported oil, cut projected load growth in half, and of course, greatly benefit the rate payer...

RESPONSE

It is more than abundantly clear that General Public Utilities (GPU), in any event, would have had to scrap their generation plans due to their dire financial situation. As repeatedly pointed out in their 1979, 1980 and 1981 GPU Annual Reports to Stockholders, financial constraints prevented them from making large capital commitments.

GPU's load management program was in existence well before TMI. It was expanded to allow GPU to maintain recognition as a long term provider of reliable electric service by holding down load growth, maximizing the use of available facilities and minimizing new capital investments. But, even then, it is only a part of GPU's plan. Major power purchases have been made and continue, in order to replace the power from TMI and allow generating unit slippage. Finally, GPU has negotiated an agreement with Ontario Hydro to build a 1200 MW cable under Lake Erie to supply power equivalent to that from a large generating station.

US DEPARTMENT OF TRANSPORTATION: UNITED STATES COAST GUARD (no date)

7.A COMMENT: FOG MONITORING AND MITIGATION

The concerned operating administrations and staff of the Department of Transportation have received the material submitted. The Federal Highway Administration had the following comments to offer:

"The proposed plant is located on the immediate west side of the Tittabawassee River opposite Saginaw Road which generally parallels the east side of the river in the vicinity of the plant. Saginaw Road is on the Federal-aid Urban System. Salzburg Road, also on the east side of the river and on the Federal-aid Urban System, intersects Saginaw Road immediately southeast of the railroad bridge crossing the river from the plant.

From the information provided on Page 5-6, 7 and 8 the area immediately east of the river could be affected by dense fog or ice from the operation of the cooling ponds. We recommend the applicant coordinate with the local road authority on the proposed mitigation and fog monitoring program addressed on Page 5-8. It may be desirable to install some of these measures in advance of plant operations to reduce anticipated hazards (signs, centerline or edge lights) until the results of monitoring are known."

RESPONSE

The proposed monitoring program and a commitment to take those actions which may be necessary to mitigate fogging effects are contained in the plant Environmental Report. ⁽¹⁾ Company officials have had discussions (May 1982) on these topics with the Midland County Road Commission.

REFERENCES

1. ER-OL, Revision 12, June 1981, Section 5.1.4.2, pp 5.1-18, 19; and ER-OL, revision 12, June 1981, Section 6.2.3.1.2, pp 6.2-3,4.

VICENTE CASTELLANOS (3/26/82)

8.A COMMENT: SUBTERRANEAN CAVERNS

These caverns may be within 1/4 mile of the Nuclear Plant. The FSAR 2.5.1.2.5.4.1 does discuss these caverns but it left many unanswered questions. Since there has not been specific calculations of the "foreign" material removed with the salt that was removed, it is possible that the caverns are significantly larger than estimated. Also never discussed was the very large chemical storage cavern which is northwest of the nuclear plant and is utilized by Dow Chemical Company. Mr Jeff Kimball, a seismologist for the NRC, was unable to answer several questions about these caverns at the OM hearing on July 10, 1981 in Midland. Mr Kimball admitted to not knowing the exact location of the caverns. He did say that the caverns were being further investigated. Where are the results of this investigation? Why hasn't remote-sensing been used to evaluate these caverns?

REPOSE

The FSAR, as written, adequately discussed subterranean caverns. In addition, NRC concerns were addressed in a recent meeting⁽¹⁾ between Consumers Power Company, Dow Chemical Company and the NRC. The following statement is taken from the meeting minutes: "A presentation was made by Dow Chemical Company (whose Midland Plant is adjacent to the Consumers Nuclear Plant site) regarding past Dow subsurface mineral recovery operations in the general area. No open questions resulted from this presentation."

REFERENCES

1. Docket Nos 50-329 and 50-310, Summary of Meeting held with Consumers Power on Geology - December 2, 1981. Issued by NRC on February 4, 1982.

VINCENTE CASTELLANOS (3/26/82)

8.B COMMENT: FOGGING OF ROADS

ITEM 2: Fogging of Roads

Dense fog may be so severe during the months of November through March that visibility will be significantly reduced to create traffic hazards. The DES only mentions Gordonville Road. Why were the parallel roads (Saginaw and Poseyville) not considered. Our children in school busses and hundreds of Dow employees travel these roads in a one hour time span. Who is responsible for their safety as they travel through this nuclear plant created hazard? Will the dense fog create (sic) a vehicular hazard for the hazardous waste trucks from the Dow Chemical Company? These trucks will be turning at Saginaw and Salzburg Road intersection at the rate of one every 8 to 10 minutes. This will occur when full operation of Dow Chemical's 152 acre hazardous waste landfill begins operation.

RESPONSE

The frequency and horizontal extent of steam fog from Midland Plant cooling ponds has been described in response to the M Kruger comment (3.E).

Additionally, the DES-OL notes that very dense fog is only expected during the coldest period of the year when the differential temperature between the air and pond water is 70°F to 80°F. Such conditions are expected to occur at the Midland pond very infrequently. For example, during the period of December 1, 1980 through March 31, 1981, there were only 34 hours (approximately 1 percent of the time) in which a differential temperature of 70°F or more would have existed between the predicted monthly average pond temperature and the actual ambient air temperature. Not only must this differential temperature exist, but the wind must also be from a northerly direction for fog to be carried over Gordonville Road. Based on meteorological data available from instruments located at the Midland Plant, northerly winds occurred approximately 24 percent of the time during December 1, 1980 to March 31, 1981. Thus, the joint probability of occurrence of the two conditions required for fogging at Gordonville Road would be 0.24 percent or approximately 7 hours per winter season based on the 1981 meteorological data. This probability assumes that both conditions (differential temperature and wind direction) occur simultaneously, which is not always the case. Thus, the 7 hours per winter value represents a conservative estimate of the frequency of occurrence of the above fogging conditions.

In regard to potential fogging effects at other roads in the Plant vicinity (primarily Saginaw and Poseyville Roads), the frequency of occurrence of the differential temperature and wind direction conditions required for fogging effects would be similar to that described above for Gordonville Road. Not only is the projected probability of occurrence quite low, but these roads are located considerably further away from the pond than is Gordonville Road. As discussed in the response to the M Kruger comment (3.E), fogging effects at other cooling ponds have been found to be quite localized and to diminish

8.B (Continued)

significantly as the distance from the ponds increased.⁽¹⁾ Thus, fogging effects resulting from operation of the Midland Plant are expected to have a minimal effect on nearby roads.

REFERENCE

1. Atmospheric Effects of Cooling Lakes, EPRI EA-1762, April 1981

VICENTE CASTELLANOS (3/26/82)

8.C COMMENT: FOGGING OF AIRBORNE EFFLUENTS

ITEM 3: Fogging of Airborne Effluents

Will dense fogging physically and/or chemically saturate toxic effluent from the Dow Chemical Company and Dow Corning causing them to have a short airborne flight? The results will be a higher concentration of toxicity in the Midland area.

RESPONSE

The issue of potential interaction of cooling pond fog with pollutants presently in the air over Midland was raised by the EPA during the Construction Permit Stage. In the FES-CP, (1) this issue was addressed by noting: "Interaction of fog with atmospheric pollutants to form acid mists, if a real possibility, should have manifested adverse effects in the Midland area by now, since natural fog occurs frequently in the area and air pollution is presently high. No effects have been mentioned by any source contacted..." We concur with the previous NRC assessment and note that its holding is applicable with respect to any airborne pollutants in the Midland area today.

It is further noted that significant improvement in air quality has occurred in the area since the FES-CP assessment. This reduction in airborne pollutant levels also represents a reduction of chemical reactants available for this hypothesized interaction.

REFERENCES

1. FES-CP, Section XII.B, p XII-4.

VINCENTE CASTALLENOS (3/26/82)

8.D COMMENT: ICING AND INSURANCE LIABILITY

ITEM 4: Icing and Insurance Liability

Should power outage occur due to icing of power lines, home owner insurance companies will NOT cover losses such as flooded basements, loss of perishable goods in freezers and refrigerators, etc. This damage is not considered an Act of God but a man-created (nuclear plant) hazard. The DES does not discuss this liability.

RESPONSE

The Company does not expect "power outages due to icing of power lines." Areas affected by fogging or icing will be minimal. In the highly unlikely event of an outage attributable to fog or ice, the liability of the Company would be controlled by the Company's Standard Rules and Regulations, which are approved by the Michigan Public Service Commission. Generally, the rules require individual customers to take necessary and appropriate steps to protect their property. If damage occurs due to the negligence of the Company, the Company can be held responsible.

VICENTE CASTELLANOS (3/26/82)

8.E COMMENT: RADIATION TAGGING

ITEM : Radiation Tagging

Radio-isotopes may tag products produced at the Dow Chemical and Dow Corning plants making these products unacceptable for certain applications: such as contact lenses (Freeland), ear, nose and breast prostheses (Hemlock) or glues (used for NASA projects). No evaluation of the radioactive impact on the 152 acre Salzburg hazardous landfill has been addressed by the DES.

RESPONSE

This comment may be in reference to process steam system operation and its interface with the Dow Chemical Company. No other interface pathway is relevant with respect to product tagging during normal Plant operations. Consequently, reference to Dow Corning is erroneous as the Midland Plant provides no process steam to their facilities.

The responses to the P E Roth comment (2.A) and to the M Kruger comment (3.D(3)) discuss why routine releases of radioactive airborne effluents do not constitute a reasonable pathway per the present comment. As discussed in response to comment 2.A, routine radiological releases from the Plant will be more than an order of magnitude below background radiation levels on an annual basis.

As stated above, the Midland Plant will be supplying process steam to the Dow Chemical Company. The process steam is separated from the reactor coolant system by two stages of heat exchangers, which are the primary-to-secondary heat exchangers and the secondary-to-tertiary heat exchangers. In order for radio-isotopes to reach the process steam system, a fuel cladding breach (fuel failure) must occur concurrent with a primary-to-secondary and secondary-to-tertiary system leaks. In the event that any one of the above-mentioned barriers fail, Plant technical specifications place limits on continued operation with respect to primary coolant activity, primary-to-secondary leakage, and secondary system activity. In addition, the Plant radiation monitoring system continuously monitors primary and secondary system radioactivity. Furthermore, the process steam radiation monitoring program includes continuous monitoring of process steam, sequential monitoring of evaporator blowdown, and an off-line sampling and laboratory analysis program of steam and blowdown samples.

Due to the barriers to radioactivity, Plant technical specifications, and radiation monitoring programs, it is considered to be extremely unlikely that any statistically significant amount of radioactivity above background will be measured in the process steam. As the ASLB⁽¹⁾ found during the CP licensing, "The Board finds that the system promises to provide assurance that leakage or radioactivity into the process steam will be an extremely remote possibility; that Applicant has submitted sufficient information; and Staff has performed

8.E (Continued)

an adequate review with respect to process steam monitoring. The environmental effects of the process will be insubstantial."

Accordingly, radiation tagging of products through the process steam system is not considered to be a significant concern and, therefore, subsequent potential environmental consequences on landfills are not considered to be credible issues.

REFERENCES

1. ASLB, Initial Decision, December 14, 1972; Paragraph 57, p 45.

VINCENTE CASTELLANOS (3/26/82)

8.F COMMENT: PROPERTY DEVALUATION

ITEM 6: Property Devaluation

It is recognized that the nuclear plant will impact property value in the area resulting in the loss of thousands of dollars for individual residences near the nuclear plant. The DES neglects this impact completely.

RESPONSE

This comment reflects a common misconception about impacts to property values in the vicinity of nuclear power plants. The issue was the subject of an extensive 1978 study by Gamble, Downing and Sauerlender of the Pennsylvania State University for the NRC.⁽¹⁾ They statistically analyzed changes in real property values near four nuclear power plants in the northeastern US, and found, to quote directly from their abstract, "The plants exerted no influence on the price of housing. The original hypothesis (viz. that nuclear power plants adversely affect community growth and residential property values) is rejected. Most people in these areas apparently have little fear over plant related health and safety factors, and the plant itself does not influence residential location decisions. Lower tax rates in host municipalities may even encourage development."

REFERENCES:

1. Gamble, H B, R H Downing, and O H Sauerlender, 1978. Effects of Nuclear Power Plants on Community Growth and Residential Property Values. US Nuclear Regulatory Commission, NUREG/CR-0454.

VINCENTE CASTELLANOS (3/26/82)

8.G COMMENT: VIOLATION OF WRC ACT

11.1.1 7: Violation of Michigan Water Resource Commission Act

The DES states that some fish and waterfowl will die as a result of cooling pond and radioactive discharges from the nuclear plant into the Tittabawassee River. This is a clear violation of the Michigan Water Resource Commission Act. (See enclosure) The DES does not discuss this.

RESPONSE

The DES does not state that some fish and waterfowl will die as a result of cooling pond and radioactive discharges to the river. The DES does state and discuss potential losses of waterfowl as a result of cooling pond operation - not as a result of the cooling pond discharge to the river.⁽¹⁾ The DES does discuss potential impacts on river fishes as a result of thermal discharges from the cooling pond - fish mortality is not expected, however.⁽²⁾ The DES does state and indicate fish mortality in the cooling pond as a result of plant operation.⁽³⁾ Fish mortality as a result of pond discharge to the river is not expected. The DES discusses Radiological Impacts on Biota other than Humans. "Although guidelines have not been established for acceptable limits for radiation exposure to species other than humans, it is generally agreed that the limits established for humans are sufficiently protective for other species."⁽⁴⁾

The MWRC Act is implemented and enforced under the General Rules of the Water Resources Commission. All wastewater discharges resultant from Plant operations will comply with Part 5 Water Quality Standards of the WRC General Rules. Therefore, the Michigan Water Resource Commission Act is not expected to be violated.

REFERENCES

1. DES-OL, Section 5.5.1.2, page 5-9.
2. DES-OL, Section 5.2.2.2, Tittabawassee River, page 5-11 and 5-12.
3. DES-OL, Section 5.2.2.2, Cooling Pond, page 5-12.
4. DES-OL, Section 5.9.3.3, page 5-29.

VICENTE CASTELLANOS (3/26/82)

8.H COMMENT: RISK ASSESSMENT

ITEM 8: Risk Assessment

The DES fails to make a cumulative risk assessment of the nuclear plant with the following established environmental risks:

Two chemical companies Four hazardous waste landfills Numerous
chemical and brine disposal wells Three chemical storage caverns
Open hazardous waste storage area (inside Dow complex) Two
recognized earth faults (sic)

RESPONSE

Site specific risks have been considered and are addressed in the FSAR. Recognizing that chemical facilities in the Midland area constitute a potential risk to the Midland Plant, ⁽¹⁾ a survey of all sources was undertaken to quantify the nature of the concerns. The two major chemical companies surveyed their production and storage facilities using specific criteria and notified Consumers Power Company of potential hazards resulting from short-term, high-concentration exposures. Based upon a knowledge of these concerns the Plant was designed with ⁽²⁾ notification and protective features to mitigate these concerns, including:

1. Telephone notification system from the two major chemical companies
2. A radio notification system
3. A hazardous gas monitoring system which can detect the identified hazardous gases in the area and automatically isolate the control room
4. Control room design features such as low leakage, pressurization from bottled air, and the ability to clean the control room atmosphere through filters in the recirculating system
5. Self-contained breathing apparatus for personnel, should it become necessary.

Other concerns of hazardous waste landfills, brine injection wells, and open hazardous waste storage areas (if they even exist), are not considered immediate threats to the facility operation since they would be related to chronic exposures as opposed to acute exposures.

The final concern dealing with earth faults as a site specific risk relate to earth fault activity as an initiator for the hazardous chemical release. Releases from this mechanism are covered by the mitigating equipment and techniques discussed above.

8.H (Continued)

If this comment referred to the effects of seismic events on Plant safety, this has been addressed in the FSAR⁽³⁾ and is the subject of ongoing discussions with the NRC.

REFERENCES

1. FSAR, Revision 41, 2/82, Section 2.2.2; pp 2.2-1 - 2.2-9.
2. FSAR, Revision 41, 2/82, Section 6.4; pp 6.4-1 - 6.4-11.
3. FSAR, Section 2.5 and Various Sections of Chapter 3.

LUCILLE M HALLBERG (3/29/82)

9.A COMMENT: ROUTINE RAD RELEASES AND FOG

"In Sworn testimony before the Atomic Energy Commission Licensing Board, Dr Edward Epstein, world renown (sic) meteorologist from the University of Michigan, testified that routine releases of radioactivity from the Midland nuclear plants would be entrapped in the fogging from the cooling pond and would rain out and ice out in the immediate area producing far higher levels of concentrations of radio-nuclides. Many of these radio-nuclides are long-lived. They will enter the water shed and, therefore, the Tittabawassee River and Bullock Creek, in much higher concentration than Consumers Power has indicated, due to this pathway of concentration of effluents...

His (James Carson) information indicated that the fogging and icing from the pond and the subsequent entrapment of radio-nuclides would be even greater than Dr Epstein indicated..."

RESPONSE

Based on the nature of the cooling pond fog, the elevation of routine radioactive airborne releases, and the lack of evidence of such effects at other nuclear power plants, no significant interaction between cooling pond fog and low-level radioactive releases are expected during plant operation. For a more detailed discussion on the subject, refer to Attachment B.

LUCILLE M HALLBERG (3/29/82)

9.B COMMENT: RAD HEALTH EFFECTS

"...In a statement to the New York Times, a number of medical doctor's associated with the Physicians for Social Responsibility have warned about what they call dangerous myths about nuclear power. Their statement includes the following comments:

Nuclear plants routinely release radioactive effluents into the air and water. They may contain elements that concentrate in the bones, muscle, thyroid and other organs. The magnitude of the health risk is inestimable since it may take time for the material to circulate through the food chain before human exposure reaches significant levels. Leukemias would not then appear for at least five more years; other cancers, 15 to 30 years, and latent genetic damage might only become manifest generations hence..."

RESPONSE

In contrast to the contention that "the magnitude of the health risk is inestimable", the DES identifies the personal risk of potential premature death from cancer to an individual from exposure to routine releases of Plant effluents. In DES Section 5.9.3.2, this risk is identified as less than one chance in one million from one year of reactor operation. This calculation accounts for the effects of buildup (bioaccumulation) in determining the radiation exposure to man due to Plant operation. Specifically, Regulatory Guide 1.109 bioaccumulation factors are used. Appendix C of the DES, Section C.1 describes the calculation approach and refers the reader to Regulatory Guide 1.109 for a detailed discussion of the dose calculations. Regulatory Guide 1.109 discusses bioaccumulation factors in depth, and tabulates values used for various elements which range up to a factor of 100,000 times greater than the observed water concentration. Thus, bioaccumulation effects have been considered fully in DES calculations of offsite radiological consequences due to routine Plant operation.

LUCILLE M HALLBERG (3/29/82)

9.C COMMENT: COOLING POND FOG

Fog plumes up to five miles long have been observed at the Dresden pond, with worse predictions for Midland.

In September 1978, James Carson, Meteorologist from the Argonne National Laboratory met with local Midland officials to specifically warn them of the far more severe fogging and icing from the cooling pond that could be anticipated than was originally described in the Midland Environmental Impact Statement of March 1972.

His information indicated that the fogging and icing from the pond and the subsequent entrapment of radio-nuclides would be even greater than Dr Epstein indicated.

James Carson stated that the people in the area of the Midland cooling pond would be subjected to hundreds of hours of steam fog every winter. Much additional snow would be generated in the area and icing would occur on homes, trees and animals.

His observations were based on data from the Dresden cooling pond in Illinois. (Bechtel had used data compiled at an Arizona cooling pond.) That information is not applicable to a cooling pond in the Midwest, according to Carson.

Carson indicated a much greater extent of the severity of the fogging problem in the vicinity of the Midland cooling pond than anyone had anticipated.

The Dresden pond covers 1,275 acres and runs 90 degrees hotter than the ambient temperature. The Midland pond covers 880 acres and will be even hotter than at Dresden. Dense fog will be quite common over and near the Midland pond during the cooler part of the year (November through March).

During these foggy periods, visibility could be sufficiently reduced to create traffic hazards. Frequent periods of dense fog will require roads in the vicinity of, and especially Gordonville Road to be very well marked. Gordonville Road may have to be widened to allow more maneuverability, flashing lights may have to be installed to warn motorists that they are entering a heavy fog area where zero visibility was possible.

Ron Cook, resident inspector at the Midland Plant, said he had visited the Dresden area during fogging and the residents called the road near the pond, "suicide road."

This excessive fogging and icing condition could have an adverse effect on emergency evacuation procedures, as well as, the removal and delivery of radioactive wastes. The operation of Tri-City Airport could be affected. Crops could be contaminated.

9.C (Continued)

RESPONSE

The maximum horizontal extent of fogging observed at the Dresden Plant during field studies completed at that facility was approximately 1.5 miles. The studies indicated that fogs which extended some distance from the pond tended to become elevated and, as such, had a minimal effect on the surrounding area. Under no circumstances were fogging extents of greater than 1.5 mile observed during the Dresden studies. (1,2)

In Section 5.4.1 of the DES-OL, the NRC staff states that it "...expects a more severe local steam-fog effect near the Midland cooling pond than was predicted in the FES-CP." Having reviewed the seven references (2-8) upon which Staff's statement was based, it appears that their conclusions represent a pessimistic interpretation of the available data on fogging and icing effects. Additionally, a recent EPRI assessment of fogging effects (1) (which was not considered in Staff's evaluation) concludes that the effects of steam fog resulting from cooling pond operation are minimal. Specifically, the EPRI report concludes:

"Steam fog was found to be the most frequently observed atmospheric effect of the cooling lakes, with a maximum occurring in fall and winter. Natural fog also occurs most often in these periods. In only rare instances did fog sufficiently thick to impair visibility extend more than a few hundred meters from the lake shore. Light icing of structures near the lake was observed immediately near the lake when air temperatures were below -7°C (19°F). No change in precipitation amount or intensity could be attributed to enhanced evaporation or convection from the cooling lake."

A summary of the EPRI study results is included as attachment to this response.

This comment implies that there is a significant difference in size between the Midland and Dresden ponds which will result in fogging effects at Midland which are more severe than those observed at Dresden. It should be noted that the two units at Dresden produce approximately 1618 Mwe with heat dissipation via a 1275 acre cooling pond. The Midland Plant will produce 1357 Mwe with heat dissipation via an 880 acre cooling pond. The ratios of electrical output to pond area are, therefore, similar for the two plants (0.79 Mwe/acre for Dresden vs 0.65 Mwe/acre for Midland) and projected pond surface temperatures for Midland are only slightly higher than those at Dresden. The Dresden Plant also uses spray modules for additional cooling which results in increased water vapor emissions and fogging potential. Given the above, fogging effects resulting from operation of the Midland Plant cooling pond are expected to be comparable to those observed at Dresden. As indicated in previous responses, the effects due to fogging at Dresden have been found to be minimal.

In discussing the need for actions to mitigate the effects of fogging, this comment implies that fogging effects at Gordonville Road will be similar to those experienced at a road located at the Dresden Plant. The road referenced

9.C (Continued)

in the comment crosses through the Dresden pond and is located adjacent to that portion of the pond which has the warmest surface temperature and the greatest potential for fogging. Thus fogging would be expected to occur at this road with the same frequency and effect as occurs at the pond itself. This situation is quite different from that at Gordonville Road. Not only is Gordonville Road located a short distance away from the pond, it is situated near an area of the pond which has a relatively low surface temperature. For these reasons, and because fogging effects at cooling ponds tend to be very localized (see response to the M Kruger comment 3-E), the effects of fogging at Gordonville Road are expected to be minimal as compared to those experienced at the road which intersects the Dresden pond. Finally, it should be noted that the Company has committed (in Section 5.1.4.2 of the Environmental Report) to take those actions which may be necessary to mitigate whatever fogging effects may occur as a result of operation of the Midland cooling pond.

REFERENCES

1. Atmospheric Effects of Cooling Lakes, EPRI EA-1762.
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Atmospheric Effects of Cooling Lakes

EA-1762
Research Project 578

Final Report, April 1981

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SUMMARY

The increasing demand for more energy throughout the world into the twenty-first century will require the construction of many electric power plants. These plants will dispense large amounts of waste heat into the atmosphere through auxiliary cooling systems such as cooling lakes and cooling towers. The atmospheric effects of waste heat dissipation from cooling lakes was evaluated using data from two field programs conducted in Illinois during 1971-1973 and 1976-1978.

Measurements of wind, temperature, humidity, visibility, and other meteorological parameters necessary for analyses of lake-induced effects on the atmosphere were made from February 1976 to March 1978 at Baldwin Lake. This is a large, man-made cooling lake operated in southwestern Illinois by Illinois Power Company. Waste heat from the 1800 MWe coal-fired power plant is dissipated in a 890-hectare (2200-acre) cooling lake. This field operation and analysis program constituted the main thrust of the research. Additional meteorological field data for the period December 1971 to March 1973 for the Dresden plant in northern Illinois were obtained from Commonwealth Edison and analyzed. The Dresden nuclear power station has a capacity of 1500 MWe, and waste heat during the field observations was dissipated by a combination of a spray canal system and a 445-hectare (1100-acre) cooling lake. Both Baldwin and Dresden are embedded in a temperate climate, typical of the Midwest.

STEAM FOG

A major atmospheric effect, and one of the most visible associated with cooling lakes, is the initiation and/or enhancement of steam fog. These fogs form when water vapor is added to the air and the source of the water vapor is much warmer than the air. Steam fog observations were made at both Baldwin and Dresden. The intensity of steam fog at Baldwin was defined by the visibility restriction. In evaluating the fog problem, steam fog with visibilities of 0.4 km (0.25 mi) or less was considered intense enough to impose restriction on driving conditions if the steam fog were to move across a road. At Dresden, the steam fog intensity was available only in qualitative terms, such as very light, light, moderate, and heavy. Visibility restrictions were ascribed to these intensities after obtaining further information from the primary field observer.

Steam fogs at Baldwin were stratified into initiation and enhancement days. Initiation days were defined as those when steam fog formed without any natural fog present near the cooling lake. Enhancement days were days when natural fog

was present and the visibility over the cooling lake was less than the visibility of the natural fog due to augmentation by steam fog. The Dresden observations were not sufficiently detailed to stratify the data in a similar way.

Steam fog observations were made on 40% of all days at Baldwin and on 49% of all days at Dresden. All intensities were most frequent during winter with a secondary maximum during fall, and minimums during spring and summer. The Baldwin data showed that only 25% of all steam fogs were accompanied by natural fog, that is, most steam fogs were strictly lake phenomena.

Cold air dominated the occurrence of all intensities of steam fog. Over 80% of the Baldwin and 92% of the Dresden steam fogs were embedded within cold air at the surface. On fog enhancement days, frontal and low pressure activity were more frequent. This would be expected because natural fog is often associated with these weather types.

The relatively small number of enhancement days at Baldwin produced an erratic temporal pattern with the greatest number of enhancement fogs occurring during summer. However, in Illinois the enhancement of natural fog by steam fog will maximize most frequently, on the average, during winter and fall when the greatest number of natural fogs normally occur. The enhancement effect will vary from year to year depending on the occurrences of natural fog and concomitant temperatures sufficiently cold to maintain the high water-air temperature difference needed to generate steam fog.

Dense steam fog (visibility of 0.4 km or less) was observed most often during winter. At Dresden 60 of 69 moderate-to-heavy or heavy fogs and at Baldwin 60% of all dense steam fogs occurred during winter. Furthermore, at Baldwin 80% of the dense initiation fogs (lake induced) occurred during winter and none in summer. Dense enhancement fogs maximized during winter also. Most dense cooling lake fogs in other seasons were associated with natural fogs rather than lake initiations.

Relatively cold air temperatures were associated with the occurrence of many dense steam fogs, but little dependence between temperature and fog intensity was noted. A useful indicator of steam fog intensity is the magnitude of the water-air temperature difference and the ambient saturation deficit. Steam fog intensity tends to vary directly with water-air temperature difference and inversely with saturation deficit.

Most dense steam fogs initiated at Baldwin (visibilities of 0.4 km or less) had water-air temperature differences of 19°C (34°F) or greater and saturation deficits of 0.5 g/kg or less. Initiation fogs were not observed over the cooling lake until the water-air temperature difference was at least 6 to 7°C (11 to 13°F). Water-air temperature differences in enhancement fogs of equivalent intensity were less. On enhancement days, the steam fog intensity was similar to that on initiation days, but when steam fog combined with natural fog, the ambient visibility was lowered by as much as 1 km (0.6 mi).

Downwind movement of steam fog farther than 6 m (20 ft) was observed in only 38% of all events at Baldwin, and only 22 steam fogs at Dresden moved more than 30 m (100 ft) beyond the confines of the lake. At Baldwin less than 10% of the fogs extended more than 0.2 km (0.1 mi), and fewer than 2% had horizontal extents greater than 1.6 km (1 mi). Significant downwind extent was observed in all seasons at Baldwin, but occurrences were most frequent in winter and fall. Over 67% of all fogs with some horizontal extent were initiation fogs. In all but two events at Baldwin, the visibility in steam fogs with horizontal extent rapidly approached the prevailing visibility as the fog mixed with the ambient air. A greater potential for intense fog and movement off the lake exists if the over-lake trajectory of air is from the cooler to warmer side of the lake.

Overall, the occurrence of steam fog at cooling lakes such as Baldwin and Dresden presents only minor problems. Most steam fogs at these locations were confined within 1.6 km (1 mi) of the lake. Only with winds less than 2 km/h (1.5 mi/h) and with very stable atmospheric conditions did steam fog with appreciably lowered visibilities travel more than 1.6 km (1 mi). On two occasions when this was observed, the steam fog drifted downwind along an old creek bed. Cooling lakes with water-air temperature differences similar to those reported at Dresden and Baldwin and within a similar climatic type regime can be located within 2 to 3 km (1.25 to 2.0 mi) of major highways, airports, or other centers of activity adversely affected by fog without appreciable interference in normal activities. It is concluded that the horizontal movement of most steam fogs will be less than 3 km (2 mi), provided no unusual features, such as major valleys, are present. This, of course, applies to the Midwest and other regions with a similar climate.

Results of this study can be used in conjunction with hourly weather data from a nearby weather station (climatically similar to the proposed site) and water-air temperatures estimated from preliminary engineering studies to calculate the ex-

pected frequency of occurrence and intensity distributions of steam fog at proposed cooling lake installations. These computations can then be used in conjunction with other results to obtain estimates of the frequency distribution of the downwind extent of cooling lake fogs at the proposed site.

ICING

During the colder part of the year, steam fog which moves beyond the lake can coat structures and vegetation with ice. The ice can take two forms, glaze or rime. Only rime icing was observed during the four winters of observations at Dresden and Baldwin cooling lakes. Rime, because of its low density and friable nature, poses little or no danger to structures or vegetation.

Rime icing was not observed unless the air temperature was -7°C (19°F) or less. Thus, in Illinois and most of the Midwest, rime is primarily a winter phenomenon. However, the icing season will be extended in other regions where the temperature drops to -7°C and below earlier in the fall and continues at such temperatures later in the spring.

At Baldwin, the greatest horizontal extent of icing was 0.8 km (0.5 mi). Most of the icing events (90%) were observed within 200 m (650 ft) of the cooling lake. The greatest accumulation of rime at Baldwin was 7.6 cm (3 in), and 90% of the rime accumulations were 2.5 cm (1 in) or less.

For rime icing to occur beyond the confines of a cooling lake, it was determined that the following atmospheric conditions must be present: 1) an air temperature of -7°C (19°F) or less, 2) a saturation deficit of 0.5 g/kg or less, 3) a water-air temperature difference of 19°C (34°F) or greater, and 4) winds of at least 1 to 3 km/h (1 to 2 mi/h). These criteria are similar to the atmospheric conditions required for the more intense steam fog events at Baldwin.

CONVECTIVE PRECIPITATION

Cooling lakes, because of their elevated surface water temperatures and greater evaporation rates, have the potential of initiating and/or enhancing convection. To investigate the possible cooling lake effects on convective clouds, satellite, radar, and raingage data were used.

Visible photographs from the two SMS-GOES satellites during the summer of 1975 were employed to investigate cooling lake effects upon the time-space distribution

of cloudiness. Analyses were made for two cooling lakes in southern Illinois, Baldwin and Coffeen, and a much larger, control lake, Carlyle. No evidence was found that the cooling lakes or control lake had a significant effect upon the summer cloud frequencies. However, local terrain features in the study region, such as ridges and river valleys, do influence the spatial distribution of clouds, primarily cumulus and cumulonimbus.

Researchers from the University of Chicago routinely collected data using a 3-cm, TPS-10 radar during the summers of 1972 to 1975. The area sampled included Baldwin Lake and the region within the satellite analysis. Plots of radar first echoes were examined, and they indicated that Baldwin and Coffeen cooling lakes have no significant effect on the first-echo distributions. However, the large control lake (Carlyle) appeared to have some influence on the initiation of convective precipitation when atmospheric motions were parallel to the major axis of this elongated lake.

A dense raingage network was operated in the Baldwin area during July to November 1976 and March to November 1977. The objective was to investigate potential effects upon the regional rainfall pattern resulting from waste heat discharges into the cooling lake associated with the Baldwin power plant. Results of the two-year study were inconclusive. A persistent rainfall maximum was located in the Baldwin Network 10 to 15 km (6 to 9 mi) east to east-northeast of the center of the lake when rainfall for the two years was combined. This apparent anomaly was especially prominent with storms moving from the southwest quadrant, which place the lake directly upwind of the observed maximum. However, the rainfall maxima in the eastern part of the network were in agreement with the natural rainfall distribution for southern Illinois during the sampling periods, as shown by the National Weather Service records.

It is concluded that cooling lakes the size of Baldwin and Coffeen have little or no effect upon the initiation of convective cloudiness or precipitation. However, much larger cooling lakes, as indicated by the Carlyle findings, could enhance convective activity when the low-level air and clouds have a relatively long travel time over the lake. Otherwise, most cooling lakes have a minimal impact upon the initiation and enhancement of convective cloudiness and should produce no environmental problems of significance.

TEMPERATURE AND MOISTURE PLUMES

Cooling lakes are warmer than natural lakes in the same climatic region and

latitude, and the average water temperatures are warmer than the average air temperatures during all seasons. The evaporation rate from such a lake will be greater than from a natural lake. Air with an over-lake trajectory can be heated, and water can be evaporated from the lake surface, adding moisture. Thus, the near-surface air has the potential of advecting warmer and moister air downwind. Temperature and dew point data were stratified by prevailing winds at 0600 and 1500 CST to determine the magnitude of temperature and dew-point increases from the upwind to downwind shore and the downwind horizontal extent of the elevated temperatures. The largest increases in monthly averages and the greatest horizontal extent of the elevated temperatures downwind from the cooling lake were realized during winter and spring.

Increases from the upwind to downwind shore based on monthly averages ranged from near zero to 3°C (5.5°F) at 0600 CST, near the time of normal daily minimum temperatures. The largest departures from the upwind to downwind shores were noted with southwest and northwest winds. Downwind extent was usually detectable only in the first 0.8 to 1.6 km (0.5 to 1 mi). At 1500 CST, near the time of the maximum daily temperature, increases in air temperature from the upwind to downwind shore were minimal, but increases in dew-point temperature ranged from 0.5 to 3.0°C (1.0 to 6.0°F). However, the downwind extent of these elevated temperatures was only 0.4 to 0.8 km (0.25 to 0.5 mi) with southwest and northwest winds, or approximately 50% of the downwind extent experienced at 0600 CST.

On individual mornings (0600 CST), air temperature increases of as much as 4.4°C (8°F) and dew-point increases of 5.6°C (10°F) were noted from the downwind to the upwind shores. The horizontal extent of the elevated temperatures changes rapidly with increasing distance from the downwind shore. However, some minor elevated air temperatures and/or dew points (0.6°C or 1°F) were noted at Baldwin as far as 2 km (1.25 mi) downwind on some mornings. By mid afternoon the air temperature increases were not as pronounced, but the dew-point temperature changes were similar to the mornings. The horizontal extent of the elevated temperature was reduced to 1 km (0.6 mi) or less.

TRACER EXPERIMENTS

Three tracer experiments using sulfur hexafluoride (SF_6) were made to simulate the advection of moisture and heat, both important to the formation of steam fog and to the downwind extent of the visible fog plume. These tracer releases indicate that significant concentrations of moisture and heat are most likely to occur with

a neutral or stable atmosphere near the surface. However, large amounts of dispersion were observed within relatively short distances. The rapid downwind dispersion experienced in these tracer releases helps to explain the relatively small downwind areal extent of lake-generated steam fog observed at Baldwin.

LUCILLE M HALLBERG (3/29/82)

9.D COMMENT: FOGGING AND EVACUATION PLAN

"This excessive fogging and icing condition could have an adverse effect on emergency evacuation procedures."

RESPONSE

As noted in the responses to related comments by M Kruger (3.E) and V Castellanos (8.B), although fogging will occur about the cooling pond, it is expected that it will remain very localized and have minimal effect on vehicle traffic. More importantly, cooling pond fog should have little effect on evacuation or other emergency activities. Since any pond fogging occurring concurrent with an accident will essentially travel in the same direction as any potential radioactive releases, it is doubtful that an evacuation of residents or travel of emergency personnel would ever be directed towards any fog plume or ice caused by fog based on minimizing radiological consequences.

THOMAS HEARRON (3/31/83)(sic)

10.A(1) COMMENT: CONSTRUCTION COST AND RATE INCREASES

Economics: The report considers only generating costs, ignoring the enormous construction costs which ratepayers such as I will have to be responsible for. Using such a methodology, one would also conclude that buying a diesel-powered Mercedes is cheaper than buying a Chevette because the Mercedes gets better gas mileage.

RESPONSE

See similar response to D Hebert comments 6.E and 6.G.

THOMAS HEARRON (3/31/83)(sic)

10.A(2) COMMENT: REPLACEMENT POWER COST

Further, the report compares the cost of nuclear-generated electricity with that of purchased power--normally the most expensive electricity--while specifically not considering the economics of converting the plant to coal or other fuels.

RESPONSE

The data presented in DES Section 2.2 regarding the energy cost of replacing Midland's generation are not just purchased power, but also include the increased cost of additional generation from the Company's coal- and oil-fired units. Further, purchased power is not normally the most expensive electricity but in fact for the majority of time is less expensive than using the Company's oil-fired units.

Utilizing the Company's existing units and purchased power are the only viable alternatives to replacing Midland's generation at this time. (Since issuing the DES, the NRC has amended its regulations to eliminate considerations of need for power and alternative energy source issues from its review of applications to operate nuclear power plants (47 FR 12940-12943, March 26, 1982).)

THOMAS HEARRON (3/31/83)(sic)

10.A(3) COMMENT: ECONOMICS - BOND RATING

Finally, the NRC staff apparently accepts Consumers Power's assertion that an excess generating capacity of 23 percent is necessary. On the other hand, Standard and Poor recently downgraded Consumer's bond rating, precisely because of a fear that Consumers was building too much generating capacity.

RESPONSE

On November 2, 1981, Standard and Poor's announced a downgrading of Consumers and Detroit Edison's first mortgage bonds from "BBB" to "BBB-". This downgrading was indicated to be due to "Deterioration of the regulatory and political environment brings into question the company's ability to maintain financial flexibility" as indicated in Credit Analyses of November 9, 1981. In fact, the issue of "excess capacity position which is expected to result when the Midland units begin operation in 1983 and 1984" was a claim brought by the Michigan Attorney General in his brief before the Michigan Supreme Court and clearly is not a claim of Standard and Poor's in their credit analyses.

REFERENCES (ATTACHED)

1. Standard and Poor's Credit Week, November 2, 1981, p 543; November 9, 1981, pp 490-491; January 25, 1982, pp 1910, 1912; April 26, 1982, p 1495, 1496.
2. Question and Answer, 23-AG-361, Question 12B

(continued from page 544)

745 PROPERTY INVESTMENTS

S&P's rating on this trust's senior notes has been raised to 'AA' from 'A'. The trust was formerly Connecticut General Mortgage and Realty Investments. The rating change reflects additional support provided by the merger of the trust into Prudential Property Investment Separate Account, a subsidiary of the Prudential Insurance Co. of America. The acquisition brought about conversion of outstanding convertible debentures, thereby lowering total debt and increasing paid-in capital. Adjusting for this, total debt to equity at August 31, 1981 was a very conservative 81%. Problem loans as a percent of equity was a low 6%. Since the mid 1970s the trust has emphasized equity investments, and at year-end March 31, 1981 higher-yielding equity investments totaled more than 50% of the well-diversified portfolio. Return on assets excluding non-recourse mortgage debt was a strong 2.9%. Debt usage has been conservative for the past five years with significantly lower short-term debt levels in the past three years. In response to Prudential's wishes, the trust does not plan to make any new investments except to fulfill existing commitments.

✓ CONSUMERS POWER CO.

S&P has lowered Consumers Power's publicly rated first mortgage and collateralized pollution control revenue bonds to 'BBB-' from 'BBB', debentures, uncollateralized pollution control revenue bonds, and preferred stock to 'BB+' from 'BBB-', and preference stock to 'BB-' from 'BB'. Additionally, the company's proposed offering of \$75 million first mortgage bonds, due 1989, has been rated 'BBB-'. As in the case of our decision on Detroit Edison, the rating changes reflect weakening financial flexibility, as evidenced by the pending Michigan Supreme Court decision concerning the legality of financing approvals by the state public service commission. Moreover, questions have also been raised relative to future inclusion of new plant in the rate base, in light of potentially high reserve margins. Our concern has been heightened by actions of the Michigan attorney general in slowing financing approvals through petitions to the courts. Additionally, costs relating to construction of the \$3.1 billion Midland nuclear plant will likely continue to weaken financials, impacted by the limited financing flexibility. These expenditures are precipitating heavy reliance on securities sales as well as substantial usage of short-term debt. Financial protection measures will remain under considerable pressure until the plants become operational and the company begins to earn a reasonable return on its investment. *See next week's CreditWeek for a complete analysis.*

✓ DETROIT EDISON CO.

S&P has lowered Detroit Edison's publicly rated first mortgage and collateralized pollution control revenue bonds to 'BBB-' from 'BBB', uncollateralized pollution control revenue bonds to 'BB+' from 'BBB-', preferred stock to 'BB+' from 'BBB', preference stock to 'BB-' from 'BB', and commercial paper to 'A-3' from 'A-2'. As in the case of our decision on Consumers Power, the rating changes reflect a deterioration in financial flexibility, exemplified by the pending Michigan Supreme Court decision concerning the legality of financing approvals by the state public service commission. The Michigan attorney general has raised serious questions relative to future inclusion of new plant in the rate base, in light of potentially high reserve margins, and has been successful in slowing financing approvals through petitions to the courts. Recent upward revisions in construction costs are expected to have a continuing negative impact on the company's financial position, particularly in view of the limited financing flexibility. Weak internal cash generation has precipitated heavy reliance on external financing and particularly high usage of short-term debt. While the court has lifted its temporary stay on Commission approval of Detroit Edison's 1981 financing schedule, no such approval has yet been given for 1982. Financial protection measures will remain under considerable pressure until new plants become operational and the company begins to earn a reasonable return on its investment. *See next week's CreditWeek for a complete analysis.*

NEW JERSEY

S&P has maintained the rating of 'AAA' on New Jersey's issue of \$150 million G.O. bonds, based on the state's sound financial position, conservative fiscal management, and good economic performance. This issue will provide \$50 million for the Green Acres (parks and recreation) program, \$45 million to institutions and agencies, and \$55 million to transportation. State debt is moderate. The state has not issued short-term debt since the adoption of the 1947 constitution. The state's economic performance has exceeded expectations. This is attributed to the recent diversification of the economic base, primarily through the expansion of the service sector as a result of casino gaming in Atlantic City. Decline of building activity has been modest, especially in contrast to the sharp declines in 1974-1976. New business charters have increased 16% in the first six months of 1981, compared with the similar period in 1980. Business failure rates have remained stable in contrast to a sharply rising national trend. Unemployment rates, which exceeded national levels in the 1970s, have remained at or below the nation's in recent years. As a result, revenues from sales, corporate, and income taxes have exceeded projections. Due to improved revenues and conservative budgeting, New Jersey's financial position remains sound. *See next week's CreditWeek for a complete analysis.*

Credit Analyses

UTILITIES

Consumers Power Co.

\$100 million first mortgage bonds due 1989

Sold, October 30, Morgan Stanley & Co.

Rated 'BBB-'

Rationale: Consumers Power Co.'s proposed offering of first mortgage bonds has been rated 'BBB-'. All other publicly rated first mortgage and collateralized pollution control revenue bonds have been lowered to 'BBB-' from 'BBB'; debentures, uncollateralized pollution control revenue bonds and preferred stock lowered to 'BB+' from 'BBB-'; and preference stock to 'BB-' from 'BB+' (*Credit Bulletin*, Nov. 2). Deterioration of the regulatory and political environment brings into question the company's ability to maintain financial flexibility. Delays by the Michigan Public Service Commission (MPSC) in granting financing schedule approval have continually placed the company under severe stress in seeking external funds to meet its large construction commitments. Issues raised by the Michigan Attorney General further cast doubt over the MPSC's ability to render binding decisions. One important issue to be addressed is the excess capacity position which is expected to result when the Midland units begin operation in 1983 and 1984 and may jeopardize the company's ability to earn an adequate return on its investment. Additionally, at this point, plans for the sale of capacity have not yet been established. Recent intervention by the Michigan Supreme Court and its pending decision in determining the parameters of commission authority of granting financing schedule approvals should resolve some of the present uncertainties relative to capital spending plans. If approval of financings is not forthcoming, however, serious pressure could be placed on the company's borrowing capacity, especially the availability of short-term credit. Fixed charge coverages showed improvement in the first half of 1981 (enhanced by large off-system gas sales to other utilities), enabling the company to meet its indenture tests and to sell this issue of first mortgage bonds. Prospects for more adequate fixed charge coverages continue to depend upon completion of the heavy construction program (which centers on completion of the Midland nuclear plant), as well as earning a return on that investment. In addition, financial flexibility is seriously weakened by the highly leveraged capital structure, the inability to meet issuance tests, and a low level of internally generated cash.

Business: This major combination utility serves more than 5.3 million residents in the lower peninsula of Michigan. Principal industries include automobile production and chemical manufacturing. Of total 1980 operating revenues, 55% were derived from electric, 43% from natural gas, and 2% from other. The electric generation fuel mix in 1980 was 68.5% coal, 13.6% nuclear, 16.1% oil and gas, and 1.8% hydro. Over 80% of gas purchased last year was from Trunkline Gas and Panhandle Eastern Pipeline. During the 12 months ended June 1981, electric sales were relatively flat while natural gas sales increased by 17%, primarily because of large amounts of off-system sales to out-of-state utilities.

Regulation: Rates are regulated by the appointed three-member Michigan Public Service Commission (MPSC). Tax benefits attributable to investment tax credits and liberalized depreciation are normalized. An indexing provision allows an adjustment in rates annually to reflect changes in certain operating maintenance

costs in accordance with changes in the consumer price index. Rate decisions effectively have no time limit. Interim rate relief may be issued in emergency cases, however the time lags have taken up to nine months. In the company's last electric rate case increase (filed in January 1979 and issued in August 1980) a portion of the costs for Campbell Unit 3 (in-service date November 1980) was included prospectively in rate base; upon petitions to the MPSC, recovery of the total investment was authorized in June 1981. On the gas distribution side, a final rate increase order (originally filed in March 1978) is anticipated in late 1981 and contains certain issues related to closing of the Marysville Gas Reforming plant and handling of reductions in cost of service resulting from the shutdown. (Previously, a portion of new plant had been excluded from rate base because of determined imprudent costs). The company must apply to the MPSC for permission to sell securities. In 1980 and through July 1981, limited financing was approved through a 1979 order and periodic interim orders and hearings were prolonged because of various challenges by intervenors. The 1981 securities sales order is currently pending before the MPSC. Several commission orders, including granting of financing approvals, have been appealed to the Michigan circuit court of appeals either by intervenors or the Michigan Attorney General, alleging errors of law by the Commission. Moreover, it appears that much of the pending controversies have related to the absence of power plant siting statutes. On occasion, the Michigan Supreme Court has heard certain controversies and remanded the cases to the Commission. On September 16, the Supreme Court intervened, upon petition of the Attorney General, in the 1980 financing approval litigation, consolidating a similar Detroit Edison Co. case with Consumers. The court imposed a stay on all financing by both companies, heard oral arguments in mid-October, and vacated the financing stays the following day. A final order has not yet been issued on the remaining matters before the court. The Supreme Court's final order should begin to resolve many of the uncertainties regarding MPSC's statutory authority and its legal responsibilities in monitoring utilities in Michigan.

Capital Projects: Capital expenditures are estimated to be \$3.1 billion (including AFDC) for 1981-1985, \$688 million of which will be spent in 1981. The construction expenditures for Midland Nuclear plant represent a large portion of the spending program. Current cost estimates for the twin units equal \$3.1 billion with company investment, as of June 30, totaling \$1.76 billion. (Bechtel Power Corp., prime contractor for the plant, is currently preparing a new cost forecast). In 1980, evaluation of licensing delays and design revisions resulting from the Three Mile Island accident nearly doubled costs (from an estimated \$1.67 billion) and extended the in-service dates by two years. If further delays develop preventing Unit 1 (a cogeneration unit and second to go on line) becoming operational by December 31, 1984, Dow Chemical Co. will be permitted to terminate its purchase agreement for the process steam service. Loss to Consumers Power for the portion of costs which would not be paid by Dow could range from \$175 to \$310 million based on current estimates.

Finances: Fixed charge interest coverages improved since year-end 1980, reflecting a general rate increase and inclusion of the company's recovery of carrying charges for the Campbell Unit 3, once it had begun commercial operation late in the year. However, substantial improvement of coverage ratios may be difficult prior to completion of the Midland nuclear plants in 1983 and 1984, and prior to inclusion of new plant in rate base or, in the alternative, large off-system utility sales to enable the company to earn a reasonable return on company investment. With the continued heavy spending requirements, internal cash flow to spending may also remain at low levels even though an upward trend occurred in the first half of 1981. Additionally, external financing requirements are likely to remain large in the near term to supplement the company's internal cash generation, ab-

sent ample and prompt rate relief by the MPSC. Financing flexibility, subjected to indenture restrictions and lagging regulatory approval, has continued to be severely limited and has required excessive reliance on short-term debt. Moreover, the company's capitalization includes somewhat high levels of long-term debt and preferred and preference stock. With total debt leverage equalling over 55%, continued infusion of common equity will be required to strengthen the capital structure when meeting the company's financing needs.

Pro-Forma Capital Structure

(M \$)	— June 30, 1981 —	
Long-term Debt	2,586.0	51.8%
Preferred Stock	472.3	9.5%
Preference Stock	266.6	5.3%
Common Equity	1,668.5	33.4%
Permanent Capitalization	4,993.4	100.0%
Short-term Debt	401.3	7.4%

Includes expected sale of additional bonds in 1981, current maturity of bank term loan, and of installment sales contracts, retirements of first mortgage bonds reacquired for the 1981 sinking fund, and estimated interest portion of an interim construction financing agreement.

(M \$)	*1981	1980(R)	1979(R)	1978	1977
Cash Flow Analysis					
Cash Retained Earnings	(74.6)	(102.7)	(70.0)	(32.1)	(11.7)
Depreciation	160.7	143.6	133.1	110.9	108.2
Deferred Taxes	24.7	9.6	21.3	64.6	72.1
Cash Flow	110.8	50.5	84.4	143.4	168.6
Cash Flow/Capitalization (%)	2.3	1.1	2.0	3.7	4.8
Depreciation Rate					
Elec. Pft. (%)	N.A.	3.03	2.93	2.87	2.94
Gas Pft. (%)	N.A.	3.76	3.76	3.80	3.66
Cash Payout Ratio (%)	226.8	513.5	276.5	179.8	147.9
Capital Requirement					
Construction Expenditures	534.9	597.3	735.1	587.8	505.6**
Maturities & Sinking Funds	N.A.	127.7	107.9	21.2	19.3
Working Capital Charge	(40.8)	74.2	(59.0)	13.2	131.5
Total Capital Needs	N.A.	799.2	784.0	622.2	656.4
Cash Flow/Constr. (%)	20.7	8.4	11.5	24.4	33.3
Cash Flow/Cap. Needs (%)	N.A.	6.3	10.8	23.0	25.7
Constr./Capitalization (%)	11.0	12.5	17.7	15.0	14.5
Asset Protection (%)					
Mortgage Funding Ratio	N.A.	37.1	36.1	42.0	45.5
Property Funding Ratio	45.4	46.2	42.8	50.3	52.0
CWIP/Net Plant	36.5	33.3	40.7	33.3	26.6

*For the twelve months ended June 30 (unaudited).

**Includes \$15 million increase in investment in Plateau Resources Ltd.

(R) The subsidiaries had previously been included in the financial statements under the equity method of accounting. This change had no material effect on any of the years presented and had no effect on net income.

	1981*	1980(R)	1979(R)	1978	1977
Liquidity Analysis					
Current Ratio (x)	0.88	1.00	0.88	1.57	1.60
Cash Flow/Long-Term Debt (%)					
	4.4	2.1	4.1	7.2	9.3
Profitability Analysis (%)					
Return on Equity	12.3	10.5	10.6	10.7	10.4
Return on Capital	11.1	10.0	9.6	8.6	8.3
Operating Ratio	85.4	86.2	86.5	87.1	87.0
AFDC/Net Income	53.9	63.6	56.8	41.8	35.0
Income Tax Rate	17.0	9.8	14.3	27.1	30.1

Earnings Test

Interest Coverage					
Pretax	2.14	1.69	2.19	2.55	2.57
Excluding AFDC	1.63	1.14	1.59	2.04	2.16
Preferred Dividend					
Pretax	1.68	1.36	1.71	1.82	1.86
Excluding AFDC	1.28	.91	1.24	1.46	1.56

*For the twelve months ended June 30 (unaudited).

(R) The subsidiaries had previously been included in the financial statements under the equity method of accounting. This change had no material effect on any of the years presented and had no effect on net income.

Janet V. Conway

Detroit Edison Co.

Reviewed; ratings reduced

Rationale: Detroit Edison's ratings have been reduced as follows: publicly rated first mortgage and collateralized pollution control revenue bonds to 'BBB-' from 'BBB', uncollateralized pollution control revenue bonds to 'BB+' from 'BBB-', preferred stock to 'BB+' from 'BBB', preference stock to 'BB-' from 'BBB', and commercial paper to 'A-3' from 'A-2' (*Credit Bulletin*, Nov. 2). Identical regulatory and political circumstances are faced by both Consumers Power and Detroit Edison. Delays by the Michigan Public Service Commission (MPSC) in granting financing schedule approval has continually placed Detroit Edison under severe stress in seeking external funds to meet its large construction commitments and overcome weakened financial flexibility. Issues raised by the Michigan Attorney General further cast doubt over the public service commission's ability to render binding decisions. One important issue is the excess capacity position expected to result when three base load units, adding 2,000mw of capacity in the 1983-1985 period, begin operation. This may jeopardize the company's ability to earn an adequate return on new plant investment. Inclusion of these units in rate base should be determined by the MPSC immediately before the plants' in-service dates. In the instance

where new plant (in part or in full) is not recognized in rate base, marketing of excess capacity will be required for the company to earn a reasonable return and to attain reasonable levels of earnings protection measures. However, the Michigan Supreme Court is currently in the process of clarifying the Commission's scope of authority. The company is engaged in construction of the Enrico Fermi (nuclear) and Belle River (two coal-fired) units. As construction costs have climbed, the level of internally generated cash has deteriorated. With upward cost revisions for the facilities being announced in June, cash flow to capital spending will likely remain substandard. External financing requirements will be heavy, with financial flexibility limited by the ongoing need to sell common equity to maintain the existing capital structure and the regulatory lag in approving financing schedules. While a project financing for the Belle River plant will ease external funding stress in nearby years, total debt leverage (56%) is considered high for the industry. During this period of heavy capital outlays, more timely and constructive regulatory actions, including resolution of the pending litigation, will be central to restoration of adequate earnings protection measures.

(continued on next page)

CreditWatch

The Coca-Cola Co. Columbia Pictures Industries Inc.

In a major departure from its traditionally conservative posture, Coca-Cola announced plans to acquire Columbia Pictures. Peripherally, Coke would also acquire Outlet Co., a broadcasting concern. The value of both transactions is about \$800 million. Coke's extremely strong capital structure, very limited use of leverage and \$356 million of cash and marketable securities as of Sept. 30, 1981 represents overwhelming financial flexibility. While the company's plans for financing the approximately \$400 million cash portion of the transaction are unknown, should this amount be financed entirely with debt, leverage ratios would increase dramatically. The acquisition would represent an important diversification into the fast-growing entertainment industry, but Columbia Pictures has been an inconsistent profit performer and could have a depressing effect on Coke's historically strong earnings protection and return on invested capital. S&P will evaluate the impact of the proposed acquisition on Coca-

Cola's fundamental business and financial position when financing plans have been finalized. S&P will also assess whether this acquisition represents a first step in a new aggressive posture by Coke, and if so, what impact this change in management philosophy would have on the company's long-term credit rating. The impact on Columbia Pictures' credit quality will also be evaluated. Coke has emphasized that Columbia Pictures will be operated as an independent, autonomous subsidiary. However, from a financial viewpoint, Coke's excellent flexibility and the potential support of Columbia's debt obligations could lead to improvement in those ratings.

*Elizabeth Sagurton
Noreen B. Williams*

Ratings profile: Coca-Cola senior debt 'AAA', Commercial paper 'A-1+', Columbia Pictures subordinated debt 'BBB-'.
→

Consumers Power Co. Detroit Edison Co.

First mortgage bonds of Consumers Power and Detroit Edison were downgraded to 'BBB-' last November, in response to a negative regulatory environment following a lawsuit by the Michigan attorney general and acceptance by the Michigan Supreme Court of Appeals alleging errors of law by the Michigan Public Service Commission. Uncertainties raised by the attorney general over the commission's statutory authority and legal responsibilities in monitoring utilities in the state may restrict the utilities' ability to raise external funds for construction. The Michigan Supreme Court will reconvene on Jan. 26. A decision should be forthcoming that will determine the authority and any constraints under which the commission can issue binding orders for fi-

ancing approval under Michigan statutes. Both utilities could be facing a liquidity shortfall if there are delays in a court decision, or if a court order restricts access to permanent capital, or if the commission fails to issue favorable financing orders. S&P will monitor developments and evaluate their impact on existing ratings of Consumers Power and Detroit Edison.

William J. Stow

Ratings profile: Detroit Edison first mortgage bonds 'BBB-', Preferred stock 'BB+', Preference stock 'BB-', Commercial paper 'A-3', Consumers Power first mortgage bonds 'BBB-', Debentures 'BB+', Preferred stock 'BB+', Preference stock 'BB-'.
→

Pacific Gas & Electric Co.

The December 1981 rate order, including the adoption of normalization for Pacific Gas & Electric, was, for the most part, a positive development. However, responsibility for improved earnings, fixed charge coverages, and cash flow rests with management, whose commitment and ability to control operating expenses during the next year will be a key factor in returning these measures to levels supporting present ratings. Another factor is commercial operation of the Diablo Canyon nuclear facility within a reasonable time frame. While the units are essentially complete, the regulatory process and political factors may cause additional delays. Hearings for the operating license are underway, but the company must also receive Nuclear Regulatory Commission approval of a consultant to review safety-related work, and of any plant modifications. Of particular con-

cern is the Jan. 15 decision of the California Regional Water Quality Control Board to postpone its decision on a thermal discharge permit for commercial operation of Diablo Canyon until July. Prior to that time, the Board will also consider plant modifications which are costly and could add to delays. S&P will monitor PG&E's expected financial improvement, and Diablo Canyon's progress in attaining the necessary regulatory approval. See full analysis in this issue.

Carolyn Perch

Ratings Profile: First mortgage bonds and collateralized pollution control revenue bonds 'AA-', Preferred stock 'A', Commercial paper 'A-1+'.
→

Ryder System Inc.

Over, a major factor in the truck leasing industry, has made steady earnings progress and capital structure improvement since 1975. Future prospects for the leasing business remain favorable despite current economic softness as does expansion and development of motor carrier operations, aided by relaxed federal regulations. We are evaluating management's operating and financial plans to maintain its market leadership

and will assess whether these factors would enhance short and long-term credit quality.

Dennis Dolan

Ratings profile: Collateral trust certificates 'BBB+', Ryder Truck Rental commercial paper 'A-2' (guaranteed by Ryder System).
→

CreditWatch

Issuer	Potential Credit Implications	Current Ratings			Write-up	
		Senior Debt	Sub. Debt	Comm. Paper	Issue	Page
Utilities, Transportation						
American Telephone & Telegraph Co.	Developing	AAA		A-1+*	1/18/82	1941
Bell System units	Developing	AAA		A-1+*	1/18/82	1941
New England Tel. & Tel. Co.	Developing	AA+		A-1+*	1/18/82	1941
Pacific Tel. & Tel. Co.	Developing	A-		A-1+*	1/18/82	1941
Excluding Southern New England Tel & Tel Cincinnati Bell and Western Electric Co.						
Consumers Power Co.	Negative	BBB-	BB+**		1/25/82	1910
Detroit Edison Co.	Negative	BBB-	BB+**	A-3	1/25/82	1910
Gas Service Co.	Negative	A			11/2/81	546
Gulf States Utilities Co.	Negative	A		A-2	11/23/81	418
Pacific Gas & Electric Co.	Negative	AA-	A**	A-1+*	1/25/82	1910
Ryder System Inc.	Positive	BBB+		A-2	1/25/82	1911
United Telecommunications Inc.	Positive	BBB	BBB-	A-2	12/21/81	294
Industrials, Retailing						
Baldwin Co. (D.H.)	Negative			A-2	12/21/81	294
Baldwin-United Corp.	Negative		BB+		12/21/81	294
Bethlehem Steel Corp.	Negative	A	A-		1/11/82	1967
Bucyrus-Erie Co.	Negative	A			11/23/81	418
The Coca-Cola Co.	Negative	AAA		A-1+*	1/25/82	1910
Columbia Pictures Industries Inc.	Positive		BBB-		1/25/82	1910
Ford Motor Co.	Negative	A			12/28/81	274
Inland Steel Co.	Negative	A		A-1	1/11/82	1967
Jones & Laughlin Steel Corp.	Positive	BB	B+		1/11/82	1967
Keystone Consolidated Industries Inc.	Negative	BB			11/9/81	485
Mobil Corp.	Negative	AA			11/16/81	459
Mobil Oil Corp.	Negative	AAA		A-1+*	11/9/81	486
Nabisco Brands Inc.	Negative		AA-**	A-1+	11/13/81	477
Nabisco Inc.	Negative	AA			11/23/81	418
National Steel Corp.	Negative	A-		A-2*	1/11/82	1967
Rockwell International Corp.	Positive	AA-	A+	A-1+*	1/4/82	1990
Savin Corp.	Negative		B		11/2/81	549
Standard Brands Inc.	Negative	AA-			11/23/81	418
U.S. Home Corp.	Negative	BB+	BB-		11/23/81	419
Witco Chemical Corp.	Negative	A+	A		1/25/82	1911
Youngstown Sheet & Tube Co.	Positive	B+			1/11/82	1967
Financial Institutions						
Creditrith Financial	Positive	A	A-	A-1*	11/2/81	549
Dial Financial Corp.	Positive	AA-	A+	A-1+*	11/2/81	549
Ford Motor Credit Co.	Negative	A	A-	A-1	12/28/81	274
Leasco Corp.	Negative	B			11/2/81	550
MGIC Investment Corp.	Negative	A	A-	A-1	12/21/81	294
Northwest Bancorp.	Negative	AAA	AA+	A-1+*	12/7/81	351
Reliance Financial Services Inc.	Negative	BBB			11/2/81	550
Reliance Insurance Co.	Negative			A-1	11/2/81	550
International						
Edmonton, Alberta	Positive	AA			11/9/81	486
Hudson's Bay Oil & Gas Co.	Negative	Suspended			1/4/82	1990
Tax-Exempts						
Austin, Texas Utility System	Negative	A+	A		12/7/81	351
California HFA Home Ownership and Home Improvement Revenue Bonds	Negative	AA-			1/11/82	1968
Chicago Board of Education	Positive	CC			11/2/81	551
Chicago Public Building Comm.						
Bd. of Ed. lease rental bonds series '70A, '71B, '75A, '76A	Positive	CC			11/2/81	551
Minnesota	Negative	AA+			12/14/81	319
HFA state assisted home improvement '76A-'81A	Negative	A+			12/14/81	319
Philadelphia Gas Works	Negative	A			12/21/81	294
San Antonio, Texas City Public Service	Negative	AAA	AA		12/7/81	351
Washington State	Negative	AA			11/2/81	551
Washington Public Power Supply System	Negative	A			11/9/81	511
Nuclear projects 4&5					1/11/82	1968

*Not under CreditWatch surveillance **Preferred stock

Provident National Corp.

Provident National Corp. and Pittsburgh National Corp. on April 19 announced an agreement in principle to form a new Pennsylvania bank holding company, PNC Corp., which will own Pittsburgh National Bank and Provident National Bank. The combination will be at the holding company level, and each bank will retain its name, directors, and staff. The action involves a tax-free pooling of interests whereby each share of Pittsburgh National and Provident National will be exchanged share-for-share for the new PNC Corp. after giving effect to a 2-for-1 stock split of Provident's common effective May 21. The combined \$10 billion assets of the new entity rank it among the 30 largest U.S. bank holding companies. Merle E. Gilliland, Pittsburgh National's chairman and chief executive, will be chairman and chief executive of PNC Corp. Roger S. Hillas, Provident's chairman, will be president of PNC Corp. The combination is subject to approvals

of directors, shareholders, and regulatory authorities and is expected within the next nine to twelve months. The combination appears devoid of credit implications for Pittsburgh National's 'A-1+' commercial paper, but could be positive for Provident National's 'A-1' rated commercial paper. Following a merger, both holding companies will be dissolved and a new rating assigned to outstanding obligations of the combined holding company.

William H. Donald

Ratings profile: Provident National Financial Corp. commercial paper (fully guaranteed by Provident National Corp.) 'A-1'. Pittsburgh National Discount Corp. commercial paper (fully guaranteed by Pittsburgh National Corp.) 'A-1+'.

Arizona Public Service Co. El Paso Electric Co. Public Service Co. of New Mexico

Arizona Public Service recently disclosed delays of several months in its target date for commercial operation of Palo Verde Nuclear Unit No. 1, to about year-end 1983. The delay creates uncertainty regarding the ability of participating utilities to restore cash flow and other financial measures to satisfactory levels over the foreseeable future. Participants affected include the project manager, Arizona Public Service, with a 29.1% interest, El Paso Electric 15.8%, and Public Service of New Mexico 10.2%. For each of these companies, internally generated funds have been weak for their respective rating categories. An important consideration in maintaining the ratings has been expectation of improved cash flow beginning in mid-1983 when unit No. 1 was to become operational. S&P will evaluate the outcome of the review which is to be released by the project manager in about two months. It will also assess the ability of each participating utility to absorb the financial impact of the delay and any related cost overruns, rate relief requirements, added external financial pressures, vulnerability of coverage and cash flow levels, and implications for timing of completion of units 2 and 3.

Carolyn Perch

Ratings profile: Arizona Public Service first mortgage bonds, 'A-'. Preferred stock 'A-'. Public Service Co. of New Mexico first mortgage bonds 'AA'. Preferred stock 'A'. Commercial paper, 'A-1+'. El Paso Electric Co. first mortgage bonds 'A+'. Preferred stock 'A-'. Commercial paper 'A-2'.

Consumers Power Co. Detroit Edison Co. CreditWatch update

A measure to restrict use by Michigan utilities of automatic fuel adjustment clauses may be placed on that state's November ballot. A state legislative committee is examining a similar proposal which would subject such increases to expanded regulatory commission approval with regard to the recovery of fuel expenses. Both measures could negatively affect cash flow, earnings levels and financial flexibility of Consumers Power and Detroit Edison. It is presently unclear what latitude the public service commission will have under either to preserve the financial integrity of these companies under either proposal. These events supercede conditions which placed the utilities on CreditWatch last Jan. 25 when questions concerning authority

of state regulators to monitor utilities were placed before the Michigan Supreme Court. S&P continues to maintain surveillance of legal and political developments and will assess the impact of any changes emanating from these actions on bondholder protection.

William J. Stow

Ratings profile: Detroit Edison first mortgage bonds 'BBB-'. Preferred stock 'BB+'. Preference stock 'BB-'. Commercial paper 'A-3'. Consumers Power first mortgage bonds 'BBB-'. Debentures 'BB-'. Preferred stock 'BB+'. Preference stock 'BB-'. Commercial paper 'A-2'.

(continued on next page)

CreditWatch

Issuer	Potential Credit Implications	Current Ratings			Write-up	
		Senior Debt	Sub. Debt	Comm. Paper	Issue	Page
Utilities, Transportation						
American Telephone & Telegraph Co.	Developing	AAA		A-1+*	1/18/82	1941
Bell System Co.	Developing	AAA		A-1+*	1/18/82	1941
New England Tel. & Tel. Co.	Developing	AA+		A-1+*	1/18/82	1941
Pacific Tel. & Tel. Co.	Developing	A-		A-1+*	1/18/82	1941
Excluding Southern New England Tel. & Tel. Cincinnati Bell and Western Electric Co.						
Arizona Public Service Co.	Negative	A-	A-**		4/26/82	1495
Consumers Power Co.	Negative	BBB-	BB+**		4/26/82	1495
Detroit Edison Co.	Negative	BBB-	BB+**	A-3	4/26/82	1495
El Paso Electric Co.	Negative	A+	A-**	A-2	4/26/82	1495
Flying Tiger Line Inc.	Negative	BBB-			2/22/82	1789
General Telephone Co. of California (GTE unit)	Negative	BBB+	BBB		4/19/82	1529
New Orleans Public Service Co.	Negative	BBB+	BBB**		4/26/82	1494
Pacific Gas & Electric Co.	Negative	AA-	A**	A-1+*	1/25/82	1910
Public Service Co. of New Mexico	Negative	AA	A	A-1+	4/26/82	1495
UAL Inc.	Negative		BBB-		2/1/82	1874
United Air Lines Inc.	Negative	BBB	BBB-		2/1/82	1874
Industrials, Retailing						
Baldwin Co. (D.H.)	Negative	-		A-2	2/22/82	1789
Baldwin-United Corp.	Negative		BB+		2/22/82	1789
Basco Inc.	Positive	B-			3/22/82	1665
Brunswick Corp.	Negative		BBB-	A-2	3/8/82	1738
Brunswick Pulp & Paper Co.	Negative			A-1	3/29/82	1635
Columbia Pictures Industries Inc.	Positive		BBB-		4/19/82	1529
Combustion Engineering Inc.	Positive	A			4/5/82	1588
Ethyl Corp.	Negative		A-**		2/15/82	1813
GAF Corp.	Negative	BB+	B+**		3/8/82	1737
Hanna Mining Co.	Negative	A			4/19/82	1529
Jones & Laughlin Steel Corp.	Positive	BB	B+		1/11/82	1967
Kaiser Cement Co.	Negative		BBB-		3/22/82	1665
Levi Strauss & Co.	Negative	AA		A-1+	4/5/82	1588
Lone Star Industries Inc.	Negative	BBB	BBB-		3/22/82	1665
Manville Corp.	Negative	A-	BBB**	A-1	3/8/82	1737
Mead Corp.	Negative	A	BBB**	A-1	3/8/82	1738
Nabisco Brands Inc.	Negative		AA-**	A-1+*	2/1/82	1874
Nabisco Inc.	Negative	AA			2/1/82	1874
National Gypsum Co.	Negative	A+			3/8/82	1737
Owens-Corning Fiberglass Corp.	Negative	A+		A-1	3/8/82	1737
Pottlatch Corp.	Negative	A	A-**	A-1	4/5/82	1588
Revere Copper & Brass Inc.	Negative	BBB	BBB-		2/22/82	1789
Standard Brands Inc.	Negative	AA-			2/1/82	1874
Twentieth Century Fox Film Corp.	Negative	BBB	BBB-		3/8/82	1738
Witco Chemical Corp.	Negative	A+	A		1/25/82	1911
Youngstown Sheet & Tube Co.	Positive	B+			1/11/82	1967
Financial Institutions						
Creditrith Financial Corp.	Positive	A	A-	A-1*	3/29/82	1635
Dial Financial Corp.	Positive	AA-	A+	A-1+*	4/5/82	1588
Marshall Field Credit Corp.	Developing			A-2	3/22/82	1666
MGIC Investment Corp.	Negative	A	A-	A-1	2/22/82	1789
Northwest Bancorp.	Negative	AAA	AA+	A-1+*	12/7/81	351
Provident National Corp.	Positive			A-1	4/26/82	1495
Southeast Banking Corp.	Negative	A		A-2	3/8/82	1738
United Airlines Credit Corp.	Negative			A-1	2/1/82	1874
International						
B.A.T. Industries P.L.C.	Negative	AA-		A-1+	3/22/82	1666
Hudson's Bay Oil & Gas Co.	Negative	Suspended			2/22/82	1789

QUESTION:

"128. Mr. Boris, by affidavit of September 18, 1981, to the Michigan Supreme Court, stated that he was requested to appear before Standard and Poors ("S&P") during the week of September 21-25, 1981, after which S&P would make a further review of the Company's security ratings.

Please provide all writings prepared:

- (A) in anticipation of the S&P appearance.
- (B) for preparation to S&P."

ANSWER:

No writings were prepared in anticipation of the S&P appearance.

Materials provided to S&P at the meeting were the proposal for decision in MPSC case U-6360, the MPSC order in case U-6360 and the Supreme Court decision and desenting opinions on the motion to vacate the stay in the Detroit Edison Case.

Subsequently the briefs of Consumers Power Company, the Michigan Attorney General and Michigan Citizens Lobby, and Michigan Public Service Commission have been sent along with the Supreme Courts October 16 order vacating the stay of the securities authorized by the Michigan Public Service Commission in case U-6360.

Prepared by G L Schwass

THOMAS HEARRON (3/31/83)(sic)

10.B COMMENT: RAD HEALTH EFFECTS

Environmental impacts: the report's section on radiological impacts is based on data which is questionable at best and outdated at worst; more recent studies suggest that the present allowable radiation limits are too high to bring about the safety desired.

RESPONSE

The radiological impacts in the DES are based on the best information currently available and generally accepted by the scientific community. It is difficult to respond to this general statement which does not identify the "more recent studies." To respond it is assumed that the reference to recent studies is based on the work of Loewe and Mendelsohn. The implications of these studies have not been resolved although several controversial opinions on the data have been published. Even Loewe and Mendelsohn are on record that revision of gamma radiation dose estimates based on their work is unfounded. (1) For additional information on the Loewe and Mendelsohn research, refer to Attachment C.

REFERENCES

1. "Radiation Estimates," Letters, Science, Vol 213, July 3, 1981.

THOMAS HEARRON (3/31/83)(sic)

10.C COMMENT: IMPACT ON DOWNSTREAM RIVER USERS

Further, the degradation of water quality in the Tittabawassee River foreseen in the report is quickly glossed over (sic). However, users of water downstream from the plant (e.g., the city of Bay City, Michigan) will be saddled with additional costs for purification, while such costs could stultify the growth and development of new industry.

RESPONSE

The degradation referred to by the commenter relates to TDS discharges from the Midland Plant as discussed in the second paragraph of Section 5.3.1, Page 5-2 of the DES. Applicant's comments on the DES set forth the Company's position regarding TDS impact on the river. These comments indicate little or no downstream impact and are thoroughly discussed in response to the Thomas L Washington comment (12.J.(5)).

The concern of TDS impact on river water quality and downstream users was thoroughly addressed by Steve Casey (Michigan Department of Natural Resources (MDNR), Comprehensive Studies Section) at the April 26, 1982 meeting of the Michigan Environmental Review Board. MDNR Staff's presentation can be summarized as follows:

- a. Midland Plant cooling pond blowdown is expected to average 880 mg/l TDS with a maximum concentration of 2,200 mg/l.
- b. Plant TDS mass loading represents about 2% of total river load.
- c. River concentration of TDS as measured at Freeland Bridge will not exceed Water Quality Standards of 500 mg/l average and 750 mg/l maximum as a result of TDS input from the cooling pond discharge at the Midland Plant.
- d. The "designated use" for the Tittabawassee River per R323.1100(1) of Part 5 of the Water Resources Commission (WRC) General Rules is "As a minimum, all waters of the State shall be protected for agricultural uses, navigation, industrial water supply, public water supply at the point of water intake, warm-water fish and partial body contact recreation" (emphasis added).
- e. The water quality standards of 500 mg/l average and 750 mg/l maximum for TDS were designed to protect for the most restrictive designated uses which are public and industrial water supply.
- f. Per EPA's Quality Criteria for water (Red Book), freshwater fish can tolerate TDS concentrations from 5,000 to 10,000 mg/l.

Downstream users beyond Freeland Bridge, such as Bay City, will not incur additional costs for purification because of TDS loading from the Midland Plant cooling pond discharge. As indicated above, State Water Quality

10.C (Continued)

Standards of 500 mg/l average and 750 mg/l maximum for TDS will not be exceeded at Freeland Bridge as a result of plant discharges. Moreover, Steve Casey (MDNR Staff) advises that there are many public water intakes with TDS concentrations near 1,000 mg/l. Moreover, he also advised that in this range of concentration, intake water would not require treatment for TDS reduction.

In summary, Midland Plant discharges of TDS will not impair the designated uses of the river. Therefore, future downstream users will be able to locate intakes in the river.

THOMAS HEARRON (3/31/83)(sic)

10.D COMMENT: WATERFOWL EFFECTS

Finally, the findings on effects to waterfowl are based on pure speculation.

RESPONSE

This comment alleges that the NRC Staff's findings on effects to waterfowl "are based on pure speculation." This is not the case.

Since 1979, Michigan State University has been under contract to study waterfowl (and other waterbird) use of the Midland Plant cooling pond and vicinity. The Michigan State team is led by Dr Harold H Prince, a noted waterfowl biologist and assistant chairman of MSU's Department of Fisheries and Wildlife. Two Michigan State University annual reports are cited as References 24 and 25 of Chapter 5 of the DES. While the results of these preoperational studies do not allow the prediction of future impacts with complete certainty, they do provide a context for impact assessment. On-going preoperational monitoring and anticipated operational monitoring will enable Consumers Power Company to more fully assess potential impacts to waterfowl and to take measures to prevent such impacts.

THOMAS HEARRON (3/31/83)(sic)

10.E COMMENT: FOG IMPACTS

...the section on anticipated fogging from the plant's cooling pond underestimates the seriousness of the matter: area school buses and trucks carrying hazardous wastes from Dow Chemical Company will be using the roads affected.

RESPONSE

The commenter has not provided any basis for this comment. The anticipated effects of fogging resulting from operation of the pond have been discussed in detail in response to comments 3.E, 8.B and 9.C. These detailed responses make it clear that contrary to the commenters position, the DES probably overstates anticipated fogging effects.

JAMES F WILSON (4/1/82)

11.A COMMENT: NUCLEAR WASTE DISPOSAL

I feel the issue of nuclear waste disposal has not been sufficiently addressed.

RESPONSE:

The commenter provides no definition or substance within this comment. As a consequence, it should be dismissed as frivolous. This is a National issue being resolved at the Federal level for the entire nuclear industry nationwide.

JAMES F WILSON (4/1/82)

11.B COMMENT: RAD HEALTH EFFECTS

I oppose the Draft Environmental Statement as written and its conclusions ... in light of new radiological research indicating errors in the Hiroshima bomb studies (used as a basis for health risk calculations in the DES.)

RESPONSE

The authors of the "new radiological research" have stated that they "fail to see how (their) work can be a basis for assigning a greater hazard to gamma radiation."⁽¹⁾ For lack of a definitive implication of this new research on radiation protection standards, the estimates of radiological impact in the DES are based on the best information currently available. For additional information on this new research, refer to Attachment C on BEIR III and the Research of Loewe and Mendelsohn.

REFERENCES

1. "Radiation Estimates," Letters, Science, Vol 213, July 3, 1981.

THOMAS L WASHINGTON - DES (4/2/82)

12.A COMMENT: STATE LAWS

In addition to our comments on the adequacy of the DES pursuant to NEPA, we have attached comments directed to the State of Michigan Department of Natural Resources (MDNR) concerning the adequacy of this document to satisfy state laws and our questions and objections relating to issuance of the draft NPDES permit. Contrary to the statement in the DES (5.3.2.2), the Michigan Water Resources Commission (MWRC) has not "issued" a draft NPDES permit, but has merely placed such a proposed draft on public notice. Further, the DES (1.2) states: "the staff is not aware of any potential non-NRC licensing difficulties that would significantly delay or preclude the proposed operation of the plant." I can assure you, on behalf of the MUCC, that such a sanguine observation is inaccurate. Resolution of objections to proposed degradation of the Tittabawassee River through public review of the NPDES permit may very well "significantly delay" the proposed operation of the Plant.

RESPONSE

MWRC has placed a draft NPDES Permit for the Midland Plant on Public Notice. The NRC Staff's finding that no potential non-NRC licensing difficulties exist that would significantly delay or preclude the proposed operation of the Plant is valid. Proposed degradation of the river as suggested by the commenter will not occur as discussed in the response to comment 12-J(5).

Contrary to the opinions expressed in this comment, Consumers Power is not aware of any issues which have not been resolved or are not under active resolution with the Michigan Department of Natural Resources.

THOMAS L WASHINGTON - DES (4/2/82)

12.B COMMENT: THERMAL DISCHARGE/FISH KILLS

Thermal/Chemical/Radioactive Discharge to Tittabawassee River

The DES (5.5.2.2) concludes that the thermal discharge to the Tittabawassee River will result in "negligible impact." This is directly contradicted by statements by MDNR fisheries biologists in review of the DES before the Michigan Environmental Review Board (March 27, 1982). They claim the high discharge temperatures will "kill fish" and have clear negative impact on the river.

RESPONSE

The MDNR fisheries biologist made an informal response to an impromptu question. Even though the Company believes that the original discharge limits would not have created "fish kills," we proceeded to further limit our discharge temperatures. Since the March 22, 1982 Michigan Environmental Review Board meeting additional thermal discharge restrictions, as identified in the attached Table I, have been accepted by the Company for inclusion in the NPDES Permit. This table will be included in the final NPDES permit as part of the special conditions regulating thermal discharges.

MDNR fisheries biologists have stated that operation of the Plant within these restrictions and other operational constraints to meet TDS and thermal mixing zone requirements will preclude lethal effects to fish in the Tittabawassee River.

ALLOWABLE DISCHARGE TEMPERATURES
MIDLAND PLANT
COOLING POND BLOWDOWN

<u>Month</u>	<u>Discharge Temperature (°F)</u>
December	75 ⁽¹⁾⁽²⁾
January	75 ⁽¹⁾⁽²⁾
February	75 ⁽¹⁾⁽²⁾
March	80 ⁽¹⁾⁽²⁾
April	85 ⁽³⁾
May	95 ⁽³⁾⁽⁴⁾
June	95 ⁽³⁾⁽⁴⁾
July	95 ⁽³⁾⁽⁴⁾
August	95 ⁽³⁾⁽⁴⁾
September	95 ⁽³⁾⁽⁴⁾
October	90 ⁽³⁾
November	85 ⁽³⁾

(1) Maximum weekly average temperature.

(2) In the event of a Plant shutdown, sudden termination of the discharge will not occur. Rather, the normal pond discharge criteria will be followed until the discharge reaches 5 cfs at which time discharge may be terminated.

(3) Maximum temperature, except as provided in Footnote 4.

(4) Discharges of up to 5 cfs are permitted when discharge temperatures are greater than 95°F but not greater than 100°F. No discharge is allowed when the cooling pond blowdown discharge temperature is greater than 100°F.

TABLE I

THOMAS L WASHINGTON - DES (4/2/82)

12.C COMMENT: SYNERGISTIC EFFECTS

There is no discussion in the DES of the relationship between increased water temperature and increased chemical reactions from other pollutants discharged by Consumers or by Dow Chemical Company. The Dow NPDES permit is being reviewed at this time by the MWRC and consideration of additive or synergistic effects of the two federal permits is an obvious omission in the DES. Dow is currently discharging, based on our estimates, over 200,000 pounds of chlorinated organic chemicals directly into the proposed Consumers mixing zone. This includes thousands of pounds of highly toxic substances and carcinogenic chemicals.

RESPONSE

The DES does not include a discussion of the relationship between increased water temperature and increased chemical reactions due to other pollutants discharged by Consumers or by Dow Chemical Company. This issue, however, has been addressed. On July 28, 1978 the Michigan Department of Natural Resources (MDNR) Staff requested Consumers Power to analyze the possible interaction between critical materials discharged from the Dow Chemical Company and thermal effluent from the Midland Plant. A September 13, 1978 letter from the MDNR provided a list of critical materials to be included in the scope of the analysis. This list originated from Dow's annual wastewater report of critical materials discharged during 1977. The resulting analysis was provided in the Company's Amendment 1 to the State Discharge Permit Application dated October 20, 1978. Subsequently, the Company provided the MDNR a report entitled, "Effects of Selected Toxicants and Thermal Discharge Interactions on Aquatic Biota." The MDNR utilized these data and thermal discharge restrictions addressed in response to comment 12(B) in preparation of a formal response and discussion to the Michigan Environmental Review Board on April 26, 1982. The MDNR concluded that the interaction of the Dow and Midland Plant discharges should not adversely affect the aquatic life in the river based on the current state of knowledge on synergistic effects under these conditions.

THOMAS L WASHINGTON - DES (4/2/82)

12.D COMMENT: BIOACCUMULATION

There is no discussion in the DES of potential bioaccumulation of radioactive materials by aquatic organisms. The DES (5.9.3.3) does state that "increased radiosensitivity in organisms may result from environmental interactions with other stresses (for example, heat or biocides)" but the converse possibility is not mentioned. It concludes that "no measurable radiological impact on populations of biota is expected" based on experiences observed at other nuclear plants. However, we are aware of no other nuclear plant where the plant's mixing zone overlaps the mixing zone of a major chemical plant's wastewater discharge.

RESPONSE

Although not specifically mentioned in the DES the issue of bioaccumulation in the biota has been addressed in considering the environmental impact of the plant. In the Environmental Report (ER), Consumers Power calculated dose rate estimates for biota other than man. Table 5.2-17 in the ER gives the calculated concentration of the radionuclides in the biota other than man. Their respective dose rates are shown in Table 5.2-18.⁽¹⁾ The models used to calculate radiation doses to biota are similar to the dose models used to calculate radiation doses to man, given in Regulatory Guide 1.109.⁽²⁾ In calculating the concentrations in the secondary organisms, the data for the fractions of radionuclides ingested and retained in the whole body of the biota and biological half lives of the radionuclides are assumed to be the same as for man. Because lower animals have generally higher metabolic rates than man, this assumption on biological half life is conservative. The bioaccumulation factors used in the estimation of fish, invertebrate, and aquatic plants are also taken from Regulatory Guide 1.109. The calculated levels of radiation dose given in ER Table 5.2-18 are far below levels which would be harmful to these species.

With respect to the issue of chemical and radioactivity synergism, this issue was discussed extensively in the Construction Permit hearings with Dr Meierotto, a biologist, Dr Nordahl, a biologist and Dr Sternglass, a physicist, testifying for the Mapletown Intervenors and Dr Rust, Professor of Pharmacology and Radiobiology, Dr Eisenbud, Professor of Environmental Medicine, and Dr Whipple, Professor of Radiological Health, testifying for the Applicant. The following was concluded by the ASLB:

"Viewed in the light most favorable to Intervenors, and without considering the countervailing evidence of Applicant and the Staff, the evidence fails to establish that, at the levels of concentration involved here, there will be any interaction which would tend to increase radiation effects from the Plant, or the chemical effects from the Plant, or the chemical effects from Dow. And when one considers the testimony of Applicant and Staff witnesses, the evidence is overwhelming against a finding of "synergism".⁽³⁾

12.D (Continued)

With respect to the issue of thermal interaction, refer to the previous related comment and response to this letter, Item 12.C.

REFERENCES

1. Environmental Report - Operating License Stage, Midland Plant - Units 1 and 2.
2. Regulatory Guide 1.109, "Calculation of Annual Dose to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance With 10 CFR 50, Appendix I," US Nuclear Regulatory Commission, Revision 1, October 1977.
3. Atomic Safety and Licensing Board, Initial Decision, December 14, 1972; Paragraphs 64-66.

THOMAS L WASHINGTON - DES (4/2/82)

12.E COMMENT: RIVER BIOTA IMPACT

The DES (5.5.2.4) concludes that "no adverse impact on river biota is expected" due to reduced dissolved oxygen in the river. No substantiation for this conclusion is provided.

RESPONSE

On July 28, 1978 the Michigan Department of Natural Resources (MDNR) Staff requested that Consumers Power assess the effect of the Midland Plant's cooling pond discharge on dissolved oxygen levels in the Tittabawassee River. The assessment was completed and a report entitled, "Effect of Midland Power Plant on Tittabawassee River Dissolved Oxygen" was provided to the MDNR. A summary of this report is presented in Appendix F of the Midland Plant NPDES Permit Application Revision 3, dated September 30, 1981.

The assessment concluded that Tittabawassee River dissolved oxygen levels will remain well above the State Water Quality Standard for dissolved oxygen. Therefore, no adverse impact on river biota due to reduced dissolved oxygen in the river can be anticipated.

THOMAS L WASHINGTON-DES (4/2/82)

12.F COMMENT: GROUNDWATER IMPACTS

The DES (4.2.6.1) states that the cooling pond "will be the intermediate sink for many plant chemical wastes..." It also states (5.3.1) that seepage from the cooling pond to groundwaters is occurring (sic). No discussion is included regarding potential water quality impacts from such seepage, or whether potential water quality degradation may violate Michigan groundwater protection regulations.

RESPONSE

The Company's comments to the NRC on the DES (Serial 16594, April 2, 1982) clarify which wastewater streams are normally routed to the cooling pond. The cooling pond will routinely receive several Plant wastewater streams prior to their discharge to the Tittabawassee River. These wastewater streams are the iron removal sump effluents, Unit 1 and 2 clean waste sump effluents, spent circulating and service water treatment chemicals, and wastes from the sodium hypochlorite generation system.

Expected wastewater characteristics of the cooling pond are (based on Exhibit VII, Table 2, Midland NPDES Permit Application, Revision 3, September 30, 1981):

EXPECTED CHEMICAL CHARACTERISTICS OF COOLING POND

<u>Parameter</u>	<u>Average/Maximum Concentration</u>
pH	7.0-9.0
TSS, mg/l	<100
TDS, ppm	980/2,290
Ca, mg/l	150/360
Mg, mg/l	40/85
Na, mg/l	70/220
SO ₄ , mg/l	375/840
Cl, mg/l	145/425
P, mg/l	0.06/0.3
NH ₃ , mg/l as N	<2.0
Ag, mg/l (a)	0.006/0.04
Hg, mg/l (a)	0.003/0.02
Pb, mg/l (a)	0.04/0.18
Ni, mg/l (a)	0.03/0.11
Zn, mg/l (a)	0.05/0.22
Oil and Grease	<15/<20
Total Residual Chlorine, mg/l	<0.2/<0.3

- (a) Concentration listed for these materials result from pond evaporative concentration of ambient river levels of these materials.

12.F (Continued)

Section 5.3.1 of the DES does not state that seepage from the cooling pond to "groundwaters" is occurring. Rather, it reflects the fact that cooling pond water has migrated into the captive fill beneath the station and that the level of the perched water table beneath the station has risen accordingly. The station, captive fill and its perched water table are all within the same confines as is the pond, ie, the dike and impervious layer underlying the entire pond and station area.

DES Section 5.3.1 references Section V.B of the FES-CP as still being valid. That FES-CP Section substantiates that pond water seepage through the dike and impervious underlying layer to ground water will be minimal.

As stated in Section 5.3.1 of the DES, during Plant operation the water which does seep into the station area will be returned to the cooling pond (by wells that are now being installed) rather than to the Tittabawassee River.

As indicated above, some wastewater streams normally will be routed to the cooling pond. The discharge of cooling pond water to the river is regulated by NPDES permit limits. Contravention of State Water Quality Standards for surface water and Michigan Groundwater Protection Regulations are not anticipated. Water quality monitoring programs will assure compliance with Michigan Standards and regulations.

THOMAS L WASHINGTON (4/2/82)

12.G COMMENT: FOG INTERACTIONS WITH RAD/CHEMICALS

Fogging Impacts from Cooling Pond:

The DES (5.4.1) discusses the predicted dense fog from the cooling pond which is expected to be "quite common" in the area. However, no discussion is included of possible air and water quality impacts from interaction with radioactive gases from the plant or with chemical discharges from Dow. Will the fog entrap such pollutants? Will such possible concentrations fall out and increase water quality impacts in the local watershed?

RESPONSE

The issue of potential interaction of cooling pond fog with pollutants in the air over Midland was raised during the Construction Permit Stage. In the FES-CP, this issue was dismissed by noting that if the phenomena was a real possibility, it should have manifested adverse effects in the area during periods of natural fogging. No such effects have been observed. (1) For an additional discussion on the subject, refer to the response to the Vicente Castellanos comment on fogging of airborne effluents (8.C). Likewise, no significant interaction between cooling pond fog and low-level radioactive releases are expected during routine Plant operation. This assessment is based on the nature of cooling pond fog, the elevation of routine radioactive airborne releases, and the lack of evidence of such effects at other nuclear power plants. For a more detailed discussion on this subject, refer to Attachment B.

For a response on hypothesized synergistic effects on water quality, refer to the previous related comment and response to this letter, 12.C.

REFERENCE

1. FES-CP, Section XII.B, p XII-4.

THOMAS L WASHINGTON - DES (4/2/82)

12.H COMMENT: EXCLUSION ZONE

Exclusion Zone:

The DES (5.9.4.4.(2)) discussed the "exclusion area," including portions of the Tittabawassee River and Bullock Creek. It is not clear if this exclusion of the public from publicly-owned surface waters is proposed only during accidents or will be routine. Routine exclusion would be illegal.

RESPONSE

As described in Section 5.9.4.4(2) of the DES, portions of the Tittabawassee River and Bullock Creek lie within the exclusion area. The DES also states that local and State agencies will evacuate and limit access to the exclusion area should the need arise. The authority for such action is delegated by the Michigan Emergency Preparedness Act. There will be no routine exclusion of the public from the surface waters of the Tittabawassee or Bullock Creek. Consumers Power, with aid of the police/sheriff, will only evacuate the area during an emergency that necessitates such an evacuation.

THOMAS L WASHINGTON - DES (4/2/82)

12.I(1) COMMENT: ANALYSIS OF ALTERNATIVES - COOLING POND BLOWDOWN TOWER

The DES (3.2) concludes that consideration of alternatives is not required for the operating-license stage. However, a major change from the proposal outlined in the construction permit final environmental statement is elimination of a cooling tower.

RESPONSE

The Company concurs with the NRC Staff conclusions presented in DES Section 3.2. There has been a change in the design of the Plant's cooling water system which included the elimination of the blowdown cooling tower.

Applicant's Environmental Report Supplement (ERS) was distributed to appropriate State and Federal agencies in 1976 per the NRC required distribution list and has been a matter of public record since then. ERS Section 3.4⁽¹⁾ discussed the Plant's heat dissipation system after the elimination of blowdown cooling towers. Earlier in 1976 the Company had reviewed with the Michigan Department of Natural Resources (MDNR) the elimination of the blowdown cooling tower. The Company was advised by letter from the MDNR that the requirements applicable to the cooling pond discharge would be those specified in the State Water Quality Standards. These standards can be met without a cooling tower on the pond discharge. Operating a cooling tower on the pond discharge would have negative effects. These would have included reduced reliability of operations and emissions of water vapor and drift which could contribute to icing of power lines and to fogging in the vicinity of the towers. The blowdown cooling towers also would have increased levelized annual cost by approximately two million dollars.

In summary, the cooling tower on the cooling pond discharge was eliminated, with MDNR knowledge, because it was not needed to meet State Water Quality Standards, it had potential negative operating effects during cold weather and it was costly.

Since Michigan Water Quality Standards will be met with the as constructed heat dissipation system, there is no compelling environmental or safety concern which merits a complete review of alternative cooling water systems or subsystems.

REFERENCES

1. ERS, October 26, 1979; Section 3.4, pp 3.4-1,2.

THOMAS L WASHINGTON - DES (4/2/82)

12.I(2) COMMENT: ANALYSIS OF ALTERNATIVES - MAKE-UP/RETURN FROM LAKE HURON

...No mention is made of the alternative of obtaining cooling pond make-up water from Lake Huron, nor of resulting positive and negative impacts which would ensue.

No mention is made of the alternative of returning such Lake Huron waters to Lake Huron for discharge.

RESPONSE

While these are alternatives which could be considered should a backup source of makeup water and disposal point for blowdown be deemed necessary, the Company does not believe they are justified as a substitute for the present design which utilizes the Tittabawassee River as the sole means of each. The present design meets the State Water Quality Standards established by the Michigan Department of Natural Resources and the Plant can operate successfully as designed. Based on this, the high costs associated with obtaining Lake Huron water from the City of Midland and/or laying one or two additional pipelines to Lake Huron, are not justified.

THOMAS L WASHINGTON - DES (4/2/82)

12.I(3) COMMENT: ANALYSIS OF ALTERNATIVES - MAKE-UP AT HIGHER RIVER FLOW

No mention is made of the alternative of using a higher base-flow rate than 350 cfs to withhold blowdown to the Tittabawassee River (such as 500 cfs).

RESPONSE

The commentor has confused information related to the establishment of a minimum river flow at which river water can be withdrawn for cooling pond makeup with cooling pond blowdown (discharge to the river).

The cooling pond blowdown discharge frequency and rate will be controlled to follow changes in river flow, temperature and level of total dissolved solids to assure that the discharge does not cause Michigan Water Quality Standards to be exceeded. The blowdown may be continuous during some seasons of the year (periods of high river flow) and intermittent in the remaining seasons depending on river conditions. There is no mention of an alternative of using a higher base-flow rate than 350 cfs to withhold blowdown to the Tittabawassee River (such as 500 cfs) because the criteria for allowing or not allowing blowdown is and continues to be the State of Michigan Water Quality Criteria applicable to this reach of the Tittabawassee River.

THOMAS L WASHINGTON - NPDES (4/2/82)

12.J(1) COMMENT: STATE EIS

Issuance of the proposed permit is clearly a major state action, pursuant to Executive Order 1974-4 and requires preparation of a state environmental impact statement. Just as clearly, the Federal Environmental Statement is inadequate to satisfy the federal standards and would be inadequate to fulfill state requirements. We request preparation of an EIS under the executive order on questions outlined in the attached comments and those discussed below directly relating to the proposed NPDES Permit.

RESPONSE

The Company believes that a State Environmental Impact Statement is not required for the issuance of the NPDES Permit because the NRC's Draft and Final Environmental Statements would adequately serve that purpose.

THOMAS L WASHINGTON - NPDES (4/2/82)

12.J(2) COMMENT: WATER WITHDRAWAL LIMITS

Part I(A)(19) proposes to authorize withdrawal of water from the Tittabwassee River for cooling pond makeup. Such authorization is not within the legal powers of the Michigan Water Resources Commission.

RESPONSE

We concur with the comment (reference Consumers Power Company letter to Michigan Environmental Review Board dated 3/10/82, copy attached). This does not prohibit the Company from making such withdrawals under our riparian rights.



**Consumers
Power
Company**

Paul C Hittle
Director of Environmental Activities

Hitt 38-82

General Offices: 212 West Michigan Avenue, Jackson, MI 49201 • (517) 788-1930

March 10, 1982

Dr William Cooper, Chairman
Michigan Environmental Review Board
Michigan State University
East Lansing, MI 48823

Dear Dr Cooper

Attached are responses to the remaining questions raised by the Board on February 22 or Subcommittee members on February 26 concerning the Draft Environmental Statement or draft NPDES Permit for the Midland Plant.

Should you require additional information on these responses, please contact me.

Yours very truly

Paul C Hittle

PCH/kek

BCC: WLBeckman, Midland (w/attach)
RFGreen, P-14-204 (w/attach)
BWMarguglio, JSC-220A (w/attach)
MRPutnam/RLFobes, JSC-285A (w/attach)
DASommers, P-14-106 (w/attach)
ATUdryes, M-1023 (w/attach)
RAWells, Jr, P-14-113A (w/attach)

1. QUESTION

Does the Michigan Water Resources Commission have the authority to "permit" the withdrawal of river water?

ANSWER

The Water Resources Commission lacks the authority to permit or prohibit the withdrawal of water in this instance. A riparian owner under the common law is entitled to make reasonable use of the waters of the river upon which his land is located. This doctrine provides the basis upon which the Company is entitled to withdraw water from the Tittabawassee River.

Even though the State lacks the authority to include provisions in the NPDES permit that either permit or prohibit the withdrawal of water in this instance; the Company nonetheless, as it has previously stated, intends to limit its withdrawal of water in accordance with the withdrawal schedule identified in the draft permit.

3/10/82

THOMAS L WASHINGTON - NPDES (4/2/82)

12.J(3) COMMENT: TDS MEASUREMENT

Part I(A)(4) proposes standards for total dissolved solids as measured at the Freeland Bridge, approximately seven miles downstream. Such an extensive mixing zone clearly violates Part 4 Water Quality Standards.

RESPONSE

The statement regarding a clear violation of Part 4 Water Quality Standards is incorrect. There is no limitation on the allowable length of a mixing zone in the Water Quality Standards. This monitoring location for TDS is appropriate because of the unique characteristics associated with this reach of the Tittabawassee River and existing TDS contribution to the river. The measurement of TDS concentrations at point-source outfall locations does not provide assurances that the standard is not exceeded "as a result of controllable point sources," because the total river TDS concentration is the summation of a number of point and nonpoint contributions. Compliance with the TDS limits is determined at a point in the river downstream from where discharges from Consumers Power Company, Dow Chemical and the City of Midland become fully mixed. The Freeland Road Bridge location is accessible and meets the mixing criterion. Therefore, the Michigan Department of Natural Resources (MDNR) Staff and the Company believe it appropriate to use the Freeland Bridge location. Staff of the MDNR Environmental Services Division have indicated they plan to verify the appropriateness of this monitoring location during a proposed river study planned for August of this year.

There are no mechanisms at these TDS concentrations and pH conditions which would alter river TDS quantities by measurable amounts during the time of travel from the Plant to Freeland Bridge. Part 4 Water Resources Commission Administrative Rules set the State's Water Quality Standards which limit the concentrations of TDS in the waters of the State. Rule 1051 states that "in no instance shall total dissolved solids in the waters of the State exceed a concentration of 500 milligrams per liter as a monthly average nor more than 750 milligrams per liter at any time as a result of controllable point sources." This standard has been set to protect public drinking water and industrial water supply and is far below the recognized level necessary to protect aquatic life.

Operation of the cooling pond discharge will be controlled to assure that river water quality standards for TDS will not be exceeded due to the cooling pond effluent.

THOMAS L WASHINGTON - NPDES (4/2/82)

12.J(4) COMMENT: FISH KILLS/THERMAL PLUME

The Fact Sheet states that maximum summer discharge temperatures of 100 degrees F will be authorized. Yet fisheries biologists claim this will result in fish kills, clearly contrary to Act 245,1929. Responsibility for cutting back on discharge of total dissolved solids (Consumers, Dow, or Midland) when maximum limits are reached is ambiguous, at best.

RESPONSE

A Michigan Department of Natural Resources fisheries biologist made an informal response to an impromptu question at a Michigan Environmental Review Board meeting. Even though the Company believes that the original discharge limits would not have created "fish kills," we proceeded to further limit our discharge temperatures. Since the March 22, 1982 Michigan Environmental Review Board meeting, additional thermal discharge restrictions, as identified in Table I attached in response to comment 12.B, have been accepted by the Company for inclusion in the NPDES Permit. This table will be included in the final NPDES permit as part of the special conditions regulating thermal discharges.

MDNR fisheries biologists concur that operation of the Plant within these restrictions and other operational constraints to meet TDS and thermal mixing zone requirements will preclude lethal effects to fish in the Tittabawassee River.

The Company will monitor and control total dissolved solids to assure that water quality standards for TDS are not exceeded as a result of the Plant's discharge.

THOMAS L WASHINGTON - NPDES (4/2/82)

12.J(5) COMMENT: DOWNSTREAM DEGRADATION

The federal draft environmental statement concludes that (Abstract):
 "Chemical discharges are expected to further decrease the existing marginal water quality of the Tittabawassee River and may adversely affect future downstream water use, but will be required to meet conditions of the plant's NPDES permit." Part 5.3.1 concludes that the plant "may produce small to moderate impacts on existing and potential new water users in terms of additional water-treatment costs." Issuance of an NPDES permit which would permit such adverse impacts to downstream riparians would be illegal. Further, the first statement makes little sense; the purpose of an NPDES permit is to prevent water quality degradation, not require it.

RESPONSE

The DES concludes that plant total dissolved solid (TDS) discharges may produce a small to moderate impact on existing and potential new water users. It is the Consumers Power Company position that since Michigan Water Quality Standards for TDS will not be exceeded in the river due to plant discharges (ie, cooling pond blowdown), Midland Plant TDS discharges will have little effect on present or potential new water users downstream. (1)

The Michigan Water Quality Standards are established to "...protect the quality of waters for recreational purposes, public and industrial water supplies, agriculture uses, navigation and propagation of fish, other aquatic life and wildlife." In addition, the Midland Plant cooling pond blowdown discharge is controlled by an on-line, real-time computer control system designed to match pond blowdown discharges with ambient river conditions to meet Water Quality Standards. (1)

Plant chemical discharges will be within regulatory limits. Plant operation may produce small, intermittent effects on potential new (if any) water users in terms of additional water-treatment costs. There are no present downstream water users that will be affected by Plant TDS discharges (ER-OL, Rev 12, Section 2.1.3.4.1). The TDS concentration in the river is controlled by regulatory limits of 500 mg/l as a monthly average and 750 mg/l as an instantaneous maximum to protect water quality for all uses. Dissolved solids will be a factor in regulating Midland Plant discharges. Plant cooling pond blowdown is controlled continuously to protect against (1) Plant discharges which would cause the river TDS to exceed regulatory limits.

Additional information is presented in the response to the T Hearron Comment 10-C.

REFERENCES

1. Consumers Power Company Letter (Serial 16594) to NRC, DES-OL Comments, April 2, 1982.

THOMAS L WASHINGTON - NPDES (4/2/82)

12.J(6) COMMENT - MERB STATUS

Pending resolution of these questions and others raised by the Michigan Environmental Review Board, and pending completion of public review of a state environmental impact statement, we urge the proposed NPDES permit be denied.

RESPONSE

The questions raised by this letter and the Michigan Environmental Review Board (MERB) have been resolved or are under active resolution with the Michigan Department of Natural Resources (MDNR). At its April 26, 1982 meeting, MERB recommended to the MDNR that certain questions raised by MERB be considered by the MDNR in revising the draft NPDES Permit for the Midland Plant. The MDNR and Water Resources Commission have also scheduled a public hearing on the Midland Plant draft NPDES Permit on May 25, 1982 to provide the public an additional opportunity to make comments on the draft permit. The comments of MERB and the public will be considered by the MDNR prior to issuance of the final NPDES Permit.

As noted in an earlier response to comment 12.J.(1), the Company believes that a state environmental impact statement is not required for the issuance of the NPDES Permit because the NRC's Draft and Final Environmental Statements adequately serve that purpose. In summary, neither any of the specific comments on the NPDES Permit nor the alleged need for an environmental impact statement provide a basis for denial of the NPDES Permit.

SHARON K WARREN (4/4/82)

13.A COMMENT: REACTOR EMBRITTLEMENT

I would like to address one of my many concerns and that is the omission of any mention of a severe problem plaguing pressurized water reactors around the country. That problem, EMBRITTLEMENT, the premature aging of reactor containment vessels due to the neutron bombardment...

Reactors, like those in Midland, have copper in the welds that hold the reactor vessel together. This copper is more susceptible to neutron bombardment damage than the steel walls of the reactor vessel. During a Loss of Cooling Accident (LOCA) temperatures in the core rise. To cool the core, the Emergency Core Cooling System (ECCS) floods the core with cool water (40 to 90 degrees). Such a temperature drop could, according to some sources, cause a rupture of the reactor containment vessel releasing its radioactive contents.

RESPONSE

Although specific mention of these safety-related issues is not made in the DES, they are extensively discussed in the Safety Evaluation Report. ⁽¹⁾ The issues of reactor vessel fracture toughness and pressurized thermal shock are generic safety issues which are currently in various stages of review and resolution by the NRC. In the case of reactor vessel fracture toughness, draft NUREG-0744 ⁽²⁾ has been issued for public comment as a proposed resolution of this issue.

It is also relevant to note that although the DES does not specifically mention the generic issue of pressurized thermal shock, the radiological consequences of such an accident are bounded by the DES assessment of accidents which degrade beyond the design base (Section 5.9.4.5(2)). Given the generic nature of this issue, the extensive SER review, and the enveloping of radiological consequences in the DES, specific omission of this issue from the DES is not significant.

REFERENCES

1. NUREG-0793, Midland Safety Evaluation Report, (May 1982); Subsection 5.3
2. NUREG-0744, "Resolution of Reactor Vessel Materials Toughness Safety Issue," Draft Version (September 1981)

A B SAVAGE (4/4/82)

14.A(1) COMMENT: ECONOMICS - CAPITAL COST

The estimated capital cost of the project is now \$3.44 billion, a stupendous and unjustified overrun.

RESPONSE

The source or derivation of the \$3.44 billion figure is not clear. The Company's current projected capital cost is \$3.39 billion. The "stupendous and unjustified overrun" comment is not substantiated.

Many forces including inflation, additional regulatory requirements, and the aftermath of TMI-2 have contributed to the present capital cost estimate. Regardless of the existing cost, the DES correctly concludes that the value-impact of the Plant is still positive.

A B SAVAGE (4/4/82)

14.A(2) COMMENT: ECONOMICS - ANNUAL COST

And yet more expenditure will be required. Over 30 years, by linear calculation, the capital cost is \$113,111,111 per year. Similarly, interest at 10% on the capital cost is \$340,000,000 per year. False costs are given in sec. 2.1. In reality, for the two significant years:

	1984	1988
Interest, at 1%/yr. (sic)	\$340,000,000	\$340,000,000
Principal/yr.	113,111,111	113,111,111
Taxes/yr.	121,700,000	121,700,000
Fuel + O&M/yr.	135,000,000	179,000,000
Decommission, once,/yr.	263,000	263,000
Total Cost/year	\$710,074,111	\$754,074,111

The report blandly ignores all costs except taxes + O&M! These other costs will be paid by the ratepayers and stockholders.

RESPONSE

Contrary to this allegation, the values given in DES, Table 2.1, are not false costs, but rather reflect those costs which the issuance of an operating license will impact. As the DES clearly explains, in the first paragraph of Section 2.2, capital cost and certain tax expenses are not considered since these are "sunk" costs from the standpoint of the issuance of the operating license. Only the operating or production costs were used for comparison because the Company is applying for an operating license and only operating costs are used for such proceedings. Obviously, as shown in DES Table 2.1, the operating costs with Midland 1 and 2 on line are less than the operating cost without these units.

Ignoring the foregoing point, the commenter's calculation of the revenue requirements for Midland is erroneous in a number of areas:

General

1. A declining rate base was not assumed in the calculation of interest or taxes, as the same amounts were used for both 1984 and 1988.
2. These calculations are presumably based on total investment and are not net of the Dow steam investment which does not have a bearing on electric customers' rates.

Interest

1. A 10% interest cost on capital is stated, when, in fact, interest is currently paid on 45.19% of total capital at a rate of 8.39% which results in roughly \$129 million in interest costs instead of the \$340 million presented in the comment.

14.A(2) (Continued)

2. Instead of interest, a return on investment should have been used in this calculation for determining the annual revenue requirement or cost per year. The Company's current authorized overall rate of return is 9.23%.

Principal (Depreciation)

1. A 30-year life was assumed instead of the Company's proposed 35-year life for calculating depreciation expense referred to as principal per year in this table.

Decommissioning

1. It is unclear where the value for decommissioning costs comes from.

A B SAVAGE (4/4/82)

14.A(3) COMMENT: ECONOMICS - REPLACEMENT ENERGY COST

The report assumes a savings in fuel cost to the company, but this comes out of the ratepayer's hide.

Alleged replacement energy	\$267,000,000	\$466,000,000
Fuel + O&M	<u>135,000,000</u>	<u>287,000,000</u>
Alleged savings	\$132,000,000	\$287,000,000 (sic)

These figures are meaningless. They are but part of the cost to the hapless ratepayer.

RESPONSE

The implication that replacement energy costs avoided by Midland's operation are not true savings indicates a lack of knowledge of the operations of a bulk power system. To simplify, if Midland is not on line during those years it is expected to be, that energy which would have been produced by Midland will have to be produced by other resources not already in use, such as oil and gas units, higher priced coal units, and purchase from neighboring utilities at their replacement cost. In 1984, this would mean replacing Midland power which would cost 2.1¢/kWh with replacement power at 4.2¢/kWh. Assuming that present procedures for setting rates continue, the savings in fuel costs will be reflected in customer's electric bills.

A B SAVAGE (4/4/82)

14.A(4) COMMENT: ECONOMICS - MILLS/KW

Using figures of mills/kw from the same table, we find the costs to be:
 $710 \times 21 / 135 = 111$ mills/kw $754 \times 28 / 179 = 117$ mills/kw. The power will cost in
1984 $111 \times 100 / 21 = 5.3$ $117 \times 100 / 28 = 4.15$ times the costs from Table 2.2

RESPONSE

This information derives from preceding calculations and containing the errors identified therein is thus equally erroneous. Consumers Power has recalculated the annual production costs of DES Table (1) 2 as 21 mil/kwh in 1984 and 24 mil/kwh in 1988 with Midland 1&2 on line.

REFERENCE

1. Consumers Power Company Letter (Serial 16594) to Nuclear Regulatory Commission, April 2, 1982; p 4.

A B SAVAGE (4/4/82)

14.A(5) COMMENT: ECONOMICS - STEAM COST

Steam costs will be proportionate. The steam cost to Dow is excessive, and the ratepayer and stockholder cannot be expected to subsidize this to the extent of the difference between these figures and those in 2.2. I recall that when the plant was proposed that the projected steam cost was six times that then in effect in the Dow Co.

RESPONSE

Steam cost to Dow is projected to be about equal to the cost of steam from new state of the art fossil fuel installations during initial years of Midland Plant operation and lower than fossil sources in later years.

Construction costs and operating costs for process steam will be separated from total Plant costs and will be paid by Dow. Electric ratepayers will pay only for electric plant investment and electric operating costs.

Projected steam cost on a cents per million basis, when the Plant was proposed, was about equal to fuel cost alone for coal. It is not conceivable that Dow's internal costs for steam were 1/6 of this.

Steam rates to Dow are a contractual matter; ratepayers and stockholders do not subsidize that rate.

A B SAVAGE (4/4/82)

14.B COMMENT: HEAT EXCHANGER TUBE PROBLEMS

A factor not touched upon in the statement is the demonstrated unreliability of stainless steel heat exchanger and condenser tubes. This is obvious in plants all over the country. This causes environmental risk due to leakage, and adds to plant unreliability. The CPCo Palisades plant is a case in point.

Stainless steel properly heat treated and of suitable composition has some corrosion resistance, but under conditions of high temperature, high velocity and in the presence of gases the passive film is eroded and intercrystalline corrosion occurs. The passivity cannot be restored if the steel is pitted. While I do not have direct information on very high temperature corrosion tests, tantalum, Durichlor, Durimet, Hastelloy and Duriron are much more suitable materials. As repeated replacement may be necessary anyway, a steel clad on both sides with high chromium-nickel alloy containing some copper might be usable. There is also probability of corrosion of tube sheets and baffles. These certainly should be of the same material as the cladding, and in no circumstances should dissimilar metals touch. Any electrolysis must be avoided.

The practice of inserting a smaller tube within a corroded tube reduces heat transfer surface and increases liquid velocity. It should not be permitted.

Indeed no further installation or startup of nuclear facilities should be permitted until this problem is resolved.

RESPONSE

This comment letter contains several factual errors:

- a. The letter refers to the demonstrated unreliability of stainless steel condenser tubes but the Midland Plant does not use stainless steel condenser tubes.
- b. The letter refers to experience at the Palisades Plant as a case in point which demonstrates the unreliability of stainless steel heat exchanger and condenser tubes. Discussions with personnel familiar with the Palisades Plant leads to the conclusion that while Palisades does have stainless steel tubes in heat exchangers and in limited areas of the condenser there have been no failures of these stainless steel tubes. In fact, at Palisades heat exchanger tubing with copper base alloy tubing have been replaced or retubed with stainless steel.
- c. The letter refers to high temperature as one of the conditions which is necessary to damage the passive film on stainless steel. Due to the nature of the Midland Plant, operating temperatures for heat exchangers will not exceed the temperature of the primary reactor coolant which is approximately 550°F. Most heat exchangers would operate at temperatures

14.B (Continued)

well below this temperature. In terms of the stability of the passive film on stainless steel 550°F is not a high temperature.

- d. The letter refers to the superior resistance to high temperature corrosion of tantalum, Durichlor, Durimet, Hastelloy and Duriron as evidence that these materials would be more suitable than stainless steel for heat exchanger and condenser tubing. High temperature corrosion is not the only characteristic which must be considered in the selection of material for heat exchanger and condenser tubing (in fact as is noted in c above, high temperature corrosion may not be relevant at all). For example, the Metals Handbook, (1) describes Durichlor and Duriron as high silicon corrosion resistant cast irons. It further states that "High-silicon irons have poor mechanical properties and particularly low thermal and mechanical shock resistance. They are difficult to cast and are virtually unmachinable." These properties would make Durichlor and Duriron very unlikely candidates for heat exchanger or condenser tubing.

Tantalum is used in systems where acid resistance is important but is considered to be unsatisfactory in alkaline applications which are more common in nuclear plants.

- e. The letter recommends cladding a steel tube on both sides with high chromium-nickel alloy containing some copper. Cladding of heat exchanger tubing is generally limited to heat exchangers where the fluids on each side of the tube are so different in their effects on materials that the selection of one material which will resist the attack of both fluids is impractical. In recommending cladding both the inside and outside of the tube with the same material the letter defeats one of the primary benefits for clad tubing.

The Applicant's position is explained in the following paragraphs. In general stainless steel is considered to be superior for most heat exchanger tubing applications and in fact is often used as a replacement material when problems are experienced with other materials. A significant exception to this general rule is condenser tubing where the circulating water has high solids, but the Midland Plant does not use stainless steel for condenser tubing.

Selection of heat exchanger material cannot be limited to one parameter such as high temperature corrosion and certainly cannot be limited to parameters which are not relevant to the anticipated conditions for the tubing. Considerations for the selection of heat exchanger material include temperature, pressure, flow rates, corrosion potential of the fluids and galvanic compatibility with other structures in the system. These considerations must be evaluated for the fluids on each side of the heat exchanger or condenser. Further considerations include the mechanical strength of the material, the ability to fabricate the tubing and the ability to form a leak tight joint at the tube sheet. These and other parameters were carefully considered in the selection of heat exchanger and condenser tubing for the Midland Plant. Stainless steel was not selected for the condenser tubing but it was selected for a number of other heat exchangers. Where

14.B (Continued)

stainless steel was selected, it was because satisfactory performance is anticipated.

In some cases within stainless steel tubed heat exchangers, the stainless steel may be in contact with other metals. If this has occurred the effects of galvanic corrosion have been considered in the selection of the stainless steel and the contacting material. Again satisfactory performance is expected.

Sleeving of tubing may be considered if heat exchangers or condensers require repair in the future. If this is done, full consideration will be given to the effects of such sleeving including the sleeve's effect on heat transfer and fluid velocity. Sleeving will only be used if satisfactory performance of the heat exchanger or condenser can be anticipated.

REFERENCES

1. American Society for Metals, Metals Handbook, Volume 1, Eighth Edition, pages 402 and 403

A B SAVAGE (4/4/82)

14.C COMMENT: UPSTREAM DAM FAILURE

The Michigan State Department of Natural Resources has recently reported a "high danger" of failure of the upstream dams on the Tittabawassee river at Sanford and Beaverton. Such failure of earthen dams could result in sudden flooding with damage to installations and leave the unit with inadequate cooling water.

RESPONSE

The Michigan Department of Natural Resources (MDNR) Water Management Division conducted a four year inventory and inspection program of Michigan Dams. The dams at Sanford and Beaverton have been classified as "High Hazard Potential" based only on their location with respect to down stream riparians. This indicates only that should the dams fail there would be a high hazard potential. The dams have not been rated as structurally unsafe, in fact the supervisor of the MDNR's Dam Inventory and Inspection ⁽¹⁾ indicates both facilities should withstand a 200 year flood with a low probability (0.5% chance) of failure. There is therefore no "high danger" of failure associated with these impoundments as implied.

A catastrophic loss of the Beaverton Dam would likely have no effect on the Midland reach of the Tittabawassee River while such a loss of the Sanford Dam could result in flooding of the area around the Plant. With a normal river elevation of 591 feet msl (approximate flow 80% of the year) and the Plant site elevation of 634 feet msl, it is highly unlikely that a breach of the Sanford Dam would significantly impact the Plant.

Saginaw Intervenors at the Construction Permit stage (1972), asked a question about consideration of flooding and design of the Plant. The Applicant's response described ⁽²⁾ the hydrologic analysis and plant design aspects relative to major flooding.

The Probable Maximum Flood (PMF) combined peak flow is 262,000 cfs which includes the effects of Probable Maximum Precipitation with failure of Secord, Smallwood, Edenville and Sanford dams. The associated peak still water level at the Plant would be about 631 feet msl. Plant dikes are at elevation 632 and the power block is at elevation 634 feet msl. ⁽³⁾

This safety related item is fully discussed in the Final Safety Analysis Report. ⁽⁴⁾ Additionally the Applicant recently has provided information to the NRC which shows that the PMF will not effect the cooling pond dikes due to slope instability, overtopping or erosion. ⁽⁵⁾ In addition, the emergency cooling pond is below the bottom of the dike and will retain water independent of dike integrity.

14.C (Continued)

REFERENCES

1. Discussion of the Michigan Department of Natural Resources, Water Management Division Supervisor of the Dam Inventory and Inspection Program (Mr Gary F Croskey) May 4, 1982.
2. Applicant's Reply to Saginaw Intervenors February 6, 1972 Statement of Environmental Contentions, Item 114, pp 124-125.
3. ER-OL, Revision 12, June 1981; Section 2.4.4, pp 2.4-5 - 2.4-10.
4. FSAR, Revision 39, 11/81; Section 2.4.3, pp 2.4-4 - 2.4-12.
5. Consumers Power Company Letter (Serial 16642) to NRC, April 21, 1982.

A B SAVAGE (4/4/82)

14.D COMMENT: USE OF HYDRAZINE

Hydrazine is to be used as a scavenger. It decomposes at 329°F into ammonia and nitrogen with explosive violence. Hydrazine sulfate also decomposes explosively at 482°F into gas and sulfur. Hydrazine, like ammonia, is flammable. It boils at 235°F and freezes at 0°C (32°F). It is toxic and carcinogenic.

RESPONSE

The explosive reaction referred to appears to relate to anhydrous (98% minimum concentration) hydrazine which is used in the aerospace industry as a propellant.⁽²⁾ The hydrazine to be used at Midland, which incidently is also common to the utility industry as a whole, will be a 35% aqueous solution which has no flash point or fire point.⁽¹⁾ It is neither explosive nor flammable at this concentration. The aqueous solution is further diluted to 3% prior to being injected into the various Plant systems in which it will be exposed to temperatures exceeding its decomposition temperature. The resulting hydrazine concentration after injection is in the range of 0.1 ppm. At these extremely low concentrations the decomposition reaction proceeds very slowly and certainly is not an explosion hazard. The decomposition of hydrazine into ammonia and nitrogen takes place at 518°F rather than 329°F as stated in the comment. The boiling point of 35% aqueous hydrazine is 229°F⁽¹⁾ and the freezing point is -85°F.

The compound referred to as hydrazine sulfate is assumed to be dihydrazine sulfate which is a complex hydrazine salt.⁽³⁾ It is presumed, like anhydrous hydrazine, to be used in the rocket industry but it is not used in the utility industry. This salt is not used at Midland nor can it be created by the reaction of aqueous hydrazine with the minute quantities of sulfates in the feedwater.

While hydrazine is toxic and a suspected carcinogen to humans, the Midland Plant will adhere to the Occupational Health and Safety Administration (OSHA) regulations regarding concentrations and worker exposure. In addition to protective clothing and devices to be worn by personnel, the design of the hydrazine storage, transfer and feed systems includes features intended to minimize airborne hydrazine concentrations and direct contact by workers. Offsite release pathways of hydrazine are by way of wastewater streams which results in further dilution. The oxygen in the wastestreams (primarily water) will react with the hydrazine so that only trace amounts of hydrazine are expected to be found in the discharge.

REFERENCES

1. Olin Chemicals. Hydrazine Storage and Handling Bulletin 731-009R on Aqueous Solutions
2. Olin Chemicals. Product Data, Anhydrous Hydrazine Bulletin 731-020
3. Olin Chemicals, Product Guide Bulletin 700-024

A B SAVAGE (4/4/82)

14.E COMMENT: FOGGING

The hazards due to icing and fogging caused by the cooling pond are grossly underestimated. Not only nearby roads but the entire city are likely to be covered by fog and smog, which will concentrate toxic contaminants.

As to highway safety, within the immediate area CPCo should be required to provide fog-dispersing devices, such as the propellers (sic) long the New Jersey Turnpike, at dangerous intersections, and to see to it that the roads affected are kept salted and sanded, and otherwise maintained.

The data in Table 4.2, compared with monthly high and low atmospheric temperatures, on the basis of humidity indicate that throughout the year, during the day, the volume of fog generated by moisture outfall will be relatively constant, and that quantities at night during January through March and in November will be in much the same range. In April the volume will increase 25% at night, in May, September and October 50% and in July through August, 130%. This means that in January through March and in November and December severe icing conditions may be expected day and night in a relatively constant area around the pond. In April and October and in part of May and September, severe icing may arise over a 25-50% greater area, if the height of the fog remains the same, and in the warmer months severe fog will extend over a much greater area, perhaps the entire city, at night.

RESPONSE

The anticipated effects of fogging resulting from operation of the pond have been discussed in detail in the responses to comments 3.E, 8.B and 9.C. Fogging effects such as those described by the comment have neither been observed at similar facilities nor are they expected to occur at the Midland Plant.

The Company has committed (in Section 5.1.4.2 of the Environmental Report) to take those actions which may be necessary to mitigate whatever fogging effects may occur as a result of the operation of the Midland cooling pond.

It is uncertain what methods the commenter used to project the "volume" of fogging; however, it appears that the assessment is based on some sort of air temperature/pond temperature/humidity relationship. While it is known that these three factors play a significant role in the frequency and extent of fogging effects, it is also known that the current state-of-the-art of modeling is not capable of providing an accurate quantitative assessment of such effects. At the present time, the best method available for predicting fogging effects is a comparative assessment such as that described in responses to comments 3.E, 8.B and 9.C. Based on these comparisons, fogging effects due to operation of the Midland Plant cooling pond are not expected to be significant.

A B SAVAGE (4/4/82)

14.F COMMENT: FOG INTERACTIONS WITH RAD/CHEMICALS

Hazard due to toxic and radioactive materials born in the fog will be much greater during the warm months of the year, when more people are outside and windows are open. There is danger of pollution of the municipal water supply.

RESPONSE

The issue of potential interaction of cooling pond fog with pollutants in the air over Midland was raised during the Construction Permit Stage. In the FES-CP, this issue was dismissed by noting that if the phenomena was a real possibility, it should have manifested adverse effects in the area during periods of natural fogging. No such effects have been observed.⁽¹⁾ For an additional discussion on the subject, refer to the response to Vicente Castellanos on fogging of airborne effluents (8.C).

Likewise, no significant interaction between cooling pond fog and low-level radioactive releases are expected during routine plant operation. This assessment is based on the nature of cooling pond fog, the elevation of routine radioactive airborne releases, and the lack of evidence of such effects at other nuclear power plants. For a more detailed discussion on this subject, refer to Attachment B.

REFERENCE

1. FES-CP, Section XII.B, p XII-4.

A B SAVAGE (4/4/82)

14.G COMMENT: CODE SAFETY VALVES

...The use of pop-valves, which do not generally reseal properly, for pressure relief is a hazard. Prangible (sic) safeties in parallel should be required.

RESPONSE

Spring loaded safety valves (POP valves) are used in industry for protecting pressurized vessels and systems. They are designed to meet the standards of the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME B&PV) Code Section III and are periodically inspected in accordance with the requirements of ASME B&PV Code Section XI.⁽¹⁾ Each Midland unit has 8 valves per steam generator and 2 valves on the reactor coolant system pressurizer.⁽²⁾

We do not agree with the contention that the valves generally do not reseal properly and therefore are a hazard. A post TMI concern resulted in an action item (NUREG-0737, Item II.D.1) for utilities to conduct testing to qualify the reactor coolant safety valves under expected operating conditions for design basis transients. This test program was conducted for the LWR Utility Industry by the Electric Power Research Institute (EPRI) and was completed in December 1981. One of the valves tested was the same model and size as the Midland pressurizer safety valve, Dresser Model 31739A. Test results for the Midland model valve utilized in a Midland type configuration (short inlet) do not uphold the contention that pop-valves generally do not reseal properly. In only 1 out of 19 tests was any extensive valve seat leakage detected. Post test disassembly inspection showed a disc guide dimension to be slightly out of tolerance and this part was replaced. Subsequent tests revealed no recurrence of excessive valve seat leakage.⁽³⁾

We believe the last sentence of the comment is in error. Prangible should be frangible and the sentence should read "Non-frangible (non-breakable) safeties in parallel should be required." CP Co believes our present design meets this suggestion to the maximum extent possible.

REFERENCES

1. ASME B&PV Code Sections III and XI
2. Midland FSAR Subsections 5.2.2 and 10.3
3. EPRI PWR Safety and Relief Valve Test Report, transmitted to NRC on April 1, 1982.

A B Savage (4/4/82)

14.H COMMENT: URANIUM FUEL CYCLE

Insistance on nuclear energy ignores the high rate of lung cancer among uranium miners, such as the Indians in New Mexico.

RESPONSE

As discussed in an article by B L Cohen, previous experiences of overexposure of uranium miners to radon daughters have been corrected by mining improvements and the enforcement of more stringent regulations since 1960. By 1970, average miner exposures had been reduced by over an order of magnitude from levels observed in 1965. Based on present mining experience, Cohen estimated standardized mortality rates for lung cancer using models based on lowest exposures for which there have been excess lung cancers reported and for average environmental radon exposures. The results of this analyses show that radon exposures to miners (using 1978 averaged data) are similar to those from background environmental exposure and represent from 0.7 to 4% of their total risk in their occupation. Furthermore, these risks, when compared to risks associated with other occupations or routine living, are small. (1)

REFERENCE:

1. "Radon Daughter Exposure to Uranium Miners" by B L Cohen, Health Physics, Vol 42, No 4, April 1982.

A B SAVAGE (4/4/82)

14.I COMMENT: ACCIDENT COMPENSATION

By calculating risk over a large (50 km radius) area the specific threat to the residents of Midland is soft-pedeled (sic). The use of such terms as person-remS over a large area dilutes the hazard. The danger is to the residents of Midland and their property. The Price-Anderson act with low values excludes them from any chance of compensation in case of an accident, and insurance cannot be obtained. The ratepayers not only bear the burden of excessive costs at the beginning, but in case of accident will be without compensation.

RESPONSE

It is not clear what the commenter meant by his statement that the calculation of risk over a large area soft-pedeled the threat to residents of Midland. The commenter apparently believes that calculations of doses from routine emissions or during accident conditions are diluted over a large area. This statement results from a fundamental misunderstanding of the calculational techniques of the Applicant and the NRC Staff. Calculational methods, both for routine and for accident conditions, take into account the dilution of sources as a function of a distance from the Plant. Even a casual reading of the DES shows that the NRC Staff has calculated estimated doses at various locations, ie, on site, at the boundary of the exclusion area and at other locations both within and outside a 50-mile radius (as opposed to 50 km, as the commenter states). DES Table 5.5, for instance, gives estimated doses at the boundary of the Plant's exclusion area, well within a 50-mile radius of the Plant.

In contrast to the comment, the evidence from the NRC's work and the Applicant's work, demonstrates that there is little or no danger to the residents of Midland from the Plant. The Staff's calculations show that even under design-basis accident conditions, radiation released to the Plant environment is well within prescribed limits.

The Price-Anderson Act was enacted by the Congress of the United States to encourage the peaceful use of nuclear energy. No regulatory agency at the Federal or State level has the power or authority to contravene its terms. Under present Price-Anderson provisions, utilities are required to maintain adequate private insurance for offsite damages the risk of which, by all reliable evidence, is low. In the face of overwhelming contrary evidence, this commenter has provided no evidence that based on the level or risk, more insurance is necessary or any danger exists to people living in the area.

WILLIAM A LOCHSTET (4/4/82)

15.A COMMENT: URANIUM FUEL CYCLE

"...The health consequences of the radon-222 released from the mill tailings and mines needed to fuel the plant, are evaluated for the first 1000 years in Appendix G. This evaluation states that the radon emissions increase with time (Page G-6, Ref 1), and there is no suggestion that there is any reason to believe that these emissions will stop after 1000 years, or even to decrease...

The NRC estimate of about 2 deaths in the Draft (Ref 1) is thus more than 100,000 too low compared to the sum of 600,000 as shown above. This is due largely to the arbitrary, erroneous, immoral, incorrect procedure of stopping at the end of the first 1000 years.

RESPONSE

The contention that the NRC is improperly evaluating the long-term health consequences of radon-222 emissions from the uranium fuel cycle is presently being addressed as a generic issue. In contrast with the conclusions of this comment, Professor B L Cohen suggests that the long-term consequences of uranium used for reactor operation may actually be less than those of the uranium had it been left undisturbed in the ground. (1)

REFERENCE

1. "Radon Characteristics, Natural Occurrence, Technological Enhancement and Health Effects", by B L Cohen, Vol 4, Progress in Nuclear Industry (1979)

WILLIAM A LOCHSTET (4/4/82)

15.B COMMENT: CLASS 9 ACCIDENT ASSESSMENT

Rebaselining: The NRC has attempted to evaluate the impact of "Class 9" accidents which might occur at Midland. Unfortunately, the few pages of this report (Ref 1) devoted to this topic are not adequate to describe the calculation that was modified from the presentation in the eight volumes of the Reactor Safety Study (RSS), WASH-1400 (Ref 6)....

...The present study (Ref 1) seems to be based on the RSS (Ref 6) with modifications to include improvements since the publication of the RSS, (Page 5-45), Ref 1). In its January 1979 statement of policy, the NRC took the following action:

The Peer Review Process: The Commission agrees that the peer review process followed in publishing WASH-1400 was inadequate and that proper peer review is fundamental to making sound, technical decisions. The Commission will take whatever corrective action is necessary to assure that effective peer review is an integral feature of the NRC's risk assessment program.

Accident Probabilities: The Commission accepts the Review Group Report's conclusion that absolute values of risks presented by WASH-1400 should not be used uncritically either in the regulatory process or for public policy purposes and has taken and will continue to take steps to assure that any such use in the past will be corrected appropriately. In particular, in light of the Review Group conclusions on accident probabilities, the Commission does not regard as reliable the Reactor Safety Study's numerical estimate of the overall risk of a reactor accident.

(Ref 9, Page 3).

The second statement would preclude the use of the results from the RSS in this action. The first requires a thorough peer review process for any such study. It is here suggested that the "rebaselining" has undergone less peer review than the RSS of 1975. In fact it appears (Page 5-45, Ref 1, Section 5.9.4.5 (2)) that the peer review comments on only the RSS were included from the Lewis Risk Assessment Review Group Report, NUREG/CR-0400 (Ref 10). The present work is too incomplete for any attempt at peer review of it.

RESPONSE:

Effective June 13, 1980, the NRC issued an Interim Policy Statement on Nuclear Power Plant Accident Considerations under the National Environmental Policy Act of 1969.⁽¹⁾ In this Statement of Interim Policy, it was the position of the Commission that future environmental impact statements (EIS) "include a

15.B (Continued)

Specific clarification within the Interim Policy Statement provided that "... detailed quantitative considerations that form the basis of probabilistic estimates of releases NEED NOT BE INCORPORATED in the EIS but shall be referenced therein ..." (emphasis added). It was further noted that, "In promulgating this interim guidance the Commission is aware that there are and will likely remain for some time to come many uncertainties in the application of risk assessment methods On the other hand the Commission believes that the STATE OF THE ART IS SUFFICIENTLY ADVANCED THAT A BEGINNING SHOULD NOW BE MADE IN THE USE OF THESE METHODOLOGIES in the regulatory process ..." (emphasis added).

As stated in Section 5.9.4.5 of the DES, the state of the art methodology employed in the probabilistic risk assessment of severe accidents is that described in the Reactor Safety Study (WASH-1400)⁽²⁾ as modified ("rebaselined"). This rebaselining was completed largely to incorporate both peer group comments received⁽³⁾ and data and analytical techniques improved since the publication of WASH-1400. The consequence model of WASH-1400 has been adopted and modified to include site specific considerations. The uncertainties attendant with use of WASH-1400 for these purposes are clearly identified in DES Section 5.9.4.5(7). In light of the June 13, 1980, Interim Policy Statement, which was issued after the NRC's January 1979 Statement on Risk Assessment...⁽⁴⁾ and which advocated the usefulness of the present methodologies (WASH-1400), the probabilistic assessment of severe accidents in the DES appears to adequately address the requirement to consider "environmental risks attributable to accidents."⁽¹⁾

REFERENCES

1. Federal Register, Volume 45, No 116, Friday, June 13, 1980, Rules and Regulations - Nuclear Regulatory Commission, 10 CFR Parts 50 and 51, "Nuclear Power Plant Accident Consideration Under the National Environmental Policy Act of 1969"
2. "Reactor Safety Study - An Assessment," USNRC, WASH-1400 (NUREG-75/014), October 1975
3. H W Lewis et al., "Risk Assessment Review Group Report to the US Nuclear Regulatory Commission," NUREG/CR-0400, September 1978.
4. "NRC Statement on Risk Assessment and the Reactor Safety Study Report (WASH-1400) In Light of the Risk Assessment Review Group Report", NRC, January 18, 1979.

WILLIAM A LOCHSTET (4/4/82)

15.C COMMENT: ECONOMIC IMPACT ON DOW

Dow Chemical: The economic impact of an accident at Midland on Dow Chemical is important. Food wrap contaminated in a class 9 accident will not be too popular in the stores. Hershey Foods discovered this after the TMI accident for their products.

RESPONSE:

The economic impact of a serious nuclear accident on any business in the Midland area would be important. There is no reason to assume that in the event of a severe accident (ie, Class 9) that the impact on the Dow Chemical Company would be different than for any other business in the immediate vicinity of a nuclear plant.

It is our understanding in reference to Hershey Foods, that although a short-term impact was observed after the TMI-2 accident, no long-term reduction in product sales has been registered. For further information on DES estimates of economic impacts, refer to Section 5.9.4.5(4) and Table 5.7 which quantifies economic impacts by probability.

Although the cogeneration feature (process steam) of the Plant makes the Dow Chemical relationship unique, accident contamination by this pathway is not a credible consideration due to the physical barriers separating the radioactivity in the fuel from the Dow processes. Furthermore, in the event of an accident, the process steam system would be isolated from the affected reactor.

US ENVIRONMENTAL PROTECTION AGENCY - REGION V (4/15/82)

16.A COMMENT: COOLING POND INTAKE STRUCTURE

Water Quality Impacts

Makeup water for the cooling system will be withdrawn from the Tittabawassee River. The intake structure design includes trash racks and traveling screens with a 3/8 inch mesh to prevent debris from entering the cooling system. Since the construction license was issued, newer designs for intake structures have been developed. One of these design is a fine mesh wedge-wire screen that is bulkhead mounted. The final EIS should discuss whether or not this design could still be installed at the site to minimize fish impingement and reduce maintenance costs at the site.

RESPONSE

The 3/8 inch mesh traveling screens have been installed at the river intake structure and river water was withdrawn through the structure for initial filling of the cooling pond in 1978-1979.

The Staff of the Michigan Water Resources Commission has tentatively determined that the location, design, construction and capacity of the Midland Plant intake structure reflects the best technology available for minimizing adverse environmental impact in accordance with Section 316(b) of the Water Pollution Control Act. ^(1,2) The Company will develop and perform a monitoring program to measure the number and species of fish impinged and entrained at the river intake under operational conditions. Should the monitoring program indicate that the intake is not in compliance with the law, a number of appropriate alternatives will be investigated which may include the use of fine mesh wedge-wire screens.

REFERENCES

1. ER-OL, April 1978; Section 12.5, p 12.5-1.
2. MDNR Letter to Consumers Power Company, January 17, 1977, included in ER-OL, Revision 3, November 1978; Section NRC Q&R, AEC 11.

US ENVIRONMENTAL PROTECTION AGENCY - REGION V (4/5/82)

16.B COMMENT: STEAM LINE LEAKS/RAD CONSEQUENCES

Radiation Impacts

The Nuclear Regulatory Commission has indicated in hearings before the House Subcommittee on Energy that pressurized water reactors are subject to leaks in the steam pressure lines. The final EIS should address whether or not these leaks will occur specifically at the Midland Plant and whether this results in increased radiation releases to the environment, and if the releases pose a health risk to persons living near the Midland Plant.

RESPONSE

Pressurized water reactors are subject to leaks in the steam generator tubes and this is accounted for in design. Such leakage is conservatively accounted for in the DES as an input assumption to the GALE computer code whether or not the leakage actually exists. ⁽¹⁾ Therefore, the DES for the Midland Plant considers potential leaks in steam generator tubes and the results are acceptable.

The Technical Specifications for the Midland Plant impose limits on the amount of primary coolant system water that may leak into the steam generator and thus into the secondary steam. In addition, limits are imposed on the amount of radioactivity that may be present in the secondary side of the steam generators. This water is sampled on a routine basis, and the effluent of the air ejectors (non-condensibles) is continuously monitored for radioactivity.

If a major leak or rupture of a steam generator tube (steam pressure line) were to occur, it would be immediately detected, and actions, both automatic and operator initiated would be taken to ensure that the health and safety of the public would be protected. Such accidents have been analyzed and such analysis is included in the Final Safety Analysis Report.

The incidence of tube leaks or ruptures during operations, though rare, have occurred in pressurized water reactors. The experience on Babcock and Wilcox designed plants has been favorable when compared to PWR industry experience.

REFERENCES

1. DES-OL, February 1982, Appendix C, Reference 1, p C-3

US ENVIRONMENTAL PROTECTION AGENCY - REGION V (4/5/82)

16.C COMMENT: WATER QUALITY IMPACTS DUE TO ROAD SALTING

Additional Comments

Icing of the road near the cooling pond may occur during winter months at the Midland Plant. The final EIS should discuss whether or not additional salting of the roads will be required and what the resulting water quality impacts will be.

RESPONSE

Applicant's response to the M Kruger comment (3.E) indicates that fogging is expected to have a minimal effect on vehicle traffic. Page S-4 of the attachment to the response to the L M Hallberg comment (9.C) discusses road icing at Dresden and Baldwin plants. No glaze ice was observed. The rime ice, of low density and friable nature, poses little danger. The potential for road icing at Midland, while expected to be minimal based on localized fogging, cannot be quantified and therefore it is premature to speculate if additional road salting, sanding or any other mitigating effort might be required. Consequently, it is also premature to determine what, if any, water quality impacts would occur should additional road salting be required.

Our understanding is that the Midland County Road Commission presently applies an average of about 1 ton/mile of a salt mixture (in winter) and about 1700 gal/mile of a brine solution (summer and winter) on approximately 400 miles of roads to control winter icing and summer dust problems.

MARK A HANDLER (no date)

17.A COMMENT: RAD HEALTH EFFECTS

...The Draft Environmental statement failed grossly in accurately predicting the health hazards of low-level radiation. The estimates were based on "BEIR I" report. The updated BEIR III report doubles the estimated cancer death rate and quadruples the cancer rate. Additional research conducted at Livermore (Science, October 2, 1981) has been interpreted as suggesting that dose estimates need to be revised...

RESPONSE:

The intervenor appears to have misinterpreted the referenced information on low-level radiation effects. The BEIR III report tends to support a lower radiation risk estimate than the BEIR I document due to the adoption of a linear quadratic dose extrapolation model. The reference to additional research and potential dose estimate revisions is made with respect to the work of Loewe and Mendelsohn.⁽¹⁾ As noted in Attachment C, the authors of that referenced research have indicated that there is no basis presented in their study for revising the dose estimate for gamma radiation. For additional information on the Loewe and Mendelsohn research, refer to Attachment C.

REFERENCES

1. "Radiation Estimates," Letters, Science, Vol 213, July 3, 1981.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH (4/1/82)

18.A COMMENT: SOIL STABILITY

1. Soil Stability - Apparently due to inadequate soil preparation, a building and some structures have experienced gross settling and some cracking of structural parts. The plant has been working with the NRC for several years on a solution which combines repair, additional support, and a soil dewatering system. This problem should be addressed in the Final Environmental Statement, along with the impacts of the corrective actions on the environment.

RESPONSE

Soils related problems at Midland have been the topic of extensive public hearings. These hearings were the appropriate forum for all the issues raised in the comment.

The design and construction details of the remedial measures at the Midland Plant are well developed and are receiving appropriate NRC review prior to full implementation of the associated construction. Soil related problems should have no offsite environmental impacts.

A dewatering system is used to lower the water table in the Plant power block fill area inside the Plant cooling pond dike. The water collected from the dewatering system is pumped back to the cooling pond as discussed in the response to the T L Washington comment (12.F). Hence, the soil related issues and the remedial measures will not have any offsite environmental consequence.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH (4/1/82)

18.B COMMENT: COGENERATION AND RADIATION MONITORING

2. Cogeneration - The plant abuts the Dow Chemical Company property so that steam produced at the Midland Plant can be piped to Dow for processing needs, thereby allowing the retirement of an old, air-polluting coal-fired steam plant. The Midland Plant will have pressurized water reactors, in which the primary water which contacts the fuel is used to produce steam in another, separate secondary system for the production of electricity in turbine-generators. Although the primary and secondary systems are separate, there is normally some leakage between the two. Therefore another, tertiary, system is to be used to produce steam for Dow. This tertiary system will use steam from the secondary system as the heat source. Since Dow produces aspirin and other chemical products which are consumed by the public, it is imperative that the tertiary system not be contaminated with radioactive materials. The plant plans an extensive continuous monitoring and control program for the Dow steam, but because of the inherently gross nature of the continuous monitoring system as compared with a laboratory analysis, a continuous sampling system should be installed so that sensitive analyses can be run on continuously composited samples. The Michigan Department of Public Health is also interested in analyzing such samples on a continuing basis.

RESPONSE

As inferred within the comment, in order for reactor-produced radioisotopes to reach the process steam system, three barriers must fail. Fuel cladding failure must occur concurrently with primary-to-secondary and secondary-to-tertiary system leaks. Barrier performance monitoring serves as an advance warning of the potential for introducing reactor-produced radioactivity into the tertiary system. In light of technical specification limitations on operation based on primary activity, primary-to-secondary leakage, and secondary activity, this concurrent occurrence is considered to be very unlikely.

The Plant radiation monitoring system will continuously monitor the primary and secondary systems for gross gamma radioactivity as noted in FSAR Chapter 11.5. Additionally, both the primary and secondary are regularly sampled for offline laboratory analysis. Based on the observed secondary activity, the frequency of process steam sampling and analysis may be increased as noted in Table 11.6-3 of the FSAR.

The process steam radiation monitoring system continuously monitors process steam for gross gamma radioactivity. In addition, each evaporator blowdown is sequentially monitored for gross gamma radioactivity at a frequency of approximately once every five hours. If a secondary-to-tertiary leak is suspected, the blowdown of the suspect evaporator can be diverted to one of two spare gross gamma monitors for continuous monitoring. Additionally, an off-line sample and laboratory analysis can also be performed on the suspect evaporator blowdown to confirm the on-line monitor indication.

18.B (Continued)

The on-line continuous monitoring system was provided to ensure real time confirmation that no statistically significant amount of reactor-produced radioactivity was introduced into the process steam. The time delay associated with sampling and subsequent laboratory analysis is not conducive to a real-time assessment of the condition of the steam, although it does provide for a more detailed and sensitive determination. As noted above, the frequency of sampling and analysis is based on secondary activity (ie, based on the potential for introducing radioactivity to the tertiary system). Typical turnaround times for sampling and analysis range from twenty minutes for gross gamma to eight hours for gross beta. In this respect, the off-line sampling system serves as a confirmation of the on-line system.

It is important to note that a sampling system based on continuously composited samples would tend to further delay and desensitize off-line results. This is due to the dilution inherent with compositing. Desensitizing would occur should conditions be degrading at the end of the compositing period or if the tertiary activity is asymptotically increasing as would be expected in a secondary-to-tertiary leak. Since the levels of radioactivity being monitored are essentially background, dilution due to compositing can very readily desensitize results to within background fluctuations (uncertainty). Grab sampling, on the other hand, provides the undiluted conditions as sampled.

Grab samples of the evaporator blowdown provide a time-integrated sample which is equivalent to a concentrated continuously composited sample for any radioparticulates or radioactive elements which potentially may be present. This is due to the substantial partitioning of these radioisotopes with respect to the water in the evaporator hotwell and the process steam. In as much as the blowdown sample provides this feature, composite sampling is provided within the process steam monitoring program scheme. The concern for real time assessment with detailed confirmation was the basis for developing the existing comprehensive monitoring program for the process steam system. In concert with the online monitoring system, adequate assurances are provided to ensure that in the unlikely event that reactor-produced radioactivity is introduced into the process steam system, its presence will be detected and appropriate corrective actions will be taken. Based on the above discussion, the comprehensive online and offline monitoring program for the process steam system is considered to be adequate as presently designed. No sampling modifications are considered necessary or justified.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH (4/1/82)

18.C(1) COMMENT: EMERGENCY PLAN - DOW

3. Plant Siting and Plant Emergency Plan - According to the DES the NRC review of the plant emergency plan will be part of the SER. Coordination of the plan with State and county plans is the responsibility of the Department of State Police Under Act 390 (1976). However, the Department of Public Health has identified some siting/emergency problems that are unique with the Midland Plant. The plant is located within the Midland City limits and directly across the Tittabawassee River from the Dow Chemical Company. In fact, a portion of the Dow property is within the exclusion area. In the event of a major catastrophe with unfavorable meteorological conditions, there could be a choice of (1) evacuation of the entire Dow property with loss of equipment and, possibly, with loss of control of plant processes that could be dangerous, or (2) evacuation of all Dow personnel except those essential for a safe shutdown. In the latter case radiation exposures could be excessive. Dow has pledged to evacuate upon word from the Plant or the State, but has stated that some Dow processes require attendance for a safe shutdown, preventing a complete evacuation for hours after the order. In fact, Dow has indicated that persons (primarily from plant security) will be required even 24 hours after the initiation of evacuation. Although Dow has had an evacuation plan for years, it is being revised especially for a nuclear catastrophe. We are concerned that these persons be protected from excessive radiation exposure.

RESPONSE

With respect to protective actions regarding Dow Chemical facilities, Dow recently added an annex to its overall emergency plans which addresses nuclear incidents at the Consumers Power Company Midland Plant. The annex provides a plan for maintaining emergency preparedness to prevent any injury to personnel and to minimize extensive loss or damage of products and equipment. Any further clarification of this issue should be obtained from Dow Chemical.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH (4/1/82)

18.C(2) COMMENT: EMERGENCY PLAN - LONG-TERM MAINTENANCE

3. Plant Siting and Plant Emergency Plan

Also, the DES indicates that Midland Plant sewage will be sent to Dow for processing. The processing system is directly across from the reactors, and some of the processing area is within the exclusion zone of the Midland Plant. During an incident with unfavorable meteorological conditions, maintenance of the sewage system could only be performed by traveling directly into the radioactive plume from the Reactors, less than 1/3 mile away. We believe that this sewage system should not be used during a major Midland Plant emergency, unless it can be accomplished with no maintenance.

RESPONSE

The portion of Dow's Wastewater Treatment Plant which is within the Midland Plant exclusion area (FSAR Figure 2.1-1A) is not normally attended. Some pumps and controls within this area are routinely checked, generally once per 8 hour shift, but this check could be deferred during accident conditions. If for some reason minor operation and maintenance became necessary during an accident, Dow emergency workers accompanied by a Consumers Power health physics technician in direct radio contact with the Consumers Emergency Operations Facility could enter the exclusion area for this task. The Dow Wastewater Treatment facilities outside the exclusion area would be kept in operation during a nuclear incident by Dow emergency workers.

In the unlikely event that evacuation of Dow's facility became necessary, sanitary sewage could continue to be discharged to Dow for an indefinite period of time as Dow's system operates generally by gravity flow (and the normal contribution from the Dow complex would be drastically reduced due to the evacuation). If for any reason Dow's Wastewater Treatment facilities did experience operational problems during this evacuation period, the Consumers lift station pumps could be deactivated and sanitary sewage from the Plant could be removed by truck until repairs are completed at Dow.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH (4/1/82)

18.C(3) COMMENT: EMERGENCY PLAN - FOG AND ICE IMPACT

3. Plant Siting and Plant Emergency Plan

The DES indicates a potential problem with fogging and icing that may have more severe consequences than those contemplated in the plant Environmental Report. We are particularly concerned about the effect of such conditions as they might affect an evacuation or the travel of emergency personnel in the event of a major catastrophe, and this problem should be fully addressed by the applicant and the NRC.

RESPONSE

As noted in the responses to related comments by M Kruger (3.E) and V Castellanos (8.B), although fogging will occur about the cooling pond, it is expected that it will remain very localized and have minimal effect on vehicle traffic. More importantly, cooling pond fog should have little effect on evacuation or other emergency activities. Since any pond fog occurring concurrent with a nuclear accident will essentially travel in the same direction as any potential radioactive releases, it is doubtful that an evacuation or travel of emergency personnel would ever be directed towards the fog plume or ice caused by fog based on minimizing radiological consequences.

For persons residing or working in the immediate fog area, their evacuation may take longer. Their evacuation would be directed away from the plume (and hence fog) in the shortest and most direct manner. It is relevant to note again, that in approximately 90 percent of all expected fogging incidents, the fog should extend less than 0.1 mile. In the infrequent occasions it extends that far or further, the fog tends to become elevated as opposed to remaining at ground level, thereby reducing or eliminating its affect on emergency activities.

MICHIGAN DEPARTMENT OF PUBLIC HEALTH (4/1/82)

18.D COMMENT: DOSE ASSESSMENT

4. Dose Assessment - The DES cannot stand alone for adequate review of the risk assessment, since there are too many references to the NRC risk assessment document and the BEIR III report. The extrapolation model used is not the most conservative model available; however, the authors do claim that cancer and genetic problems for the population are comparable to those calculated in the BEIR III report, which uses a generally accepted extrapolation model.

Although the authors claim that "worst case" assumptions for exposure were employed, there were several areas where average or "realistic" doses and meteorology were used. No possible or projected levels of exposure are given for accidents. Also, the authors assume the safety systems will work and prevent worker and general public exposure. In particular, all calculations assume that the primary containment will be completely functional, leaking only at the regulatory leakage rate, in spite of the fact that the containment could be breached and numerous valve leakage problems have been experienced by operating plants.

RESPONSE

It is assumed that the first paragraph of this comment contends that reliance of the DES on a vast set of basis documents prohibits the DES from standing alone as a reference on radiation safety. It is a fact that the many referenced works provide a detailed background and support the methods of analysis used and conclusions drawn in the DES. Due to the large volume of referenced material, it would be impractical to incorporate all these documents directly into the DES. All of the referenced documents are available in the NRC's Public Document Room, and a majority are available to the public from other local sources.

The statement that "worst case" assumptions were not always used is correct. The DES does not presume to present only "worst case" assumptions, but chose to provide both "realistic" doses (pg 5-43, first complete paragraph) and "...much more pessimistic (conservative or worst case) assumptions..." (pg 5-43, last paragraph). Although the choice of the term "worst case" may be unfortunate because it tends to imply an absolute condition, it appears clear in the context of its use in DES Section 5.9.4.5 that it was meant to imply conservatism on the side of safety rather than an absolute.

The remaining contentions within this comment appear to be due to a misunderstanding of the several accident analyses which are performed in the DES. The commenter contends that "no possible or projected levels of exposure are given for accidents." It is further contended that the DES risk assessment assumes "safety systems will work and prevent and general public exposure." To the contrary, DES Section 5.9.4.5 addresses exposures due to design base accidents as well as more severe accidents, (refer to DES Tables 5.5 and 5.7). These analyses consider safety system degradations and failure. As stated in DES

18.D (Continued)

Section 5.9.4.5 under Design Basis Accidents, "These assumptions include...additional single failures in equipment, operation of ESF's (engineered safety features) in a degraded mode, and very poor meteorological dispersion conditions." Under the subsection Probabilistic Assessment of Severe Accidents of DES Section 5.9.4.5, the assumptions include "substantial physical deterioration of the fuel..." and "...deterioration of the capability of the containment structure to perform its intended function..." These assumptions constitute severe safety system failures. Presentation of doses in probabilistic terms for these accidents is made in DES Figure 5.5.

In response to the comment that all calculations in the DES assume that the primary containment will be completely functional, we again refer to the probabilistic assessment discussion in DES Section 5.9.4.5. This assessment uses methodology based on the Reactor Safety Study (WASH-1400) which includes containment failure.

US DEPARTMENT OF HEALTH & HUMAN SERVICES: PUBLIC HEALTH SERVICE:
FOOD AND DRUG ADMINISTRATION (4/12/82)

19.A COMMENT: FREQUENCY OF RADIOIODINE ANALYSIS

4. The radiological monitoring program, as presented in Section 5.9.3.4, and summarized in Table 5.3, appears to provide an adequate environmental monitoring program for the critical exposure pathways. However, it is indicated that milk will be sampled at five locations, but it does not include information on frequency of analysis and required sensitivity. (Required analytical sensitivity is given in NUREG 0492.) In our view, it is important to establish a well-planned program as part of the operational monitoring program. Such a program is needed in the event of a radiological accident to provide a source of data on radioiodine in milk for use in the event protective actions are necessary.

Also, we suggest that the plan be modified to address the particular problems of monitoring radiohalogens (especially radioiodine) in the presence of radionoble gases. This could be accomplished by reference to FEMA REP-2, a document on instrumentation with considerable input from NRC. Furthermore, it would be helpful to cite specific studies at operating plants that would verify that the instrument systems for making such measurements actually perform as expected and meet the technical specifications.

RESPONSE

DES Table 5.3 was adapted incorrectly from ER-OL Table 6.1-6. ER-OL Table 6.2A-3-9 describes the Applicant's preoperational and operational radiological environmental monitoring program and does not include milk monitoring.⁽¹⁾ Applicant re-evaluation indicates that milk monitoring should be part of the radiological monitoring program. Sampling and analysis of milk will be pursuant to NUREG-0472.⁽²⁾ The milk sampling will be initiated six months prior to fuel loading to obtain baseline information.

REFERENCES

1. ER-OL, Revision 12 June 1981, Section 6.1.5, p 6.1-29.
2. NRC, NUREG-0472 Radiological Effluent Technical Specifications, Revision 2, July 1979.

US DEPARTMENT OF THE INTERIOR (4/13/82)

20.A COMMENT: THERMAL PLUME/FISH KILL

Tittabawassee River

Additional data should be presented in the final statement concerning the impacts from plant discharges in the river, as well as an approximation of the actual effects to be caused by the plume in the river.

More important, however, we believe the discussions about the effects of the thermal plume in the river, and to fishery resources including fish migration are unclear and fragmented. (Refer to Sections 4.2.6.2, 5.3.2.2 and 5.5.2.2.)

For example, paragraphs one and three on page 5-12 are contradictory in their conclusion as to whether the fisheries in the Tittabawassee River will be subjected to cold shock. Furthermore, the discussion on the subject of intermittent heated discharge into the Tittabawassee River and its effect on the fisheries during the winter season is not adequate. The following additional information would be helpful in describing the effects of the thermal discharge on the fisheries of the Tittabawassee River: the space occupied by the plume in the temperature range which would be detrimental to fish by sudden temperature drops; the species affected, and how; and the tendency for thermal discharges to attract and concentrate fish in the plume areas during winter months. A discussion on the percent of time the average and worst case plume sizes will occur for the coldest and warmest months indicated should also be presented along with the confidence limits for the analysis of plume configurations.

RESPONSE

The Midland Plant discharges to the river will comply with NPDES Permit limits and State Water Quality Standards and thus protect the aquatic resource. To comply with Permit requirements, the frequency of the Midland discharge will be intermittent and the volume of discharge small. The Michigan Department of Natural Resources (MDNR) and Company fisheries biologists concur that operation of the Plant within the allowable discharge temperatures and other operational constraints to meet TDS and thermal mixing zone requirements will preclude lethal effects to fish in the Tittabawassee River. The attached responses by the Company to two Michigan Environmental Review Board questions (No 14 and 15) concerning the thermal effects of the Midland discharge provide a detailed assessment and the agreed upon maximum discharge temperatures.

Concerning fish migrations, the permitted 5°F (2.8°C) thermal mixing zone will occupy no more than 25% of the river cross section in the discharge vicinity and will not extend beyond 515m (1,700 ft) downstream of the discharge, which provides an adequate biotic zone of passes. It is important to emphasize that discharge from the closed cycle cooling system will be infrequent and operational restrictions will often result in restricting the thermal plume to a much smaller area than is permitted. In all cases, migrations of aquatic organisms will not be affected.



Paul C Little
Director of Environmental Activities

Mitt 50-82 80EP10.1.2
General Offices: 212 West Michigan Avenue, Jackson, MI 49201 • (517) 788-1930

April 8, 1982

Dr William Cooper, Chairman
Michigan Environmental Review Board
Michigan State University
East Lansing, MI 48823

Dear Dr Cooper

Attached are responses to the questions raised at the March 22, 1982 MERB meeting concerning the Midland Plant proposed NPDES Permit. The responses are numbered 12 through 18. (Responses to numbers 1 through 11 were submitted to you prior to the March 22 meeting.)

Responses 13, 17 and 18 covering the ammonia discharge, the TDS measurement location and the documentation of the withdrawal schedule, respectively, are joint Company and DNR responses. All other responses are the Company's responses.

You should also know the Company and the DNR staff have agreed to additional restrictions on the cooling pond blowdown thermal discharge. Should you require additional information on these responses, please contact me.

Yours very truly,

PCH/mlp

CC RJCourchaine, DNR

BCC WLBeckman, Midland
✓RFGreen, P-14-204
BWMarguglio, JSC-220A
MRPutnam/RLFobes, JSC-285A
DASommers, P-14-106
ATUdrys, M-1023
RAWells, Jr, P-14-113A
DCC 1141*72*40*05

RECEIVED

APR 23 1982

MIDLAND PROJECT
MANAGEMENT

14. QUESTION

Will the maximum cooling pond discharge temperatures cause lethal effects to fish?

ANSWER

The DNR staff and the Company have agreed to the thermal restrictions shown in Table I. Operation of the Plant within these restrictions and other operational constraints to meet TDS and thermal mixing zone requirements will preclude lethal effects to fish in the Tittabawassee River. The restrictions in Table I limit the maximum blowdown temperature to 95°F - except that a discharge of not more than 5 cfs is permitted when discharge temperatures are greater than 95°F but not greater than 100°F.

The occurrence of cooling pond blowdown is constrained primarily by two considerations. The first consideration is the concentration of TDS in the river. Cooling pond blowdown can only be discharged when it would not cause the concentration of TDS in the river to exceed the allowable limitation established for the river. The second consideration is the ability of the cooling pond blowdown thermal plume to meet the established criteria for length, width and incremental temperature at the mixing zone's edge. Only when both the river TDS and thermal mixing zone requirements are met can blowdown occur.

In addition to limiting blowdown occurrence, the quantity of blowdown that can be discharged is also limited by river TDS and thermal mixing zone requirements. River flow is an important variable in determining how much the TDS and thermal mixing zone requirements will limit the allowable quantity of pond blowdown. The difference in temperature between the cooling pond and the river (ΔT) is also an important variable in determining the quantity of cooling pond blowdown that can be discharged. In general, when river flow is low, or ΔT is high, the quantity of pond blowdown which can be discharged will be small if permitted at all. During operations

14. ANSWER (Contd)

the amount of blowdown discharged will be determined by a computer controlled system which continuously monitors key parameters, calculates water quality characteristics in the river and sets the blowdown flow every 15 minutes.

River flows usually are low during the summer when the highest cooling pond temperatures will occur (Exhibit 1). For example, the average river flows during the months of June, July, August and September are 1318, 728, 553 and 685 cfs, respectively. The river flow varies during any day with typical variations of greater than 50% from the daily average (Exhibit 2). Because the amount of pond blowdown which can be discharged is related to river flow, the pond blowdown rate will vary throughout any day with the river flow variations. For example, Exhibit 3 shows that during typical summer conditions of 500 cfs daily average river flow, the volume of blowdown will vary throughout the day from 0 to 13 cfs provided that the discharge temperature does not exceed the restrictions described in Table I.

The frequency of occurrence of blowdown during the summer period is expected to be small. To assure that the Plant's cooling system would be capable of operating successfully under worst case conditions, the Company had a cooling pond operating study performed with rigorous constraints placed upon the pond's ability to makeup or blowdown. The effects of these constraints were to maximize temperature and total dissolved solids concentrations in the pond. Exhibit 4 shows the frequency of occurrence of blowdown discharges for the summer months of June, July, August and September during a 41 year historical simulation period under these worst case conditions. Exhibit 4 shows that under these conditions the average frequency of summer blowdown over the 41 year simulation ranged from 32% during June to 3.5% during August. Blowdown discharges during actual operations will probably be more frequent than these conservative estimates, nonetheless, blowdown during periods of high pond temperatures will still be infrequent especially during the months of July, August and September.

14. ANSWER (Contd)

The maximum blowdown temperature of 100°F is not anticipated to cause lethal effects to fish in the Tittabawassee River. A blowdown temperature of 100°F could occur during June, July, August and September. Based on laboratory temperature preference data, some Tittabawassee River fish species could be attracted to areas of a thermal plume where temperatures range from 80°F to 92.8°F (1). In sharp contrast to the established response of attraction derived from such laboratory experiments, fish communities in their natural environment have not been found to exhibit this same response (2,3).

In the event that some fishes reach the end of the discharge pipe where the warmest plume temperature occurs, a blowdown temperature of 100°F would not be lethal. Field data from the literature document that most fishes present have been collected above 100°F. In fact, the dominant* Tittabawassee River fishes during July and August, emerald shiner and spotfin shiner, have been collected at temperatures of 107.6°F (1).

During the summer period of highest pond temperatures, the infrequent blowdown of small volumes (not more than 5 cfs) are anticipated. Under these summer conditions the area of the plume approaching the blowdown temperature is very small (Exhibit 5).

Fishes may experience sudden exposure to increased temperatures by swimming into the plume or being at the point of discharge when blowdown is initiated. A review of scientific literature identifying the response of species of fishes found in the Tittabawassee River to sudden temperature change (5,6) indicates a fish acclimated to summer temperatures and suddenly exposed to a temperature of 100°F would be unlikely to experience heat shock. Finally, fish tracking studies at various power plants have documented that fishes travel in and out of thermal plumes without experiencing detrimental effects (7,8,9).

*Of the combined 1979 and 1980 Tittabawassee River preoperational monitoring fish collection, these species comprised 82% of the July collection and 97% of the August collection (4).

14. ANSWER (Contd)

In summary, during the summer period of high pond temperature, blowdown discharges will be characterized as infrequent, intermittent, small in volume, and gradually changing in volume with the change in river flow. With these blowdown characteristics and the end of pipe blowdown temperature of 100°F, lethal effects will not occur. The 100°F maximum discharge temperature is similar to the 98°F maximum discharge temperature of the existing Dow H-flume discharge which is not known to have caused lethal effects. (The Dow H-flume discharge will be terminated when the Midland Plant begins operating.)

4/6/82

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ALLOWABLE DISCHARGE TEMPERATURES
MIDLAND PLANT
COOLING POND BLOWDOWN

<u>Month</u>	<u>Discharge Temperature (°F)</u>
December	75 ⁽¹⁾⁽²⁾
January	75 ⁽¹⁾⁽²⁾
February	75 ⁽¹⁾⁽²⁾
March	80 ⁽¹⁾⁽²⁾
April	85 ⁽³⁾
May	95 ⁽³⁾⁽⁴⁾
June	95 ⁽³⁾⁽⁴⁾
July	95 ⁽³⁾⁽⁴⁾
August	95 ⁽³⁾⁽⁴⁾
September	95 ⁽³⁾⁽⁴⁾
October	90 ⁽³⁾
November	85 ⁽³⁾

(1) Maximum weekly average temperature.

(2) In the event of a Plant shutdown, sudden termination of the discharge will not occur. Rather, the normal pond discharge criteria will be followed until the discharge reaches 5 cfs at which time discharge may be terminated.

(3) Maximum temperature, except as provided in Footnote 4.

(4) Discharges of up to 5 cfs are permitted when discharge temperatures are greater than 95°F but not greater than 100°F. No discharge is allowed when the cooling pond blowdown discharge temperature is greater than 100°F.

TABLE I

<u>MONTH</u>	<u>RIVER FLOW(1) - DAILY AVG</u>			<u>TEMPERATURE (AVG)</u>		
	<u>MIN</u>	<u>AVG</u>	<u>MAX</u>	<u>POND(2)</u>	<u>RIVER(3)</u>	<u>ΔT</u>
JUN	355	1,318	5,270	97.5	73.2	24.3
JUL	234	728	4,492	100.1	79.5	20.6
AUG	225	553	2,236	100.0	80.4	19.6
SEPT	250	685	5,420	93.9	72.8	21.1

(1) Data base - 1937 to 1977, USGS data.

(2) Worst case conditions (see ER-Rev 12, Table 3.4-5).

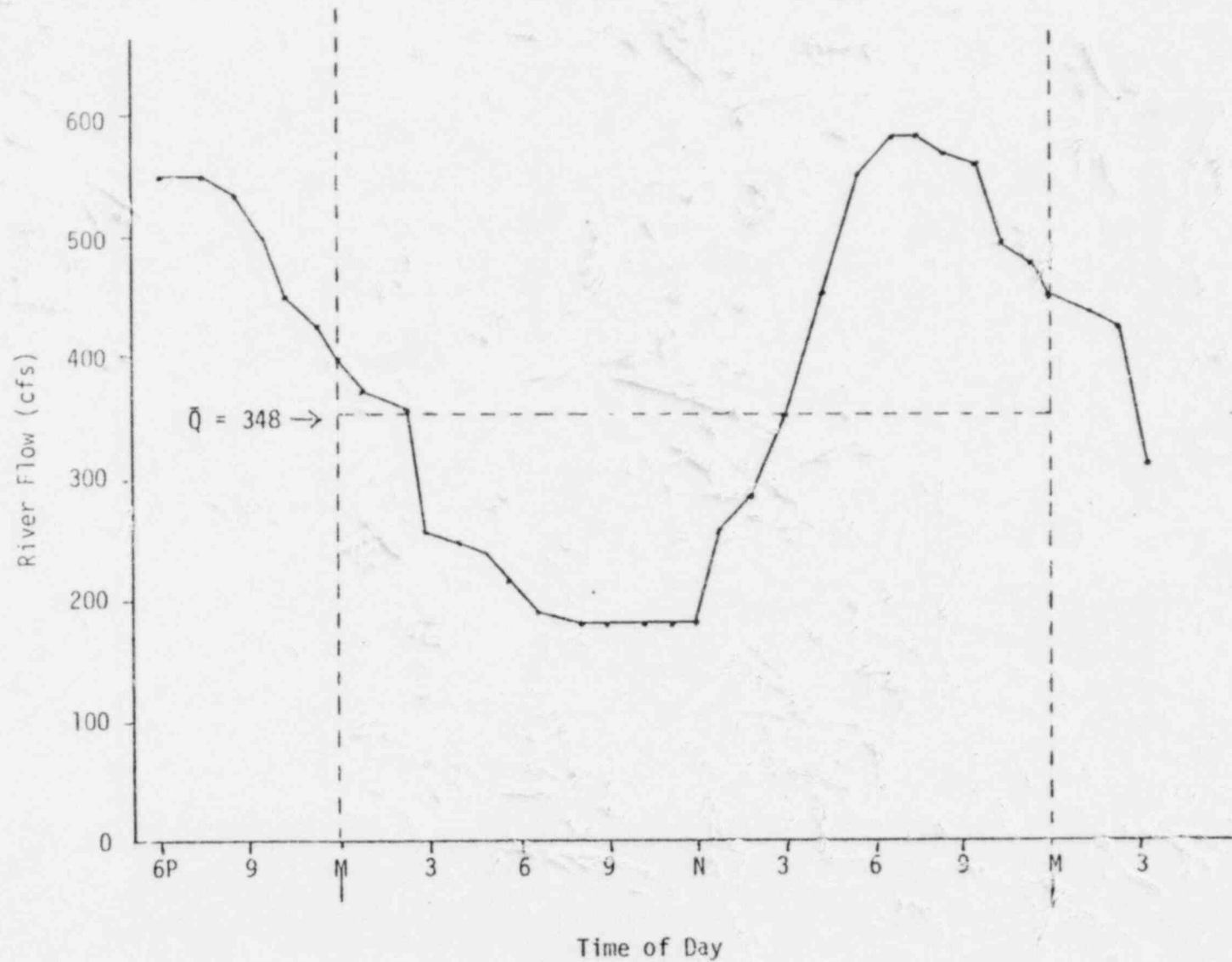
(3) Data base - Water Years 1975-1976, 1976-1977 and 1977-1978.

EXHIBIT 1

TITTABAWASSEE RIVER HYDROGRAPH

SEPTEMBER 22, 1978

SOURCE: USGS



E X A M P L E

SUMMER SEASON

$\Delta T = 20^{\circ} \text{ F}$

HOUR	DAILY AVG RIVER FLOW @ 500		DAILY AVG RIVER FLOW @ 1000	
	<u>Q_R</u>	<u>Q_B</u>	<u>Q_R</u>	<u>Q_R</u>
1	575	7	1150	22
2	525	5	1050	18
3	503	0	1006	17
4	374	0	748	11
5	368	0	736	10
6	351	0	702	10
7	316	0	624	8
8	276	0	552	7
9	259	0	518	7
10	259	0	518	7
11	259	0	518	7
12	259	0	518	7
13	259	0	518	7
14	385	0	770	12
15	431	0	862	15
16	503	0	1006	17
17	647	9	1294	26
18	783	12	1566	31
19	826	13	1652	35
20	826	13	1652	35
21	798	12	1596	32
22	776	12	1552	31
23	683	9	1366	28
24	661	9	1322	28

Q_R = River flow rate (cfs).

Q_p = Pond blowdown flow rate (cfs).

ΔT = Difference between pond and river temperature.

Frequency of blowdown for summer months during the 41 year historical simulation period using worst case conditions which maximize pond temperature and total dissolved solids concentrations⁽¹⁾

<u>Month</u>	<u>Range of Predicted Blowdown Temperatures (41 Year Simulation)</u>	<u>Predicted Number of Days Blowdown Occurred at Each Temperature Range</u>	<u>Total Number of Days Blowdown Occurred During 41 Year Simulation</u>	<u>Percent of Possible Time Blowdown Was Predicted to Occur During 41 Year Simulation</u>
June	85-95 95-105 ⁽²⁾ 106 ⁽²⁾	89 300 3	392 of 1230	32%
July	90-95 95-105 ⁽²⁾ 105-108 ⁽²⁾	19 103 9	131 of 1271	10%
August	95-105 ⁽²⁾ 105-106 ⁽²⁾	40 5	45 of 1271	3.5%
Sept	75-85 85-95 95-103 ⁽²⁾	28 67 9	104 of 1230	8.5%

(1) - Midland Plant Cooling Pond Operation Study (Bechtel 1979).

(2) - The Company has agreed not to discharge blowdown at a temperature above 100°F. This commitment will further reduce the number of days blowdown will occur during the summer period.

$\frac{T}{(^{\circ}\text{F})}$ $\frac{\Delta T}{(^{\circ}\text{F})}$

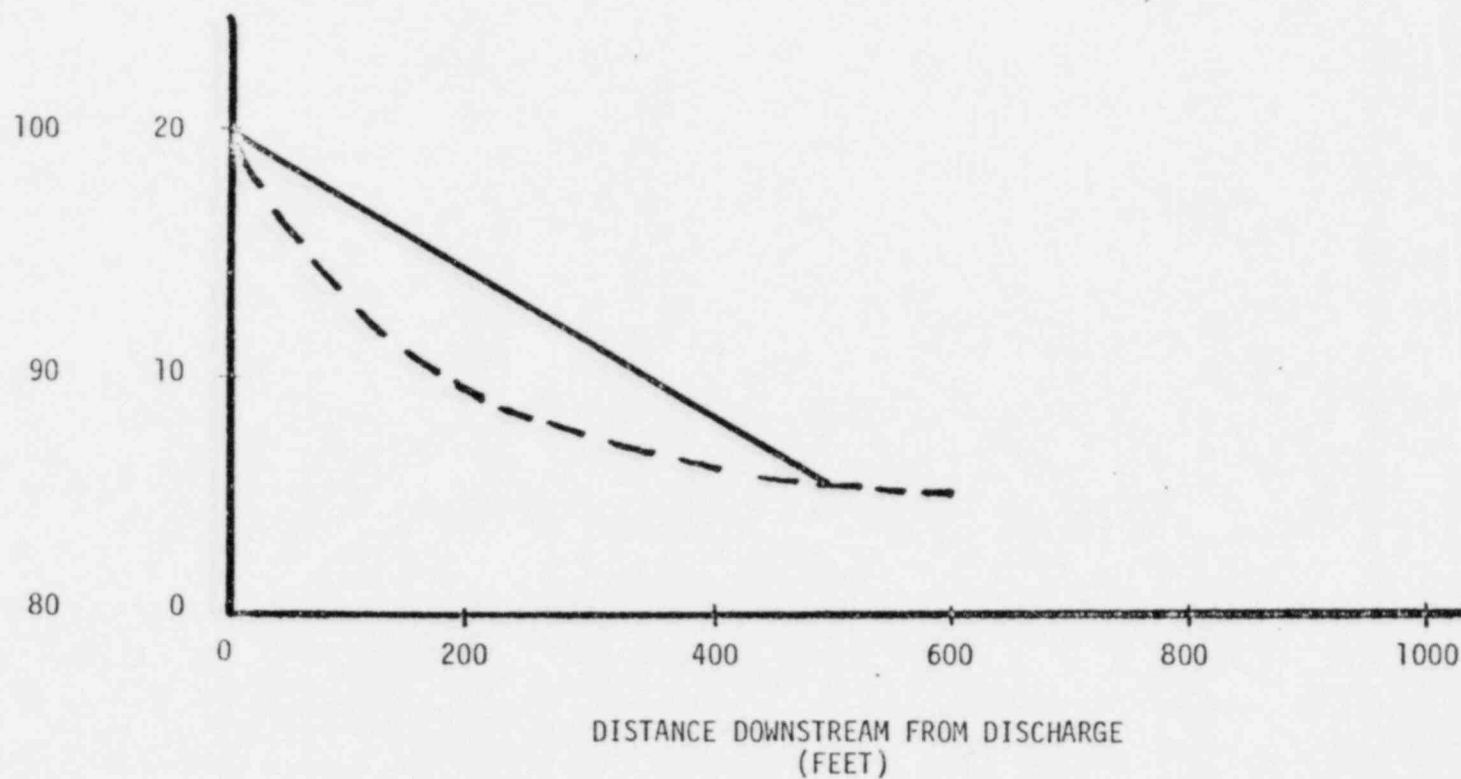


EXHIBIT 5

15. QUESTION

Will the fluctuation in the cooling pond thermal discharge during the winter cause lethal effects to fish in the Tittabawassee River?

ANSWER

The DNR staff and the Company have agreed to the thermal restrictions shown in attached Table I including the requirement that in the event of a Plant shutdown sudden termination of the discharge would not occur; rather the normal pond discharge criteria would be followed until the discharge reaches 5 cfs at which time discharge may be terminated. These restrictions, for the reasons described below, lead to the conclusion that the thermal discharge during the winter is unlikely to cause lethal effects to fish.

Fishes can tolerate relatively large, sudden changes in temperature. Sudden temperature changes of 20°F or more produce little behavior reaction and no immediate mortality, provided that such changes do not exceed the fishes' upper or lower thermal tolerance limits. Literature documenting the extremes of temperature change fishes can tolerate is minimal, but temperature increases approaching 40°F and decreases of up to 33°F with no shock response have been documented (1,2).

Data indicate that fishes acclimated to winter river water temperatures (<40°F) would likely not experience lethal heat shock if suddenly exposed to temperatures such as the maximums expected from the Plant's cooling pond blowdown. In winter, if a fish acclimates to an increased temperature such as that of a thermal plume, there is a corresponding shift in its thermal tolerance limits. The upward shift of the lower tolerance limit of fish acclimated to warm water is the basis of most cold shock damages at power plants. The physiological adjustments that are made during acclimation to warmer water take time - on the order of 24 hours (3,4). Thus, in the winter, fishes that have become acclimated to a thermal discharge may exceed their upward shifted lower thermal tolerance

15. ANSWER (Contd)

limit when a discharge is discontinued and river water temperatures are 34°F or less (2). At Midland an important prerequisite to cold shock - acclimation to the warmer discharge water - is virtually eliminated for several reasons. First, the discharge from the cooling pond blowdown is not continuous. As Exhibit 1 shows at a daily average river flow of 1000 cfs and a ΔT of 30°F, pond blowdown would not occur continuously through a day. Second, when the discharge is continuous at higher river flows (Exhibit 1), the area of the thermal plume elevated 10°F or more above the river temperature is small. For example, at a river flow of 2950 cfs and a discharge ΔT of 30°F the area within the plume in which the temperature is increased 10°F or greater above the ambient river temperature would be less than 1/3 of an acre. A small area is less likely to attract fishes. Third, it would be more difficult for a fish to remain within a small area and become acclimated to the warmest plume temperature because the velocity at the discharge pipe is 14 ft/sec under the conditions in the example described above and the river velocity would be 3.3 ft/sec at this river flow. Fourth, the larger the difference in temperature between the cooling pond and the river, the smaller the allowable volume of discharge and the more intermittent the occurrence of discharge would be (Exhibit 2). All of these factors would reduce a fish's potential for becoming acclimated to the higher temperatures in the plume. These factors which reduce acclimation potential virtually eliminate the potential for cold shock due to the pond discharge.

In summary, field acclimation temperature of fish would rarely be the same as the discharge temperature because the fish are not provided the habitat for continuous residence in the discharge (3), and fishes can tolerate sudden changes in temperature provided that such changes do not exceed the fishes' upper or lower thermal tolerance limits. Limited research indicated that fishes acclimated to winter conditions, then exposed to temperatures such as those of the Midland thermal discharge, would be unlikely to experience exceedance of their

15. ANSWER (Contd)

upper thermal tolerance limit. Additionally, lower thermal tolerance limits should not be exceeded under the conditions of discharge at Midland because the opportunity for fish to acclimate to warmer discharge temperatures is virtually eliminated due to the characteristics of the cooling pond blowdown discharge.

4/1/82

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ALLOWABLE DISCHARGE TEMPERATURES
MIDLAND PLANT
COOLING POND BLOWDOWN

<u>Month</u>	<u>Discharge Temperature (°F)</u>
December	75 ⁽¹⁾⁽²⁾
January	75 ⁽¹⁾⁽²⁾
February	75 ⁽¹⁾⁽²⁾
March	80 ⁽¹⁾⁽²⁾
April	85 ⁽³⁾
May	95 ⁽³⁾⁽⁴⁾
June	95 ⁽³⁾⁽⁴⁾
July	95 ⁽³⁾⁽⁴⁾
August	95 ⁽³⁾⁽⁴⁾
September	95 ⁽³⁾⁽⁴⁾
October	90 ⁽³⁾
November	85 ⁽³⁾

(1) Maximum weekly average temperature.

(2) In the event of a Plant shutdown, sudden termination of the discharge will not occur. Rather, the normal pond discharge criteria will be followed until the discharge reaches 5 cfs at which time discharge may be terminated.

(3) Maximum temperature, except as provided in Footnote 4.

(4) Discharges of up to 5 cfs are permitted when discharge temperatures are greater than 95°F but not greater than 100°F. No discharge is allowed when the cooling pond blowdown discharge temperature is greater than 100°F.

TABLE I

E X A M P L E

WINTER SEASON

$\Delta T = 30^{\circ} \text{ F}$

HOUR	DAILY AVG RIVER FLOW @ 1000		DAILY AVG RIVER FLOW @ 2000	
	<u>Q_R</u>	<u>Q_B</u>	<u>Q_R</u>	<u>Q_B</u>
1	1150	8	2300	28
2	1050	5	2100	22
3	1006	0	2010	19
4	748	0	1500	15
5	736	0	1470	14
6	702	0	1400	13
7	624	0	1250	12
8	552	0	1100	8
9	518	0	1040	5
10	518	0	1040	5
11	518	0	1040	5
12	518	0	1040	5
13	518	0	1040	5
14	770	0	1540	26
15	862	0	1720	18
16	1006	0	2010	19
17	1294	12	2590	39
18	1566	16	3130	70
19	1652	18	3300	70
20	1652	18	3300	70
21	1596	17	3190	70
22	1552	16	3100	70
23	1366	13	2730	45
24	1322	12	2640	43
25	1236	12	2470	32

Q_R = River flow rate (cfs).

Q_B = Pond blowdown flow rate (cfs).

ΔT = Difference between pond and river temperature.

MAXIMUM ALLOWABLE BLOWDOWN RATES
AT WINTER MONTHLY MINIMUM AND
AVERAGE RIVER FLOWS

Month	ΔT ($^{\circ}F$) ⁽¹⁾	Blowdown Rate (cfs)	
		@ Minimum River Flow ⁽²⁾	@ Average River Flow ⁽³⁾
December	10	33	78
	20	0	26
	30	0	12
	40	0	0
January	10	30	87
	20	0	28
	30	0	12
	40	0	0
February	10	30	105
	20	0	31
	30	0	16
	40	0	8

(1) ΔT - the difference in temperature between the cooling pond and the river.

(2) The minimum historic river flows during December, January and February are 462, 388 and 466 cfs, respectively.

(3) The average historic river flows during December, January and February are 1218, 1322 and 1569 cfs, respectively.

US DEPARTMENT OF INTERIOR (4/13/82)

20.B COMMENT: LANDSCAPING/ECOLOGY

Site Ecology

The statement is made that the applicant is committed to a landscaping program that will mitigate some of the construction-phase impacts on terrestrial wildlife. This program will include planting 350 acres with native, or closely related, tree species. More information about the landscaping program is required in the final statement to evaluate the program's value as a mitigation measure to wildlife. Information needed to assist in this evaluation would include the following items: (1) Will the program include the planting of tree species that are valued as cover and forage habitat for wildlife? (2) How many trees per acre will be planted? (3) Will the understory be allowed to develop into a natural ground cover, or will it be maintained as a manicured lawn? and (4) Will there be buildings, vehicle traffic, and other human activity within the 350-acre area? These data should be presented in the final statement.

RESPONSE

The Applicant's landscaping program will provide only slight mitigation of some construction-phase impacts on terrestrial wildlife. Landscaping of the Midland Plant around the cooling pond border is provided for screening, aesthetics, naturalizing, zoning commitments and fog barriers. (1) While the plantings, particularly evergreens, are of some value to nesting birds, rabbits, and some rodents, their aggregate value to wildlife is slight.

The site's total acreage is about 494 ha (1235 acres). The cooling pond's acreage is about 352 ha (880 acres). When the power block, parking lots, support buildings, lawns, and access roads are subtracted from the terrestrial portion of the site, less than half (perhaps 100-125 acres) might reasonably be considered wildlife habitat.

With the exception of the floodplain area, habitat patterns onsite are usually linear and sometimes disjunct. The floodplain area is subject to flooding, which renders it unsuitable to most terrestrial wildlife for part of the year. While many of the animals present prior to construction may be seen from time to time onsite, the site itself is incapable of supporting small populations of most species present before construction began.

In summary, preconstruction terrestrial habitat has been largely replaced by the Plant and its associated facilities. While landscaping may provide some wildlife habitat, its mitigative value is slight. The cooling pond which provides important habitat for waterfowl and many other avian species could be a greater asset to wildlife than the preconstruction terrestrial habitats were.

REFERENCES

1. ER-OL, Revision 12, June 1981; Section 3.1.2.3, p 3.1-6

US DEPARTMENT OF INTERIOR (4/13/82)

20.C COMMENT: COOLING POND ECOLOGY

The brief discussion on the effects of the cooling pond on waterfowl indicates that the 880-acre heated pond will attract and over-winter migratory birds, and cause some waterfowl mortality. A conclusion of no significant impact on birds was reached in this statement which was based on a comparison of "regional" bird populations to pond-induced mortalities. No information is presented to indicate whether the data base used in reaching this conclusion was based on cumulative impacts, which are necessary for this type of comparison. Cumulative impacts are those effects on migratory birds resulting from all existing open-waters created in the "region," and projecting the amount and effects of additional open-waters in the future.

The Fish and Wildlife Service winter waterfowl survey of January 25, 1982 records approximately 5,000 diving ducks in the open-water area on Saginaw Bay. This open-water area is created by the thermal discharges from the Karn and Weadocks electric generating facilities.

As the Midland Electric Generating Plant becomes operational, its large heated cooling pond, which supports fish, aquatic plants and possibly other forage organisms of waterfowl, could attract and hold hundreds or even thousands of birds. If these migratory birds remain after mid-January, they probably will be too weak to continue their migration, would overwinter in the pond, and be subjected to the harsh winter conditions prevalent. As a result, large numbers could succumb to starvation, disease or pond freeze-up due to plant shut-down. For the protection of this important resource, it is strongly suggested that waterfowl use and mortality be monitored at this large open-water area during the winter months and made a condition in the license.

RESPONSE

The comment is correct that cumulative impacts must be considered in assessing the overall impact of a new source of heated (open) waters on wintering waterfowl. We concur with the statement that the Midland Plant cooling pond "could attract and hold hundreds or even thousands of birds." The cooling pond, does support fish, aquatic plants, and other organisms which attract waterfowl, as indicated in our Avifauna Monitoring Program reports. Not mentioned by the commenter is the proximity of grain fields, which supply an offsite food source for dabbling ducks and geese. However, even when the cumulative impacts of regional open water sources and the amenities of the cooling pond are taken together, the numbers of waterfowl which will use the pond are difficult to predict. There may be hundreds, which might indeed be insignificant with respect to regional populations as NRC Staff indicates, or there may be thousands, which might not be insignificant, as the comment implies.

We concur with the assertion that disease potentially could pose a problem to wintering waterfowl. In fact, as a contingency measure we have contacted a Michigan Department of Natural Resources wildlife veterinarian to discuss the

20.C (Continued)

roles of State, Federal and Company representatives should a disease incident require the implementation of the Federal Waterfowl Disease Contingency Plan.

We disagree with the scenario on waterfowl starvation. There are several reasons:

1. Field feeding ducks and geese in the State readily move south as field food sources become unavailable. Wintering populations move north and south along the critical snowline with the availability of food and open water. Starvation should not be a problem with these birds.
2. While the Midland Plant cooling pond does attract some diving ducks (Aythyinae), numbers are generally low. At optimal operational levels, mean pond depth is too great to allow luxuriant growth of macrophytes favored by diving ducks. Macroinvertebrate fauna in the pond is also poorly developed. Taken together, food resources are insufficient for a significant diving duck buildup in the winter. Thus diving duck starvation, a problem in wintering situations where ice cover renders food unavailable, is not anticipated.
3. A second type of diving duck, mergansers (Merginae) are fish eaters and are attracted to the pond by numerous small fish. While the fish fauna in the pond may change during operation, it is likely that some fish will survive and provide an appropriately sized forage base for mergansers. Winter use of the pond by mergansers seems likely; indeed, mergansers are the most abundant diving ducks found in the Karn-Weadock discharge in Bay City. Mergansers commonly winter in the region in other warm water discharges, the faster flowing rivers, and stretches of rivers below dams. The diversity of potential wintering habitats lessens the likelihood of starvation for the Merginae. The nearby Karn-Weadock discharge could serve as a potential safety valve in case of Plant shutdown in freezing weather. In fact, the Karn-Weadock discharge will probably prove to be a better merganser habitat than the cooling pond due to its potential for harboring a larger fish population.

In summary we do not believe that waterfowl starvation is a potential problem.

ATTACHMENT A
EMERGENCY PLANNING

EMERGENCY PLANNING

The authority for general public evacuation in Michigan with respect to nuclear power plant radiological incidents rests with the Emergency Services Division of the Michigan State Police as delegated by the Michigan Emergency Preparedness Act, Public Acts 1976. The description for implementation is provided in the Michigan Emergency Preparedness Plan (MEPP) for which each State agency involved prepares its own annex. A description of the actions to be considered in the development of local evacuation plans is provided in Annex A of the MEPP. Those evacuation actions will be developed in accordance with the following quote from the most recent revision of the MEPP which states that evacuation plans are to:

- a. Be developed in coordination with other jurisdictions that may be involved in the evacuation and/or reception or through which evacuation routes may pass;
- b. Designate areas which are likely to require evacuation from potential radioactive contamination and identify points of safety nearby;
- c. Establish primary and alternate evacuation routes;
- d. Identify and make arrangements with sources of transportation for mass evacuation;
- e. Provide emergency crews (monitoring teams, etc) with access to the area(s) being evacuated;
- f. Provide for barricading access roads to the contaminated or restricted area;
- g. Designate evacuee assembly and departure points to expedite mass evacuation;
- h. Set up procedures for orderly access to, progress along, and exit from evacuation routes;
- i. Designate relocation sites and coordinate reception arrangements with the Red Cross, Salvation Army and other appropriate welfare, relief and agriculture agencies to include monitoring of evacuees at relocation centers; registering;
- j. Consider special needs for evacuation of school children, hospital patients and other groups which may require specialized transportation and other attention;
- k. Provide for alert and warning of persons located in a potential evacuation area; and
- l. Provide for preparation and dissemination of appropriate instructions to the general public.

The Emergency Services Division of the Michigan State Police, the lead agency within the State for coordinating emergency preparedness, will provide direction in the preparation and exercise of plans and procedures for use by local jurisdictions in responding to any radiological emergencies related to the Midland Plant. Specifically, the planning will include assuring that adequate evacuation plans exist prior to start-up of the first unit of the Midland Plant.

The decision to evacuate is based on an evaluation of the radiological and meteorological conditions made by the Department of Public Health. On notification that evacuation is or may be necessary the affected local emergency jurisdiction will take action as provided in the local emergency operations plan. The Department of Public Health will base its determination upon the criteria given in Annex Q to the MEPP. This criteria is in turn based upon the US Environmental Protection Agency guidance. The Department of Public Health will be utilizing both its own resources and data and recommendations provided by Consumers Power Company in making protective action determinations.

ATTACHMENT B

ROUTINE RELEASES OF RADIOACTIVE
AIRBORNE EFFLUENTS AND
COOLING POND FOG INTERACTION

ROUTINE RELEASES OF RADIOACTIVE
AIRBORNE EFFLUENTS AND
COOLING POND FOG INTERACTION

Based on the nature of cooling pond fog, the amount and type of routine airborne radioactive effluents, and the elevation of these routine releases, any potential effects of steam fog interaction with routine radioactive releases is not expected to have any significant impact on the existing projections or conclusions of the DES concerning annual dose commitments.

As noted in DES Table C-1, the major pathways for routine releases of radioactive airborne effluents are the reactor building stacks, auxiliary building stack, and air ejector exhausts. All of these pathways have elevated release points in contrast to the cooling pond fog which emanates from ground level. Releases from these pathways consist largely of noble gases. Calculated releases of particulates and halogens represent less than 0.01% of the noble gas contribution according to the DES. Noble gases do not adsorb on dust particulate nor partition out in condensed steam (fog) in any significant quantity to merit consideration with regard to the hypothesized interaction. Of the remaining radioactive materials routinely released during plant operation, the vast majority of these releases come from the reactor building and auxiliary building which are elevated releases with discharge points approximately 166 feet above grade.

There are no routine radioactive releases to the cooling pond. Consequently, pond fog should carry no radioactivity above that which is experienced as normal background. If the pond fog plume remains localized and low to the ground as normally expected, the elevated releases of routine airborne effluent should not pass directly into the fog, thereby eliminating any chance of the potential interaction. If the fog plume rises, the positive buoyancy of the fog would act to make the associated radioactive release buoyant and rise as well. Independent of any potential interaction, this would subject the release to a greater degree of diffusion, thereby reducing offsite doses. It should be noted that independent of specific fog conditions, the cooling pond will generally act as a localized buoyant effect to any plume transversing its surface area.

Finally, a cooling pond fog interaction with radioactive materials has not been observed at Dresden (ie the plant referenced in several intervenor comments on fogging). The environmental monitoring program at Dresden has documented no abnormal levels of radioactivity offsite. This should not be surprising. If interaction of pond fog with routine radioactive releases did concentrate the effects of these low-level releases, the effect should have already been observed at operating plants due to naturally occurring fog conditions.

For the above-mentioned reasons, the potential interaction of cooling pond fog with routine releases of low-level airborne radioactivity is not expected to have any significant effect on the projections or conclusions of the DES on annual dose commitments due to Midland Plant operation.

ATTACHMENT C

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LOEWE AND MENDELSON

Several commenters contend that researchers William Loewe and Edgar Mendelsohn of the Lawrence Livermore Laboratory have found that serious errors were made in the radiation dose estimates of the Hiroshima and Nagaski atomic bomb blasts. These data have been the basis for much of the current radiation dose estimates, including those in the 1980 National Academy of Science Report. The intervenors contentions appear to rely heavily on information from an article by Elliot Marshall which appeared in Science, May 22, 1981.⁽³⁾ This article states that the neutron radiation from the blast appears to have been overestimated by a factor of 6 to 10. The article drew the conclusion that the gamma rays were therefore more toxic than had been thought, since the effects on human health remain the same.

The Marshall article is essentially accurate in repeating statements of various people on the subject, however, it gives an erroneous view of the implications of the study. Although the revisions proposed by Loewe and Mendelsohn of the Hiroshima and Nagasaki doses (T65 dosimetry) have been widely circulated in summary form, they have not been published. The proposed Livermore revisions are being publicized instead by individuals whose knowledge of the specifics of the study are incomplete and sometimes in error. Loewe and Mendelsohn assert that the gamma dose in Hiroshima was grossly underestimated in the T65 dosimetry, while the gamma doses in Nagasaki and the neutron doses in both cities were overestimated. The net result is that the risks for cancer, per rad, estimated on the linear hypothesis, change very little.

In a letter written by William Loewe and Edgar Mendelsohn to Science⁽¹⁾ responding to the Marshall article, Loewe and Mendelsohn stated: "We take exception to statements that our results show gamma radiation is much more hazardous than previously assumed." Marshall had stated in his article that the Loewe and Mendelsohn conclusion of much lower neutron dose estimates imply "that the gamma rays were more toxic than had been thought."⁽²⁾ Marshall failed to observe that the reduction in neutron dose was accompanied by a substantial increase in gamma dose, a significant factor not supportive of the quoted Marshall statement. Loewe and Mendelsohn further said in their letter: "Thus any conclusions drawn in the past concerning the radiobiological effects of gamma radiation in Nagaski could not change significantly on the basis of our new dose estimates alone. We, therefore, fail to see how our work can be a basis for assigning a greater hazard to gamma radiation."⁽¹⁾

REFERENCES

1. "Radiation Estimates," Letters, Science, Vol 213, July 3, 1981.
2. "New A-Bomb Data Shown to Radiation Experts," Science, Vol 212, June 19, 1981.
3. "New A-Bomb Studies Alter Radiation Estimates," Science, Vol 212, May 22, 1981.
4. "Japanese A-Bomb Data Will Be Revised," Science, Vol 214, October 2, 1981.