UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
	)	Docket Nos. 50-329
CONSUMERS POWER COMPANY	)	50-330
	)	
(Midland Plant, Units 1 and 2)	)	

INITIAL DECISION

CONTENTS

APPEARANCES

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on behalf of

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on behalf of
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I.

BACKGROUND

1. On January 13, 1969, Consumers Power Company ("Applicant") filed with the Atomic Energy Commission ("AEC") an application for a license to construct and operate a dual purpose pressurized water nuclear power plant.[1/] The proposed plant, designated the Midland Nuclear Plant, Units 1 and 2 ("Plant"), would produce approximately 1300 megawatts of electricity and 4,050,000 pounds of process steam for sale by Applicant to the Dow Chemical Company. It would be located on Applicant's approximately 1200-acre site on the south shore of the Tittabawassee River in Midland County, Michigan.

2. Upon completion of the Staff review,[2/] the AEC, on October 29, 1970 (35 F.R. 16749) published a Notice of

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1/ The Application and its 21 amendments are collectively referred to as the "application" or the "PSAR".

2/ Prior to completion of the Staff review, the application was reviewed by the Advisory Committee on Reactor Safeguards (ACRS); the ACRS Reports, dated June 18, 1970 and September 23, 1970 were admitted into the record (Applicant's Ex 4 and Ex 5) as required by law (42 U.S.C. § 2232 (b)) for the sole purpose of showing compliance with the statute and not as evidence of the truth of any statement therein.

Hearing pursuant to which a pre-hearing conference was to be held on November 17, 1970, and the hearing was to begin on December 1, 1970. On or before November 17, 1970, as required by the Notice of Hearing, petitions to intervene were filed by the Dow Chemical Company (Dow) and the Midland Nuclear Power Committee[3/] in support of the application. Against the application, a joint petition to intervene was filed by the Saginaw Valley Nuclear Study Group, Citizens Committee for Environmental Protection of Michigan, Sierra Club, United Auto Workers of America, Trout Unlimited, West Michigan Environmental Action Council and University of Michigan Environmental Law Society (hereinafter collectively called "Saginaw Intervenors") and a separate petition by the Environmental Defense Fund (EDF).[4/] These petitions were granted by the Board in its Order dated November 24, 1970. A late petition to intervene against the application filed by six residents of the

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3/ The Midland Nuclear Power Committee did not actively participate in the hearing.

4/ Trout Unlimited and Environmental Defense Fund withdrew from the proceeding before the hearing on environmental matters. (Tr. 5685-86)

community of Mapleton ("Mapleton Intervenors") was granted by the Board's Order of December 8, 1970.

3. On December 1, 1970 the Hearing was begun for the purpose of receiving limited appearances. Limited appearances in favor of the application were made by the following individuals and organizations: Harold Krefft for Federal Power Commission; William G. Turney for Michigan Water Resources Commission; Donald E. VanFarowe for Michigan State Air Pollution Control Commission; James Woodruff for Michigan Public Service Commission; John A. Rapanos; Franklin E. Braman for Board of Directors of Downtown Bay City, Inc.; Hon. Julius Blasy, Mayor, City of Midland; Frank Olds, Chairman, Board of Commissioners, Midland County; Robert B. Chatterton, Supervisor Midland Township, Midland County; Dr. Sidney Smock for Midland Hospital Association; Fred L. Yockey, City Manager, City of Midland; Dr. Edward L. Kern, President, High Performance Technology, Inc.; Clifford Mapes, Vice Chairman, Midland County Road Commission; Ned Arbury, President, Arbury & Sons Insurance; Milton Getzendaner, President, Midland Nature Club; H. C. Allison, Vice President, Alden B. Dow Associates, Inc.; Fred Minzer for Minzer Realty; J. R. Buckley, Vice President,

Mutual Savings and Loan Association; Roy Lanham, President, Brown Lumber, Inc.; John A. Miller; Alan Ott, Vice President and Director, Chemical Bank and Trust Company; Rev. Theodore M. Greenhoe for Memorial Presbyterian Church; Robert Ferries, President, Ferries and Maxwell Insurance Agency, Inc.; James G. Bandeen, President, Bandeen Chevrolet; Arthur E. Maass, Superintendent, Wastewater Department, City of Midland; Lyn DeVries for Midland Business and Professional Womens Club; Robert Parker, Executive Vice President, Midland Area Chamber of Commerce; William H. Meier, President, Meier Studio and Camera Shop; Robert Kingsley, Director of Elementary Education, Midland Public Schools; George B. Ulmer; Robert Copeland, Chairman, Midland Section, American Institute of Chemical Engineers; Lewis Warren, Executive Vice President, Greater Saginaw Chamber of Commerce; William Demers, President, Lumber Dealers Association; Robert R. Denison, Airport Manager, Tri-City Airport Commission; Bruce R. Benway, Vice President, First National Bank; Larry Reed, Executive Vice President, Bay Area Chamber of Commerce; George Elleson, Bay County Industrial Development Corp.; and James L. Collison, Executive Director, East Central Michigan Economic Development District. Limited

appearances opposing issuance of the construction permit were made by Georgena Goff and Wendell Marshall. Limited appearances expressing interest in procedural or safety matters related to the Plant but not opposing issuance of a construction permit were made by Thomas Doyle for Michigan Department of Natural Resources; Judith Boli for Saginaw YWCA; William Foster; and Frederick L. Brown, President, Michigan United Conservation Clubs.

4. After the limited appearances, the hearing was adjourned to permit opposing intervenors to have discovery and prepare for the hearing. Among the contentions of opposing intervenors were several relating to "environmental" (as opposed to radiological health and safety) matters. Under then controlling regulations of the AEC, environmental issues could not be raised in the proceeding. On April 27, 1971, the Board held Intervenors' challenge to those regulations insufficient, thereby excluding all environmental questions from the proceeding.[5/]

5/ Except as to the conformance of the Environmental Impact Statement with the Regulations, an issue which later developments made academic.

5. The hearing on radiological health and safety questions resumed on June 21, 1971, and continued on seventeen days until July 23, 1971, when it was adjourned.[6/] Coincidentally, on the same day the United States Court of Appeals for the District of Columbia (in Calvert Cliffs Coordinating Committee v. AEC, 449 F. 2d 1109 (1971)) held that the AEC regulations did not comply with the National Environmental Policy Act. (42 U.S.C. §§ 4321-49 (1970)). One effect of the Calvert Cliffs decision was to require that environmental matters be heard in pending proceedings, including this proceeding.

6. Following the adoption of new regulations, the AEC published, on December 4, 1971, a Supplemental Notice of Hearing on environmental matters. A timely petition for intervention on environmental issues by Steve J. Gadler

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6/ At that time the hearing on radiological matters was substantially completed, except as to the question of the emergency core cooling system (ECCS). By Order dated March 10, 1972, the record was closed on radiological questions except ECCS and the iodine spray removal system.

was denied by the Board on February 9, 1972,[7] (By Order of March 31, 1972, the Atomic Safety and Licensing Appeal Board sustained the denial.)

7. On October 19, 1971, pursuant to the revised Regulations, Applicant duly filed its Supplemental Environmental Report (ASER).[8] This was followed by preparation of the Staff Draft Environmental Statement and the circulation of that statement for comment as required by law. The Final Environmental Statement (FES) was then prepared and notice of its availability was published on April 7, 1972 (37 CFR 7012).

8. Evidentiary hearings on environmental matters began on May 17, 1972, and ended on June 15, 1972, after fourteen days of hearings.

7/ On September 13, 1971, the State of Kansas petitioned to intervene to challenge the AEC decision to locate an ultimate high-level waste depository in Kansas. The Board permitted the intervention for the limited purpose of arguing the legal question whether high-level waste storage was an issue in this proceeding. By Order dated March 10, 1972, the Board ruled that high-level waste storage was not an issue in the proceeding, but referred its decision to the Appeal Board. The latter agreed. Kansas has not otherwise participated in the proceeding.

8/ Applicant's original Environmental Report (AER) was filed on July 24, 1970 under then controlling regulations.

9. This proceeding is a contested proceeding within the meaning of the regulations. It should be pointed out, however, that Saginaw Intervenors who took the laboring oath in the radiological hearing did not participate in the environmental hearing and have not filed proper proposed findings[9/] or conclusions even on radiological matters, although directed to do so by the Board's Order of June 28, 1972. Mapleton Intervenors' participation in the radiological hearing was relatively limited but they fully participated in the environmental hearing. Unfortunately, their proposed findings fall far short of the specification and detail required by the Regulations, and do not serve the purpose for which they were required.[10/]

9/ Saginaw did file a paper entitled "Proposed Findings of Fact and Conclusions of Law" but as to environmental issues they expressly state that "they have no conventional findings of fact to set forth." As to radiological issues, they state that they "have not chosen to search the record and respond to this proceeding by submitting citations of matters which we believe were proved or disproved." They do claim to reserve the right to take exception to any findings which the Board makes.

10/ The Board would like to note that the failure to propose proper findings and conclusions has greatly complicated the task of the Board and has made it virtually impossible in some instances to know whether particular issues are in fact contested.

As Applicant has noted both Mapleton and Saginaw are in default; as Applicant has also conceded, it is not clear what should be done about the default. The Board might, we suppose, strike the intervention and treat the proceeding as uncontested. This would not make sense in the circumstances. The opposing Intervenors by their participation strongly influenced the conduct of the proceeding and their work should not be ignored. On the other hand, we are troubled by the notion of opposing Intervenors that they can avoid the burden of proposed findings and at the same time reserve the right to attack the Board's decision once made. We have concluded that the best course would be the following: We will treat as contested issues of fact those as to which intervenors introduced affirmative evidence or engaged in substantial cross examination. With respect to conclusions of law, we will attempt to deal with those questions which we understand to be raised by the proposed conclusions in the light of earlier contentions by the intervenors. We leave open the question of the effect of the failure to file adequate Proposed Findings and Conclusions for consideration when and if there are exceptions to our decision.

II

RADIOLOGICAL HEALTH AND SAFETY

10. The proposed reactors are of the pressurized water type, each with an ultimate power level of 2252 MWT. One of the reactors will be used solely for the production of electrical power (800 MWe); the other will produce approximately 500 MWe of electrical power and, in addition, supply steam for use in various manufacturing processes.

11. Applicant's proposed findings on radiological issues cover approximately 100 pages (out of a total of 267). While the Board has found these very detailed proposals helpful, it does not feel that it should respond in kind. The proposed reactors are substantially identical to a number of reactors previously licensed. The Board has reviewed the various aspects of the proposal, e.g. coolant systems, leak detection systems, seismic design criteria, instrumentation, radiation monitoring, control room, flooding,[11/] and finds that Applicant has submitted

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11/ With respect to flooding, the staff testified that it would review the Applicant's calculation of the probable maximum flooding during construction of the plant to assure that the calculational techniques described by Applicant have been properly employed. (Staff Safety Evaluation ("SSE") p. 14)

sufficient information and the Staff has conducted an adequate review of those aspects of the Plant. We do not believe it would be helpful, nor is it required that we do so, to comment in any detail on the standard features of the Plant, (except where an issue is contested). Instead we will devote our attention to those aspects of the proposal which are new or unusual, to contested issues, and to those specific matters as to which we are required to make findings.

12. The aspects of the Plant of primary interest stem from the fact that its dual-purpose nature requires that the reactor be located in close proximity to a large chemical plant, a plant which is heavily populated during work hours. The contested radiological issues are: meteorology and the related dose calculations; quality assurance; emergency procedures; and iodine spray removal systems.

13. The Plant site is located on the south shore of the Tittabawassee River in Midland County,[12/] Michigan.

12/ The site is presently in Midland Township; however an Order of annexation of the Township to the City of Midland has been issued and is presently in litigation.

The site consists of approximately 1200 acres of which a relatively few acres along the river will be utilized for Plant buildings and about 880 acres to the south of the area occupied by the Plant itself will be used for a cooling pond. The site is bounded on the north and east by the Tittabawassee River, on the south by Gordonville Road and on the west by farmland and scattered residences (PSAR Applicant's Ex. 1-A, §2 and Figure 2-1).

14. Applicant has described the population density and use characteristics in the site environs (PSAR Applicant's Ex. 1-A, §2.2.5 and 2.2.6). The areas directly across the river from the Plant to the north and east are occupied primarily by the industrial complexes of the Dow and the Dow Corning Company for a radius of one mile to one and one-half miles. The area beyond these industrial complexes to the north is occupied by the commercial and residential areas of the City of Midland and the area to the east is a sparsely populated residential area containing many forested areas and scattered farms. The area to the south of the Plant is occupied by the cooling pond and other portions of the site for about one mile, is primarily

forested for an additional two miles and primarily used for farming for another two miles. The first mile to the east of the Plant is industrial property owned by Applicant and Dow; the next mile is mostly residential and light farming; and the next three miles are sparsely populated and primarily agricultural. The area five to fifty miles from the site is primarily used for farming, where not forested, except for the industrial communities of Bay City, Saginaw and Flint (PSAR Applicant's Ex. 1-A, §2.2.6). Projections of population growth have been made by Applicant for Midland County and surrounding counties based on material supplied by the Michigan Department of Commerce (PSAR Applicant's Ex. 1-A, §2.2.5).

15. The required (10 CFR §100.3(a)) exclusion area for the Plant has a radius of 0.31 miles (500 meters). The land within this area will be owned by Applicant except for a small portion which consists of a fenced-in waste treatment facility owned by Dow. Dow employees visit this facility only occasionally and Dow has agreed that Applicant may exercise the right to remove persons therefrom when required (PSAR Applicant's Ex. 1-A, §2.2.4;

Response to Staff Question 2.8, PSAR Applicant's Ex. 1-C, p. 2.8-1). The Board concludes that Applicant has the authority to "determine all activities" in the calculated exclusion area as required by 10 CFR Part 100.

16. The low population zone proposed by Applicant has a radius of approximately one mile (1600 meters) from the reactors. The area encompasses property owned and controlled by Applicant south of the reactors, a part of the Dow and Dow-Corning Company complexes to the north and east and a few residences in the southwest (PSAR Applicant's Ex. 1-A §2.2.5.5). The residential population within this zone is approximately 38 and the transient industrial or business population, primarily employees of Dow and Dow-Corning, is about 2145 (PSAR Applicant's Ex. 1-a, §2.24; Tr. 3103, 3119, 3295). The residential population within the zone is well within acceptable limits. The size of the transient population is unusually large and the acceptability of the low population zone depends upon the ability to evacuate the Dow and Dow-Corning employees. Subject to what is said below (see Findings 31-33) with respect to evacuation plans, the Board finds the population zone satisfactory.

17. The distance from the reactor to the nearest boundary of the City of Midland is 0.21 miles, considerably less than the "population center distance" of one and one-third miles seemingly required by the Regulations (10 CFR §100.11(a)(3)). However, in view of the fact that the population within one and one-third miles was largely limited to a transient population and that populous areas of Midland were sufficiently removed from the site vicinity, the Staff concluded that the reduced population distance was acceptable (SSE, p. 9; Tr. 2135-39, 2145, 2165). We concur.[13/] The recently ordered annexation of Midland Township by the City of Midland will not affect the population distribution.

18. Applicant is a combination electric and natural gas utility incorporated under the laws of the State of Michigan. The Applicant will finance the total costs of constructing the Midland Plant as an integral part of its normal construction program, using funds internally generated (cash on hand, undistributed earnings and depreciation and other accruals) and from the sale of securities (debt, equity,

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13/ Again, the acceptability of the reduced population distance depends on our conclusions as to the feasibility of rapid evacuation of the transient population, discussed at Findings 31-33 below.

and short-term notes) when and as required, in the same general manner as it finances other Plant additions. (PSAR Applicant's Ex. 1-D and 38E; SSE Appendix H, and Staff Ex. 8).

19. Applicant has had long experience in building and operating fossil fuel plants and has gained experience in nuclear plants at its Big Rock Nuclear Plant and Palisades Plant. The Babcock and Wilcox Company (B&W) which will design and supply the nuclear steam supply system, and the Bechtel Corporation which will design and supply the remainder of the Plant, have had extensive experience in designing and constructing nuclear projects.

20. The application reflects that the activities to be conducted would be within the jurisdiction of the United States and that all of the directors and principal officers of the Applicant's organization are citizens of the United States. Applicant is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. The Applicant will rely upon obtaining fuel as it is needed from sources of supply available for civilian purposes, so that no diversion of special nuclear material needed for military purposes is involved (PSAR Applicant's Ex. 1-D; SSE p. 83, following Tr. 1674).

21. The AEC requires that data as to site meteorology be included in the PSAR for a construction permit. This information is used in evaluating the adequacy of plant site and plant design. The meteorological data are used in calculating the radiation dose which might be received over a given period of time by a person at the site boundary from normal operating or accidental airborne releases. Intervenors questioned the adequacy of the meteorological data with respect to the evaluation of the site under 10 CFR Part 100. In particular, they challenged the assumption as to diffusion rates used in that evaluation.

22. Two main sources of data were used by Applicant: The Dow Plant, which has recorded weather records for over ten years, and the Saginaw (Tri-City) Airport, about eight miles southeast of the site.[14/] The Dow data was considered to be too incomplete for purposes of calculating diffusion

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14/ A third source of some upper air data was U.S. Weather Bureau information from Flint, Michigan, about 50 miles southeast of Midland. (PSAR, Applicant's Ex. 1-A, pp. 2A-3 to 2A-4).

models, and for that purpose Applicant used the more extensive, but more remote data from Tri-City Airport. (PSAR, Applicant's Ex. 1-A, p. 2A-4). In order to grant a construction permit, the Board is not required to find that the available meteorological data is complete (which it clearly is not). The Staff did not accept Applicant's data, but used, as is its practice, an arbitrary formula incorporating what it claims to be many conservative features. (SSE, p. 10). The Staff witness, an employee of the National Oceanographic and Atmospheric Administration ("NOAA") confirmed the conservatism of the assumptions in light of the general conditions in the area. (Tr. 3704). The testimony of Intervenor's witnesses, although there is some ambivalence, taken as a whole tends to corroborate the conservatism.15/ (Tr. 3406-3687). The Board is satisfied that the assumptions are sufficiently conservative to justify a reasonable expectation that the site is satisfactory.

23. Because of the absence of on-site data, the Applicant indicated it will conduct an on-site meteorology

15/ For example, (at Tr. 3659) Dr. Epstein characterized the site as "being rather good from the point of diffusion by and large".

program with a continuous recording of meteorological data (wind direction, velocity and temperature lapse rate) until at least a year's history is obtained. (PSAR, Applicant's Ex. 1-c, p. 1.00-1). Since the conclusion of the hearing, the AEC has promulgated Safety Guide No. 23, Onsite Meteorology Programs, describing the requirements of an acceptable on-site meteorological program, which is considerably more extensive than that proposed by Applicant in the PSAR. The Board concludes that the Staff should require Applicant to conduct a meteorological program of the scope described in the Safety Guide No. 23. The program must be sufficient to validate the conservatism of the meteorological assumptions referred to above and can be developed and executed during the construction phase.

24. The application states that the reactor vessel, steam generator, and pressurizer will be designed, manufactured and tested in accordance with Section III of the ASME Code. (PSAR, Applicant's Ex. 1-A, §4.5). Several types of nondestructive tests are to be performed during fabrication of the reactor vessel. These tests include radiography of welds, ultrasonic testing, magnetic particle examination, and dye penetrant testing. (PSAR, Applicant's Ex. 1-A, §§4.5.1 and 4.5.2). Surveillance specimens

consisting of material representative of the reactor vessels are to be exposed in the reactor vessels to allow monitoring of the neutron induced nil ductility transition temperature shift. (PSAR, Applicant's Ex. 1-A, §4.2.5.2).

25. The reactor coolant piping is to conform to the nuclear power piping code, USASI B31.7, and the reactor coolant pump castings are to be manufactured in accordance with Section III of the ASME Code, where applicable. (PSAR, Applicant's Ex. 1-A, §4.5). All system components are to be designed to withstand normal loads of mechanical, hydraulic and thermal origin plus the forces that would result from the blowdown of the reactor coolant system as a result of a design basis loss-of-coolant accident, concurrent with the design basis earthquake loads. (PSAR, Applicant's Ex. 1-A, Appendix 5A). The proposed codes and standards for reactor coolant system components and piping comply with 10 CFR §50.55a. The Staff has reviewed the codes, the plans for design and fabrication, and the quality specified for the reactor vessels and coolant piping and concluded that the reactor vessels and coolant piping as planned are acceptable. (SSE, p. 20).

26. Finally, the quality assurance program calls for verification by the Applicant of the methods used by

the vendor to certify that this equipment meets the specifications developed on the above bases. (SSE, p. 22).

27. The Staff and their consultants have reviewed and found the seismic design methods acceptable. Major core and core support components will be designed to provide assurance that they are not vulnerable to vibration. Confirmatory vibration testing will be conducted as part of the preoperational start-up program. The Staff has found acceptable the Applicant's plans and methods for limiting the vibration of the internal components. (SSE, p. 22; SSE, Appendix G).

28. A great deal of the discussion with respect to Quality Assurance by the Intervenors reflected a basic misunderstanding of the Board's function in this area at the construction permit stage. That function is to ascertain whether the Applicant has adopted a program of quality assurance, over which it will have final responsibility, and which, if implemented in accordance with the representations of the application, will satisfy the requirements of Appendix B of 10 CFR Part 50. The enforcement of the program is the responsibility of the Commission which has delegated the enforcement function to the Director of Regulation. The Board must assume that the Director of

Regulation, through the Directorate of Regulatory Operations will require adherence to the quality assurance programs described in the application.

29. The record in this proceeding shows that Applicant is committed to a comprehensive, documented quality assurance program for which it will have final responsibility. The application contains a description of the program, including a discussion of how the applicable requirements of Appendix B of 10 CFR Part 50 will be satisfied. The Board has reviewed this information and concluded that if the program is implemented in accordance with the representations in the application, the requirements of Appendix B will in fact be satisfied. During the hearing, much additional information relating to the question of quality assurance was introduced into the record (Tr. 4009 et seq.). For example, the record includes manuals implementing the quality assurance program; Division of Compliance (now Directorate of Regulatory Operations) reports, noting, inter alia, some deficiencies in the Applicant's implementation of the program; and documentation relating to what the Saginaw Intervenors allege was inadequate quality assurance during the construction of the Applicant's Palisades Plant. The Board has

considered this additional information, but only for the limited purpose of determining whether any evidence has been adduced which would be inconsistent with findings favorable to the Applicant on the ultimate issues in the proceeding. The Board has found no such evidence in the record.

30. A major objection of Mapleton Intervenors is that fabrication of the reactor vessels for this plant had been commenced and one of the vessels was approximately 50% complete at the time of the radiological hearing, and that the AEC's Division of Compliance had not yet inspected the reactor vessel nor made audits of the fabricator's documentation. There is nothing in the Regulations or in sound practice which prohibits the beginning of fabrication of the pressure vessel before the construction permit is granted. Nor is there any requirement that the Division of Compliance inspect the vessel during fabrication. A witness from the Division of Compliance described generally the steps involved in reactor vessel fabrication, the documentation accompanying each step and the testing of the reactor vessel at the end of fabrication (Tr. 4539-41). At the end of this procedure the Division of Compliance will audit the documentation and make a physical inspection of the vessels (Tr. 4541,

4568-69). Any deficiencies will be brought to the attention of Applicant and it will be required to correct them (Tr. 4569).

31. Applicant submitted an emergency plan prescribing immediate action to be taken to minimize exposure of persons to radiation, both within the exclusion area and outside the exclusion area from any major accidental release of radioactivity. The emergency plan prescribed the actions to be taken in order of priority, the responsibilities of Plant personnel and summarized the personnel and materials available for assistance. The emergency plan took into account evacuation of the Dow Chemical and Dow-Corning plants in the event of a large accident and gave consideration to procedures in the event of an accident at Dow Chemical that could affect the Plant. (PSAR, Applicant's Ex. 1-A, Appendix 2C-1 through 2C-20).

32. Testimony at the hearing indicated that Applicant had prepared the plan prior to issuance of the AEC's "Guide to the Preparation of Emergency Plans for Production and Utilization Facilities" in early 1970, and prior to promulgation of Appendix E to 10 CFR Part 50. (Tr. 2243). Despite its acceptability to the Staff, the Board found this original plan inadequate, and so advised Applicant at

the hearing. (Tr. 2258, 2271). Applicant thereupon revised its emergency plan based on its Palisades Plant operating license stage emergency plan and on more detailed contact with local agencies. (Tr. 2604-2615). The revised plan contains and incorporates the State of Michigan emergency plan, the Midland County Civil Defense Plan and Dow Chemical evacuation procedures. Appendix E to 10 CFR Part 50 requires the Applicant to include in the PSAR a "discussion of preliminary plans for coping with emergencies." The discussion is to include "sufficient information to assure the compatibility of proposed emergency plans" with the plant location. The purpose of this requirement as we understand it is not to insist on specific proposals, but to give enough general information to indicate that a satisfactory plan is feasible.

33. In view of the "credit" taken by the Applicant in establishing the population center distance and the relatively high number of transients in the low population zone, the Board was particularly interested in the evacuation procedures of Dow and Dow-Corning. Considerable testimony on the Dow procedures was adduced at the hearing. (Tr. 2664-2683; 3047-3266). Notwithstanding the testimony of Saginaw Intervenors' witness (Tr. 4695-4821), based on experience

elsewhere in uncontrolled situations, the Board is satisfied that timely evacuation is reasonably assured. However, the Board agrees with the Staff's view that advance planning should be done to protect the population in the low population zone and that such plans should be capable of expansion and mobilization of extra resources should a more serious accident occur. The Board is satisfied that the revised plan conforms with the requirements of Appendix E to 10 CFR 50.

34. The reactor building spray system is provided to remove heat and fission products from the reactor building atmosphere following a loss-of-coolant accident in order to limit the reactor building pressure to the design value and to reduce the post-accident level of fission products in the reactor building atmosphere. Chemicals are added to the water coming from the borated water storage tank after a loss-of-coolant accident to establish a basic pH by addition of sodium hydroxide and to provide for iodine retention by addition of sodium thiosulfate. (PSAR, Applicant's Ex. 1-A, §6.2). The major question raised was as to the long-term stability of the sodium thiosulfate. In the Board's view, Applicant's testimony at the hearing confirmed the long-term stability of sodium thiosulfate solutions (Tr. 2836-55).

35. Electric power generated by the Plant is to be fed through separate connections to a main transformer for each unit. There, it is stepped up to 345 kV and delivered to a switchyard on separate overhead lines. The units and associated switchyard will be part of the Applicant's integrated electric system. The Plant electrical output also feeds the Plant station power transformers. The five 345 kV transmission lines which terminate at the Midland switchyard will provide startup and standby power from the system through a step-down substation (to change the voltage from 345 kV) and a Plant start-up transformer. A second Plant start-up transformer will provide an alternate off-site power source via another 138 kV substation. (PSAR, Applicant's Ex. 1-B, §8.2.1; p. 8.2-2; SSE, pp. 41-42). The Plant has an auxiliary power distribution system which is a two-bus system for each unit. The engineered safeguards system bus sections are electrically separate and redundant and will be located in separate rooms of the auxiliary building to provide physical isolation. The redundant safeguard bus sections will have access to (a) the Plant electrical output through the station power transformers, (b) the off-site area transmission network, and (c) the on-site emergency diesel generators. (PSAR, Applicant's Ex. 1-B, §8.2.2, SSE, pp. 42-43). The Plant's direct current

power supply for safeguards systems consists of two 125-volt batteries located in separate rooms. Two separate 125-volt d-c power distribution buses will be provided to supply redundant safety related loads in each unit. These batteries will have the capacity to provide a safe and orderly hot shutdown in the event that all a-c power is lost. Separate 250-volt batteries will supply non-safety related loads on site. (SSE, p. 44-45).

36. The Saginaw Intervenors questioned whether there was sufficient redundancy and electrical independence in order to assure that electrical power would always be available to operate required safeguards equipment. Applicant's testimony was that the design criteria for the two-unit Plant are satisfied by the two shared diesel generators and that their ability to perform their safety functions is not significantly impaired by such sharing. (Tr. 2330-2340).

37. The Board asked Applicant to indicate the experience of other industries with emergency generation and their redundancy requirements. (Tr. 2920-21). Applicant testified that no industry, except the nuclear industry, requires redundant emergency power sources although some

airports have redundant systems. The absence of such a requirement appears to be based on the satisfactory performance of emergency power systems over the past twenty years. (Testimony of Witness Castleberry, filed August 16, 1971.)

38. The Staff has found the electrical system, including the backup diesel system adequate; however the Staff has required that test data be supplied to confirm the suitability of the diesel generators as an on-site emergency power source prior to the operating license review (SSE, p. 43).16/ We concur.

III

EMERGENCY CORE COOLING SYSTEM (ECCS)

39. The sufficiency of the ECCS was contested by Intervenors from the outset of the proceedings and would, in the normal course of events, have been one of the radiological issues litigated in June and July 1971. On June 29, 1971, the AEC issued new rules governing ECCS in the form of "Interim Criteria for Emergency Core Cooling Systems for Light-Water Power Reactors" (36 F.R. 12247);

16/ The Staff has also indicated that more detailed cable installation and additional design criteria will be required (SSE, p. 45).

the Criteria were amended on December 18, 1971 (36 F.R. 24082) to cover B & W reactors. In the meantime the AEC had on November 30, 1971 (36 F.R. 22774) published a Notice of Rule Making Hearing on ECCS.[17/] Both Mapleton and Saginaw Intervenors are parties to that hearing.

40. Intervenors do not contest the compliance of the proposed reactor with the Interim Criteria. The Staff has found that the proposed reactors do meet the criteria and the Board finds the Staff review adequate.

41. Intervenors do, however, challenge the validity of the criteria. Normally such a challenge would be made (under the Calvert Cliffs doctrine) by attempting to establish a sufficient case of invalidity to warrant the Board's referral to the Commission. Here, as the Board has pointed out in its Order of March 10, 1972, the usual practice would make no sense. The AEC has the issue before it; it is being vigorously litigated in the national ECCS hearing (Docket No. RM-50-1) and nothing but confusion would be added by our consideration of the issue here.[18/]

17/ The Interim Acceptance Criteria were promulgated without a rule-making hearing.

18/ Our conclusion is consistent with that of the Atomic Safety and Licensing Appeal Board in Wisconsin Electric Power Company et al. (Point Beach Nuclear Plant, Unit 2), ALAB-78 (November 10, 1972).

42. We believe that this mode of proceeding is mandated by the AEC instruction that the pendency of the rulemaking hearing should not affect the orderly resolution of the ECCS issue in licensing proceedings (37 F.R. 288). We also are of the view that no problems of public health and safety are created by so proceeding. Applicant will be bound to comply with any changes in criteria which may be adopted as a result of the national hearing. In any event, Applicant has committed itself to meeting any applicable ECCS regulation forthcoming from the proceeding and has furnished the Board with a compilation of dates by which major components involved in ECCS analysis are needed at the site in order to meet a schedule of commercial operation in May 1977 (Applicant's letter of June 6, 1972). This schedule indicates that no major components involved in the ECCS analysis are needed at the site prior to the spring of 1974. Applicant in furnishing the list also agreed that unless the ECCS rulemaking had been completed earlier, none of those major components would be shipped prior to the date needed on site without prior AEC approval (Applicant's letter of June 6, 1972). Thus, if any modification in equipment is necessary, the equipment will still be in the shop where it can be more readily modified than if it had been shipped or installed.

IV

ENVIRONMENTAL ISSUES

43. With respect to environmental questions the Board is required to do the following: a) determine whether the requirements of the National Environmental Policy Act and Appendix D to Part 50 have been complied with, b) independently consider the final balance among conflicting environmental factors in the record of the proceeding, c) determine after weighing the environmental, economic, technical and other benefits against environmental costs whether the permit should be issued, denied, or appropriately conditioned, d) (in a contested proceeding) decide any matters in controversy among the parties. By its Order of March 10, 1972, the Board ruled that it would not consider the environmental effects of the fuel cycle except in the following aspects: 1) the transportation of fuel elements from the fuel fabrication plant to the reactor site, 2) the transportation of spent fuel elements from the site to the fuel reprocessing plant, 3) the transportation of packaged radioactive material from the site to low-level waste burial grounds, and 4) radioactive discharges occurring at the site and any other environmental

effects directly associated with the handling and use of the nuclear fuel at the site. That decision of the Board was upheld by the Atomic Safety and Licensing Appeal Board. In reaching our decision we do not mean to suggest that there are no environmental costs associated with mining, fabrication and waste disposal. But we are not engaged here with an assessment of the entire atomic energy program and there is no meaningful way -- except the cost of fuel -- that we can assess those costs in this proceeding.

44. Environmental issues are a new area of responsibility for the Atomic Safety and Licensing Boards; as yet there are no precedents to guide the Boards and the regulations are vague as to how the environmental decision is to be made. In the hope that it will be helpful to Boards in other cases, we have attempted to describe in some detail how we have gone about deciding environmental issues. In the process we have treated some issues in more detail than is warranted by the evidence adduced in the hearing.

45. The difficulty lies in the direction to the Boards to independently consider the final balance after weighing the costs and benefits. "Final balance" and "weighing" costs against benefits have a deceptively mechanistic connotation, as though one could make a calculation of the costs and benefits and decide on the basis of the arithmetic. Obviously this is not possible. Calculations of costs and benefits may be a useful exercise, but more often than not the quantifications are so speculative and non-objective as to be worse than useless.

46. The chief benefits claimed by Applicant and the Staff are the production of electricity (and process steam) and the elimination of the air pollution from Dow's present fossil-fuel steam plant. The claim of production of electricity as a benefit is in turn premised on the need for additional electricity on Applicant's system. The demonstration of that need took the conventional format.

47. Applicant presented detailed electric sales forecasts through 1980, converted sales forecasts into estimates of peak demand for electricity and related the projections to its existing generating capacity, its construction and retirement program and projections for the Michigan Electric Power Pool to demonstrate the need for electricity from the Plant. (ASER Applicant's Ex. 38F-1, Section 2; Applicant's Ex. 38G, revised Ex. 1 to Section 2; Applicant's Ex. 38K, pp. 108-114.) The projected increases in sales over the next ten years result from population increases, particularly large increases in the adult population which result in increased household formation, and increased usage per consuming unit, including significant increase in electricity being used for control or elimination of air and water pollution (ASER Applicant's Ex. 38F-1, pp. 2-6 to 2-9; Tr. 6528-33). The Staff has concluded that the projections of need are reasonable, and a witness from the Federal Power Commission (FPC) agreed (Tr. 8090-91). Intervenors do not seriously challenge the projections, although Mapleton made a weak try at eliciting a concession that the additional capacity was really to

satisfy Canada's needs rather than local needs. We find that this "contention" is without foundation, and we conclude that Applicant's projections of need are reasonable. (ASER Applicant's Ex. 38G, Table DEM-1 to revised Ex. 1 to Section 2; Applicant's Ex. 38K, pp. 109, 111.)

48. Intervenors have suggested at various times that the Board must go behind the characterization of "demand" made by the Applicant to determine whether an appropriate alternative to satisfying the demand would be to set limits on particular uses of electricity. The Board declines to do so. So far as appears from the record, the postulated demand is made up of normal industrial and residential use and it is, in our view, beyond our province to inquire into whether the customary uses being made of electricity in our society are "proper" or "improper". The suggestion was also made that Applicant is stimulating demand by its advertising. No evidence was offered on this point and absent some evidence that Applicant is creating abnormal demand, the Board did not consider the question.

49. Once the Board accepts the need and the "benefit" of satisfying that need, its conclusions on the cost benefit questions (although not as to alternatives) is, in our view, practically a foregone conclusion. It would require some evidence of special environmental damage to outweigh the benefit and there is no suggestion of such special damage in the record. Indeed if such evidence existed, it would probably be relevant to the question of alternatives rather than cost-benefit.

50. Nevertheless, we believe it would be instructive to review in some detail the subject of the cost of the damage to terrestrial ecology at the site. The evidence on this point was a substantial portion of Mapleton Intervenors affirmative case and the subject illustrates very well the nature of some of the problems posed for all concerned by the requirement that the costs and benefits be weighed and a balance struck.

51. As noted earlier, the site is adjacent to a large industrial complex and some residential property. There is

nothing unique about it,[19] and in all likelihood, if not used for the proposed plant, it will be used for some other industrial, or possibly residential, development. Applicant's assessment of the impact of the plant on the terrestrial ecology is based on a survey performed by a team under the general supervision of Dr. Leslie Gysel of Michigan State University.[20] (ASER, following p. 3-1.) Applicant concededly did not attempt to identify every species of plant or animal at the site or to make detailed population estimates. Instead, it listed those wildlife species that had been personally observed at the site, those for which signs such as scat, tracks, etc. had been observed by local

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19/ The Board visited the site and saw nothing to contradict Applicant's evidence as to the absence of unique characteristics.

20/ After the close of the hearing, Applicant offered a written statement of Dr. Gysel in reply to the testimony of Mapleton's witness Dr. Stuart Holcomb. Mapleton objected to the reception of Dr. Gysel's statement, and, asked that if it were to be received in evidence, the Board also consider a supplemental statement by Dr. Holcomb. Both statements are essentially argumentative and no purpose would be served by re-opening the hearing to allow cross-examination. The Board understands the arguments of both sides, and for reasons which should be clear from the text is of the view that no further evidence would be useful.

residents and plant site security personnel. The result of the survey is the conclusion that there are no special characteristics of the site of special value as a wildlife habitat.

52. Intervenors on the other hand challenge the survey as completely inadequate and assign a "conservative" value of $36,000,000 to the flora and fauna to be disturbed by construction. Approximately $30,000,000 of this amount is for losses of bird life and animal life alone. (Tr. 8563.) The method used to arrive at these evaluations was to estimate populations of species which could be expected to be found in the area on the basis of existing studies. Intervenors then estimated the number of each species expected to be found and assigned an arbitrary value to each bird and animal, for example, $10.00 per sparrow and $10.00 per mouse. Intervenors' witness, Dr. Stuart Holcomb, made no allowance for the effect of predation, although he conceded that predation would take a considerable toll. (Tr. 8592, 8596.) Nor did he make any allowance for the fact that many of the birds to be found are generally considered pests (indeed there are bounties in the State of

Michigan on some of them). He then multiplied his final figure by 30 representing the expected life of the plant of 30 years. The Board finds this method of evaluation and calculation wholly insupportable. We note without further comment, for example, that the figures shown include $151,000 per year as the value of mice to be lost and $190,000 per year for varieties of sparrows -- a total of some $10,000,000 over the life of the plant for mice and sparrows alone.

53. The testimony does however illustrate that a more elaborate survey of ecological effects on the plant site could have been made. The real question is at what expense and to what end. We agree with Dr. Gysel that a complete survey would be very expensive and, for some species, not even possible. We are not insensitive to the problems posed, but we believe that it is only realistic to accept the cost of the land as the cost of the ecological impact on the site, at least absent a showing of some special characteristics as to particular species or value of the tract of land as a habitat for wildlife. But even if we

were to accept Dr. Holcomb's premise, and his arithmetic, the result would be no different. Given our prevailing values there is no way in which the loss of flora and fauna in a site of this kind can outweigh the benefits of supplying needed electricity.

54. Are the other disbenefits claimed by Intervenors substantial in comparison to the need for electricity? Those stressed by Intervenors include the threat of process steam contamination; the impact on aquatic ecology; the effect of releases of radioactivity during normal operation; the claimed "synergistic" interaction of releases of radioactivity with chemicals released from Dow; the effect of accidents; fogging and icing from the cooling pond; and the effect of decommissioning.

55. To the extent that the claimed disbenefits are based on releases of radioactivity within the limits permitted by the regulations, these contentions of Intervenors were treated during the radiological hearings as attacks on the regulations. Under the prevailing practice, such attacks can only be considered by the Boards for the purpose

of ascertaining whether a sufficient showing of invalidity has been made to warrant referral to the Commission. For those purposes, the showing was, in all cases, clearly insufficient. However, in the environmental hearing, the Board permitted testimony and cross-examination on such matters as pertinent to the cost-benefit analysis.

56. As originally proposed, the process steam supplied to Dow would have been produced via secondary heat exchangers. At an early stage, Applicant modified the proposal to provide a tertiary heat exchanger - further insulating the process steam from the possibility of introduction of radiation from the primary coolant. The process steam will be monitored for radioactivity with an on-line gross gamma monitoring system and with grab samples for gross beta. The tertiary steam to Dow will not contain more radioactivity than the Lake Huron makeup water supplied to the tertiary heat exchangers. (PSAR Applicant's Ex. 1-c, p. 11.00-2.) If any Dow products come in contact with contaminated process steam, they will be monitored. In the event the product exceeds the inherent natural background radioactivity, the product will be decontaminated or disposed of as necessary. (Applicant's Ex. 38c.)

57. The Board finds that the system promises to provide assurance that leakage of radioactivity into the process steam will be an extremely remote possibility; that Applicant has submitted sufficient information; and Staff has performed an adequate review with respect to process steam monitoring. The environmental effects of the process will be insubstantial.

58. The liquid waste treatment system is designed to collect, process and reuse or dispose of off-site all liquid wastes, except for laundry waste, containing radionuclides generate[d] normal operation of the Plant. (PSAR Applicant's Ex. 1-B, Section 11.) About 120 gallons per day will be the only waste containing radionuclides from the Plant that will be released to the Tittabawassee River during normal operation. The Applicant estimates that the gross activity in the dilution stream from this laundry waste, based on operation with 1% failed fuel for a full year will not exceed 25 pico curies per liter on an annual average, i.e., equivalent to about two curies per year. (PSAR Applicant's Ex. 38-E, p. 11.1-1.) Using this upper limit concentration, the Applicant calculates a

potential dose to a hypothetical individual who consumes 2200 cc's per day of water from the river and eats 37 lb of fish per year from the river to be about 0.8 mrem/year. (PSAR Applicant's Ex. 38-E, p. 11.8-11.)

59. Potentially high-activity waste-gas is routed to the waste-gas surge tank where its activity is monitored. In the event of high levels of radioactivity, the waste-gas is routed to waste-gas decay tanks where such gases can be stored for up to sixty days to permit decay of all of the radioactive gases, other than krypton 85, to essentially zero. (PSAR Applicant's Ex. 1-B, p. 11-7; ASER, p. 4.2-4A.)

60. Applicant estimated that in the event both reactors operate for a full year with 0.1% failed fuel, the quantity of Kr-85 and Xe-133 released through the radwaste treatment system will be about 1224 curies and 50 curies, respectively. The Applicant further calculated the dose to an individual continuously present at the site boundary for a full year to be about 0.46 mrem/year. (ASER Applicant's Ex. 38F-1, Section 4.2.) A calculation of the dose using 60 days' holdup and 1% failed fuel would be approximately 4.6 mrem/year.

This dose is a small fraction of 10 CFR Part 20 and is less than the dose specified in the proposed Appendix I to 10 CFR Part 50.

61. The solid waste treatment system consists of tankage and facilities for collecting and packaging spent demineralizer resins and evaporator bottoms and for packaging contaminated items such as spent filter elements, rags, clothing, etc. All radioactive material from the solid waste system will be shipped off-site for storage by AEC licensed contractors. (PSAR Applicant's Ex. 1-B, p. 11-8.) In the Board's view, the environmental effects of the normal releases of radioactivity and disposal of solid wastes are minimal.

62. While no aquatic environmental studies have been conducted by Applicant or the Staff, there have been numerous studies conducted by the Michigan Water Resources Commission, Michigan Department of Natural Resources and by Dow over the years. (ASER Applicant's Ex. 38F-1, Section 3.2.2.)

63. The Michigan Water Resources Commission is implementing a program to improve discharges into the river and improve river water quality. The Tittabawassee River

from Midland to its confluence with the Saginaw River is designated to be upgraded not later than January 1, 1974, for intolerant fish warmwater species and agricultural uses. (Tr. 5664-65.) Applicant will be required to conduct a thorough ecological study of the site and its environs prior to Plant operation to establish base line values as recommended by the Staff. Applicant has committed itself to discharges that are significantly lower than those permitted by the standards for thermal releases and total dissolved solids. The Board accepts the conclusion that the proposed use of Lake Huron water by the Plant will not create any incremental environmental effects. However, there will be some destruction of aquatic life in intake water from the Tittabawassee River. Because of the presently depressed quality of the river, the amount to be destroyed is conjectural,[21/] but even after the river is improved, the aquatic life destroyed should not be significant.

21/ Applicant submitted only a preliminary design of the intake structure for taking water from the river to the pond, pending the results of a study which it agreed to undertake as to the type and size of fish to be expected in the river after upgrading. The Board

64. Intervenors alleged that because of the unique location of the Plant adjacent to a large chemical complex, the effects of radioactive effluents from the Plant might combine synergistically with the effect of chemical effluents to produce a combined effect greater than the sum of the separate effects. The synergistic effects considered included both the physiological effect of combined dosages of the chemical and radiological effluents on the tissue of human recipients and the interaction of the radiological and chemical effluents in the environment to produce a reactant which could have a different effect on the human recipient.

65. Saginaw Intervenors requested a list of all chemical effluents discharged to both the air and water from the Dow complex. (Tr. 1500.) The Board ordered Dow to submit a list of effluents expected to be discharged

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Fn 21/ cont'd understands that the final design will incorporate the Staff's recommendation that the intake flow velocity should be less than one foot per second. (See finding No. 77.)

from its facilities in 1975, the year in which the Plant was originally scheduled to start operation. (Tr. 1502.)

66. Although repeatedly invited to submit evidence in support of their claims of synergism, Saginaw Intervenors never did so. However, at the environmental hearing, Mapleton did produce three witnesses on the subject:[22/] Dr. Richard Meierotto (Tr. 8248-8291), Dr. Carl Nordahl (Tr. 8487-8517) and Dr. Ernest Sternglass (Tr. 8360-8487).[23/] 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 Dow. And when one considers the testimony of Applicant and Staff

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22/ Technically, the evidence of synergism at the environmental hearing was admissible only as to the cost-benefit analysis. However, with respect to synergism, as indeed with respect to other safety questions, the Board was always receptive to any affirmative showing by Intervenors.

23/ After the close of the hearing, counsel for Mapleton requested (letter of June 21, 1972) that a letter written by Professor Morris H. DeGroot, which was

witnesses, the evidence is overwhelming against a finding of "synergism".

67. Applicant furnished information with respect to potential public exposures to radioactivity from postulated accidents in the course of Plant operation. (ASER Applicant's Ex. 38F-1, as amended by Ex. 38G, Section 4.2.2.) The information submitted was in accord with guidance issued generally to Applicants by the Commission on September 1, 1971. The classes of accidents range from those that can be expected to occur during the life of the Plant and have trivial consequences to those that are never expected to occur but could have more severe consequences. However, those accidents with more severe consequences have a probability of occurrence so small that their environmental risk is extremely low. We will discuss the question of

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Fn 23/ cont'd referred to by Dr. Sternglass, be admitted as evidence of the belief of Dr. DeGroot that there is substantial probability that Dr. Sternglass' hypothesis correlating radioactive discharges with infant mortality is correct. Since Dr. Sternglass remarks on infant mortality were not relevant to synergism -- about which he was supposed to be testifying -- admission of the letter would serve no relevant purpose.

accidents again in connection with alternatives, but for purposes of the cost-benefit analysis, we find the cost to be minimal.

68. Mapleton Intervenors raised questions concerning the environmental costs of decommissioning the Plant at the end of its useful life. Neither Applicant nor its contractor has had any experience with decommissioning a nuclear plant. (Tr. 6893.) The AEC has had some experience although not with a plant of the proposed size. The Board is satisfied that decommissioning is possible. The environmental effects of the most likely (given today's technology) method of decommissioning do not appear substantial except for the loss of use of a few acres of land occupied by sealed buildings. The estimates of cost of decommissioning are quite speculative; however, the Board accepts as generally indicative of those costs Applicant's estimate of $35,000,000 --- present discounted worth $8,000,000 (Tr. 7820-21).

69. Mapleton Intervenors also contended that there would be substantial fogging and icing in the area around

the cooling pond (including Mapleton). The evidence even of Mapleton's own witness does not support the contention. (Tr. 8317, 8322.) The effect on Mapleton seems likely to be negligible and even in the area close to the pond, the effects seem likely to be insubstantial and the environmental costs minimal. The evidence does, however, demonstrate the need for further study of the effects of cooling ponds and part of the surveillance program of Applicant (see finding No. 77) should include a study of the duration, intensity and extent of fog and icing in the surrounding area.

70. As noted above, the Board is satisfied that the benefits outweigh the costs. The real question comes with respect to alternatives. Assuming that the power needs are to be met, are there better alternatives? The evidence demonstrates that there are no hydro sites available, that a pumped storage facility would not meet the load needs, that gas is not a viable alternative for power use, and that outside sources are unavailable. (ASER Applicant's Ex. 38F-1, Section 5.2.) The question of alternatives is then boiled down to a choice between nuclear and fossil

(either oil or coal) fuel at the proposed location or at some other location.

71. So far as the choice between nuclear and fossil plants is concerned, the evidence demonstrates a considerable cost advantage of nuclear fuel over oil or coal. (ASER Applicant's Ex. 38F-1, Tr. 7011-42, 7917-23.) While long run cost estimates must be speculative, the Board is of the view that they are reasonable, and no contrary estimates were introduced.24/ But large as the estimated cost differentials are, they would not override any significant environmental advantages of a fossil fuel plant in this case. Are there such? The Board finds that there are not.

72. The major environmental effects of fossil fuel plants are the release to the atmosphere of fly ash and sulphur dioxide. By contrast, such air pollution from

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24/ The cost advantage probably reflects the relative scarcity of low sulphur coal and oil compared to uranium, so that the choice of nuclear fuel is also consistent with the objective of preserving scarce raw materials. However, the Board does not feel that the impact of a single plant on fuel reserves is sufficient to warrant a choice on that basis.

nuclear plants is essentially nil. Light-water moderated nuclear plants are less thermally efficient than fossil plants and discharge more waste heat in the cooling water. However, the use of a cooling pond or cooling tower will minimize the problem so that in the case of the proposed plant, the comparative disadvantage will be an increase in fogging and icing.

73. The major environmental effects from the nuclear plant are from releases of radioactivity in normal operation and from the possibility of accidents. The permissible releases of radioactivity in normal operation are now governed by Part 20 of the AEC regulations. The expected releases from this plant do not exceed Part 20 limits. However, under the regulations, we must take into account the environmental impact of radiation releases even within the standards. There are no known effects of radiation in the amounts contemplated to be released from this plant in normal operation, although it is assumed that there are genetic effects and that there may be cumulative effects of a combination of this radiation with other radiation. Weighed by a reasonable scale, these potential costs cannot

tip the balance against nuclear power here. The major argument of intervenors is that not enough is known about the long-term effects of small doses and that the plant should not be licensed until such effects are known. This really is an argument that no nuclear plants should be constructed until we know all that there is to know about low level radiation effects. Such an argument is untenable in light of the Atomic Energy Act. The judgment has been made there that atomic energy must be used for production of electricity and there is nothing in the National Environmental Policy Act which overrides that judgment.

74. Apart from questions of cost, the choice essentially narrows down to weighing the known environmental effects of fossil plants against the possibility of nuclear accidents,[25/] indeed, against the possibility of a serious accident not contained within the reactor building. It is widely conceded that the possibility of such an accident is extremely remote. In our view so far as any particular reactor is concerned, the chances of a serious accident

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25/ The Board does not regard decommissioning as a substantial environmental problem; however, as noted above, it may be a significant cost factor.

involving damage to the public is vanishingly small. This is not to say that such accidents will certainly never happen, but only that the odds of an accident happening at a particular reactor are incalculably small. For purposes of a cost-benefit analysis, we believe they must be taken as insubstantial.

75. Given the already substantial problem of air pollution in the Midland area, we conclude that nuclear power is clearly preferable to available alternatives.

76. Turning to the question of alternative sites, an important feature of the proposed project is its dual-purpose nature. In addition to supplying electricity for the Applicant's system, the plant will produce process steam for use by Dow. Applicant concedes that it would not locate the proposed installation at the proposed site but for this feature. It is thus necessary to consider as an alternative the location of the plant elsewhere and the independent supply of steam to Dow by some other source.[26/] We have

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26/ The evidence is clear that it is not economically feasible to supply steam to Dow from a plant at some other remote location. (Tr. 6857-6860.)

not considered, and we do not believe it is within our province to do so, the possibility that there might be environmental benefits from closing down some or all of Dow's operations. If the plant is not built where it is now planned, Dow will have to continue to produce its own steam. Since a small nuclear plant for that purpose would be extremely uneconomical (and would pose most of the same problems as the proposed reactor) as a practical matter, the result would be construction of a new fossil plant. Thus, any other site would have to demonstrate sufficient advantage over the proposed site to outweigh the air pollution from the new Dow fossil steam generating plant. Applicant has adduced considerable evidence that other sites available to it would not have any such advantage and no one else has suggested an alternative site for consideration. We conclude then that there is no preferable alternative.

77. Assuming that the proposed plant will be built at the proposed site, a final question is whether there is a preferable alternative cooling system for condenser water. An important consideration in this respect is that in order

to supply coolant water in periods of low river flow, there will have to be a pond built at the location. The use of this pond for cooling thus has a natural cost advantage over cooling towers, all the cost of which would be supplemental to the cost of the pond. (FES, XI-2, 3.) The Applicant discussed and the Staff considered the use of both dry and wet cooling towers. Neither form of wet tower (mechanical draft or natural draft) would offer any significant environmental advantages. The use of a dry tower would in the Staff's view eliminate fogging and icing and reduce water consumption, but these benefits would only be achieved at considerable cost in thermal efficiency as well as high capital costs. (FES, XI-37.) Those costs seem hardly justified to avoid the relatively small problem of fogging and icing expected - particularly in view of the lack of experience with dry cooling towers. We find that in the circumstances of this plant; the proposed cooling system is preferable to available alternatives.

78. The Staff's conclusion that the construction permit should be granted was subject to certain conditions. These conditions, which are set forth in Paragraph 7 of the Staff's

Final Environmental Statement (FES), included a modification of the water intake design to minimize fish loss, the relocation of certain transmission lines, the conduct of ecological studies and development of surveillance programs, etc. Applicant has agreed to all of these recommendations except that in 7(f) of the FES which would have required Applicant to "prevent any discharge which would result in increasing the phosphorus concentrations in the river above 0.05 ppm". As a substitute for 7(f), Applicant has agreed to treat phosphates so that total discharge including laundry waste and start up waste based on the actual average will not exceed 35 pounds per day exclusive of the pond reconcentration of existing phosphate levels in the river. The Staff agreed to that substitution and the Board sees no reason why the proposal should not be satisfactory. The Board would like to note for the record that its conclusions are based on the understanding the Applicant will carry out the recommendations to which it has agreed.

79. The Board has reviewed the entire record of this proceeding, including the limited appearance statements

and the proposed findings of fact and conclusions of law submitted by the parties, and replies thereto submitted by the Applicant. All the proposed findings and conclusions submitted by the parties which are not incorporated directly or inferentially in this Initial Decision are herewith rejected for the reason that there is not reliable, probative, and substantial evidence in the record to justify their acceptance, or because they are unnecessary to the rendering of this Initial Decision.

V. CONCLUSIONS

80. Upon consideration of the record of this proceeding and the findings of fact and conclusions, the Board has determined that:

(1) In accordance with the provisions of 10 CFR 50.35(a):

(a) The Applicant has described the proposed design of the facility, including, but not limited to, the principal architectural and engineering criteria for the design,

and has identified the major features or components incorporated therein for the protection of the health and safety of the public;

(b) Such further information as may be required to complete the safety analysis and which can reasonably be left for later consideration, will be supplied in the final safety analysis report;

(c) Safety features or components which require further development have been described and the Board has been assured the Applicant will conduct research and development to satisfactorily resolve any associated safety questions before the latest date stated in the application for completion of construction of the proposed facility.

(2) The proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public;

(3) The Applicant is technically qualified to design and construct the proposed facility;

(4) The Applicant is financially qualified to design and construct the proposed facility;

(5) The issuance of a permit for the construction of the facility will not be inimical to the common defense and security or to the health and safety of the public.

81. Upon consideration of the record of this proceeding and the findings of fact and conclusions, the Board has determined that in accordance with the provisions of Section A.11 of Appendix D, 10 CFR 50:

(1) The requirements of Section 102(2)(C) and (D) of the National Environmental Policy Act and Appendix D of 10 CFR 50 have been complied with in this proceeding;

(2) The appropriate action to be taken is to authorize issuance of the construction permit.

VI. ORDER

82. Wherefore, pursuant to the Atomic Energy Act as amended, and the Commission's Regulations, IT IS ORDERED that the Director of Regulation is authorized to issue a construction permit to Consumers Power Company. IT IS FURTHER ORDERED, in accordance with Sections 2.760, 2.762, 2.764, 2.785, and 2.786 of the Commission's "Rules of Practice", that this Initial Decision shall be effective immediately upon issuance and shall constitute the final decision of the Commission subject to the review thereof pursuant to the above-cited Rules.

ATOMIC SAFETY
AND LICENSING BOARD

Arthur W. Murphy, Chairman

Clark Goodman

David B. Hall

Issued at Washington, D. C.,
this 14th day of December, 1972.