November 5, 1976

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Atomic Safety and Licensing
Board Panel
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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

Gentlemen:

Pursuant to the Licensing Board's Memorandum and Order of October 21, 1976, the NRC Staff encloses the following written testimony to be presented at the suspension hearing:

1) NRC Staff Testimony of Sidney E. Feld On Need For Facility

2) NRC Staff Testimony of Sidney E. Feld On Cost of Replacement Power Resulting From Suspension

3) NRC Staff Testimony of Arnold H. Meltz On the Financial Cost of Delay (Excluding Replacement Power)

4) NRC Staff Testimony of Lawrence P. Crocker Relating to the Possibility of Constructing a Smaller Nuclear Plant at Midland

5) NRC Staff Testimony of Lawrence P. Crocker Relating to Delay of Construction and Make-Up of Lost Time

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Form AEC-318 (Rev. 9-53) AECM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1974-525-166

6) NRC Staff Testimony of F. S. Echols On the Environmental Impact of Continued Plant Construction During the Next Year and Environmental Review Schedule

The professional qualifications of the above named witnesses are also enclosed.

Sincerely,

Lawrence Brenner
Counsel for NRC Staff

cc (w/ encl):

Myron M. Cherry, Esq.
Judd L. Bacon, Esq.
Honorable Vern Miller
Howard J. Vogel, Esq.
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PROFESSIONAL QUALIFICATIONS

SIDNEY E. FELD

U. S. NUCLEAR REGULATORY COMMISSION

I am Sidney Feld, Regional-Environmental Economist with the Cost-Benefit Analysis Branch, Division of Site Safety and Environmental Analysis of the Regulatory Staff of the Commission. I served with the Staff from July 1973 to August 1974, and rejoined the Staff in October 1975. I am responsible for reviewing and analyzing Applicants' environmental reports and preparing cost-benefit sections for the NRC Staff's Environmental Statements. During the 1973-74 period, I conducted generic research on topics related to the social and economic impacts of nuclear power plants, including costs of delay, and the potential for population and industrial growth in the vicinity of nuclear plants. More recently, I have been involved in preparing a staff guide for use in instructing staff reviewers on the requisite methodology in analyzing the issue of need for facility. I also presented testimony on need for power and conservation of energy issues for the hearings on Alvin W. Vogtle Nuclear Power Plant, April 1974, the Shearon Harris Nuclear Power Plant, May 1974, and the Wolf Creek Generating Station, February 1976.

I received a B.B.A. Degree in Economics from the City College of New York in 1967, an M.A. Degree in Economics from the University of Rhode Island in 1969, and a Ph.D. Degree in Resource Economics from the same university in 1973. My graduate degree in resource economics focused on the application of economic theory to public resources. Areas of study included: simulation of market economic solutions; consideration of social implications such as environmental impacts; and the application of decision tools such as cost-benefit analysis.

From September 1974 through August 1975, I was an Assistant Professor of Resource Economics at the University of New Hampshire at Durham, New Hampshire. In this capacity, I taught courses in Resource Economics and Statistics. I also served as co-investigator on a Sea Grant research project to examine economic activity in the New Hampshire Coastal Zone.

During fiscal year 1970, I served as the coordinator of the Governor of Rhode Island's Technical Committee on the Coastal Zone. In this capacity, I prepared working papers and parts of the Committee's Final Report. The Committee's recommendations were adopted by the State Legislature in 1971, leading to the establishment of a Coastal Zone Council and Coastal Zone Laboratory, both of which are presently the state's principal governmental bodies overseeing coastal resources.

F. S. Echols

ENVIRONMENTAL PROJECTS BRANCH NO. 2

DIVISION OF SITE SAFETY AND ENVIRONMENTAL ANALYSIS

U. S. NUCLEAR REGULATORY COMMISSION

I am employed as an Environmental Project Manager with the Division of Site Safety and Environmental Analysis, U. S. Nuclear Regulatory Commission, responsible for managing and coordinating the review of Applicant's environmental reports, analysis and evaluation of environmental impacts of nuclear power plant construction and operation and the preparation of NRC Environmental Statements in accordance with the Commission's regulation, 10 CFR Part 51, which implements the requirements of the National Environmental Policy Act of 1969. At present, I am the Environmental Project Manager for the Clinton, Hartsville, Vogtle, Barton, Harris, Surry, Arkansas and Midland Nuclear Stations.

I was awarded a Bachelor of Science degree in Nuclear Engineering in 1969 from the University of Florida. I received a Master of Business Administration degree in 1970 and a Doctor of Philosophy degree in Environmental Engineering in 1973, from the University of Florida.

While in the doctoral program majoring in Health Physics, I was employed to conduct a radiological field study of a Nuclear Power Plant. My doctoral research was conducted at the Oak Ridge National Laboratory, where I studied the differential chemoprotection of radioprotective drugs on normal and malignant tissues in various types of radiation fields.

From 1973,to 1974, I worked for an architectural engineering firm as an Environmental Project Engineer. I was responsible for the coordination and production of the Applicant's environmental reports and, in that two-year period, I completed reports for four utilities and also contributed to the PSAR effort on each with special attention to site suitability. During this period, I also taught evening courses in the Business Administration Department, Montgomery College.

In 1974, I accepted my present position as an Environmental Project Manager. I am a member of the American Nuclear Society, the Health Physics Society and the International Association for Pollution Control.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

NRC STAFF TESTIMONY OF LAWRENCE P. CROCKER RELATING TO THE POSSIBILITY OF CONSTRUCTING A SMALLER NUCLEAR PLANT AT MIDLAND

Introduction:

In this testimony, I discuss the feasibility of constructing a smaller nuclear plant at the Midland site as a substitute for the nuclear plant now under construction.

Discussion:

The Midland Plant is to consist of two pressurized water reactors of Babcock & Wilcox design, each with a rated heat output of 2452 Megawatts, thermal. Unit 1 is to have an electrical output of about 460 Megawatts, electric, and, in addition, is to supply approximately 4,000,000 pounds per hour of process steam to the Dow Chemical Company plant. Unit 2 is to have an electrical output of 811 Megawatts, electric.

The design of the nuclear steam supply systems (NSSS) for plants of the Midland type was offered by the reactor vendor during the late-1960's. More recent NSSS designs offered by Babcock & Wilcox have been on the

order of 3600-3800 Megawatts, thermal. In recent years, the other reactor vendors in the United States also have been offering nuclear steam supply systems in the range of 3000-3800 Megawatts, thermal. This no doubt is due in part to the emphasis of recent years on standardization of nuclear plant designs at or close to the maximum authorized power level of 3800 Meagwatts, thermal.

Nuclear plants smaller than the Midland design have been constructed in the United States and I would judge that if a utility really wanted to order a smaller size unit today, any of the reactor vendors would be capable of supplying a NSSS of whatever size desired. I doubt, however, that purchase of a smaller unit is a realistic alternative. Since recent utility and vendor efforts have concentrated on larger units, both a time and a cost penalty would be incurred if a utility ordered a smaller plant. The entire cost of developing the design probably would have to be charged to the single smaller unit or the pair of smaller units since there apparently is no market for additional smaller units. Further, since units in a smaller size range have not been ordered for a number of years, extra time probably would be required for design, and it is likely that additional licensing effort would be required since the NRC staff would not be familiar with the design.

The Midland plant now is about 15% complete. We have been informed by the licensee that the bulk of the NSSS components are now on-site awaiting installation. Similarly, many of the balance-of-plant components

are either on-site or on order. Work on the reactor containment structures, the auxiliary building and the turbine hall is well underway. Under these circumstances, even though a smaller plant might be available for purchase, such action does not represent a viable alternative. The engineering and construction have thus far proceeded on the basis of the particular design for Midland. A change to a smaller unit would require essentially a complete new design with a consequent loss of the bulk of the engineering and construction efforts expended to date and a probable loss of a great portion of the component procurement to date.

If for some reason it should be determined that less power is needed from the Midland units, the present construction could be continued and the units ultimately could be operated at whatever power levels are desired up to the rated capacity. This continued construction of the current design would provide for ultimate expansion to meet increasing power needs. In my view, completion of construction of the present design, even though the forecasted power needs might be less than the plant rated capacity, would be far preferable to any attempt to redesign the station to accept smaller units.

Conclusion:

Continued construction of the Midland plant to the current design does tend to further preclude a subsequent change to a plant with a smaller output. However, for the reasons stated above, I consider such a change to be an infeasible course of action at the present time, so continued construction would not affect my conclusion.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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	)	50-330
(Midland Plant, Units 1 & 2)	)	

NRC STAFF TESTIMONY OF LAWRENCE P. CROCKER RELATING TO DELAY OF CONSTRUCTION AND MAKE-UP OF LOST TIME

Introduction:

This testimony provides my estimate of the time required to shut down and subsequently to re-start the construction of the Midland Plant in the event of a nine-month suspension of construction. I also discuss the question of whether Consumers Power Company could make-up for time lost during a suspension of construction.

Discussion:

Construction activity at the Midland Plant now is in full progress, with about 1200 workmen on site. Construction of both reactor containment buildings is underway and work is in progress on the auxiliary building, turbine building and associated plant structures. At the present time, the principal activities consist of placement of reinforcing steel and structural steel, and pouring of concrete.

Should an order be issued to suspend further construction, some period of time would be required to close down the project. In addition to personnel related matters such as laying off members of the construction force and termination of subcontractor effort, specific efforts would be required to bring the construction activity to an orderly close such that construction materials could be protected from the elements and so that work now in place could be protected. Further, it should be recognized that continued effort would be required to maintain the integrity of the various protective covers and to assure that the construction site is not subject to vandalism. Thus, the shut-down of construction should not be viewed as an instantaneous occurence. Rather, it is a gradual process which would require a minimum of several weeks to accomplish, and which ultimately would result in some residual, continuing effort to provide necessary maintenance and site protection services.

For a suspension period on the order of nine months, I would estimate that about three to four weeks would be required to close down the present construction activity in a condition that would allow reasonable protective measures to be taken. The bulk of the work force probably could be disbanded about two weeks following notification of the suspension, with a slower personnel reduction following that period, ultimately resulting about two months after issuance of the suspension order in a residual force of perhaps twenty persons to handle continuing maintenance and protective services. These persons also would have to receive and store those materials and supplies that are now on order for

which delivery could not be cancelled. It should be noted that this shut-down of the construction activity really could be carried on during the initial period of suspension and could be provided for in the suspension orders. It does not have to be provided for as a separate period of time.

The time required to re-start the construction following a nine month suspension would be largely dependent upon the state of the nation's economy at the time the suspension order is lifted. While re-mobilization of common laborers should be relatively easy to accomplish, it is likely that a period of several months would be required to obtain the services of skilled workmen such as welders, pipe-fitters, and riggers. I would not expect skilled workmen to remain in the vicinity of the plant waiting for the construction to resume. Rather, it would be more likely that they would scatter across the country to other jobs. Thus, at the time the suspension was lifted, I would judge that a period of perhaps four to six months would be required to locate the requisite skills in the proper numbers to resume construction efforts.

In addition, subcontractors more than likely would be committed on other projects and would not be immediately available to start work at the Midland site. Both equipment and personnel probably would be committed elsewhere. In addition, a finite time obviously is involved to advertize for the necessary subcontract work, select the subcontractors, negotiate terms for the subcontract effort, and assure that the subcontractors meet the quality assurance requirements for the work.

In view of the above, I thus would judge that a period of four months is an optimistic estimate of the time required to get the construction effort underway again following a nine month suspension. The re-mobilization time easily could be more than four months if the economy is booming at that time and could extend to six months or more.

I turn now to the question of whether time lost during a suspension could subsequently be made up. Under certain circumstances, it is possible to speed up construction work by taking such measures as adding additional personnel to the work force, using extended work hours beyond the normal work shift, or going to double-or multiple shift operation. Within limits, by employing such methods, it would be possible to make up for construction time lost. My experience has shown, however, that for a variety of reasons the additional work accomplished during a given period of time does not normally bear a one-to-one relationship to the additional effort applied. Thus, two weeks worth of construction progress by a given size work force usually cannot be accomplished in a one week period simply by doubling the number of workers or by going to a two-shift operation. Problems such as materials scheduling and handling, equipment breakdowns, and personnel utilization generally manage to make the total effort less efficient than for a smaller work force over a longer period of time.

Certain construction activities are critical to the overall project scheduling in that they must be accomplished prior to other work. For example, reinforcing steel and embedded items must be placed and must be

checked for adequacy and accuracy of placement prior to concrete pours around these materials. For the concrete pours themselves, the maximum rate of pouring is limited by the curing time required for that concrete previously placed. Welding and general erection of structural steel is largely a sequential operation wherein certain activities must be accomplished before others can be initiated.

Working conditions and the project status also have a considerable influence on the rate of construction placement. Where working space is limited, where the working conditions or the work sequencing must be closely controlled, or where special skills are necessary, attempts to speed up construction by employing more workmen, or by going to overtime or multiple-shift operation could actually be counter-productive. This becomes extremely crucial toward the end of a project when control of workmen becomes difficult at best, where the workmen are operating in relatively limited space due to previously installed work, where the services of the most skilled workmen are required, and where many of the activities, of necessity, must be accomplished sequentially.

The present schedule for the Midland Plant calls for a Unit 2 fuel loading date in November of 1980 and a corresponding date for Unit 1 in November of 1981. Thus, the utility currently plans about 47 months (from December 1976) for completion of construction of Unit 2 and an additional 12 months for Unit 1. To accomplish this, work at the site currently is proceeding on the basis of one full shift plus a partial shift. Thus, Consumers Power Company already is employing a portion

of the possible alternatives to speed up construction.

As I stated earlier, following a construction suspension of nine months, I estimate that a period of four to six months would be required for remobilization of the construction effort. Thus, a construction suspension of nine months entails a total delay on the order of 13 to 15 months. This represents nearly one-third of the presently scheduled time remaining for completion of Unit 2. In my judgment, it would be impossible for the utility to make up for a construction delay of this magnitude, particularly when they already are attempting to accelerate the rate of construction placement by employing more than a single shift.

Considering the present stage of construction, the utility could, in my judgment, accelerate the rate of placement of construction by going to multiple-shift operation or by employing additional workers on each shift. Following a construction suspension and subsequent remobilization, this option would still be available. Such efforts probably would enable the utility to complete the construction in a shorter period of time than if they continued with essentially a single-shift operation. However, it should be noted that in accordance with the present schedule, Unit 2 of the Midland Plant is to have fuel loaded in November of 1980 and is to be ready for commercial operation in March of 1981. Any significant delay in the construction schedule thus would cause the unit to be unavailable to help meet the 1981 summer peak load for the utility. While the possibility exists for reducing the impact of a 13 - 15 month delay on the commercial

operation date for the Midland units, which would result from a nine month construction suspension, in my judgment Consumers Power Company probably could not recover enough lost time to bring Unit 2 on line in time for the summer peak of 1981.

Conclusion:

A nine month suspension period would result in a project delay of a least 13 months and the delay could reasonably be expected to extend to 15 months, depending upon the state of the economy. While the potential exists for Consumers Power Company to recover a portion of the delay period and thereby reduce the impact of the delay on the commercial operation dates for the Midland units, it is unlikely that enough time could be recovered to bring Midland Unit 2 on line in time for the summer peak of 1981.

LAWRENCE P. CROCKER

PROFESSIONAL QUALIFICATIONS

I am the Technical Assistant to the Director of Project Management. Until August of 1976, I was a project manager in the Division of Project Management, and it was my duty to coordinate the safety evaluation of those central station nuclear power plants for which I had primary responsibility. Since assuming my present position, I have temporarily retained responsibility for certain projects, including the responsibility for the Midland plant.

I graduated from the U.S. Military academy at West Point, New York in 1951 with a Bachelor of Science degree in military engineering. I was commissioned a Second Lieutenant in the Corps of Engineers, U.S. Army. I served on active duty in the Corps of Engineers from then through August of 1970, at which time I retired in the grade of Lieutenant Colonel. My military experience included assignments as platoon leader, company commander, and battalion commander of various engineer units; overseas duty in Korea, Japan, the Azores, and Thailand; and service on the Army General Staff. During my military service, I attended various Army schools including the Army Command and General Staff College.

In 1955, I entered Iowa State College, from which I graduated in 1956 with a Master of Science degree in Nuclear Engineering. The following

year was spent attending the Oak Ridge School of Reactor Technology (ORSORT) at the Oak Ridge National Laboratory (ORNL). Upon graduation from ORSORT, I remained at ORNL for an additional year as Technical Liaison Officer for the Army Nuclear Power Program with the responsibility of representing the Army's interests at ORNL. From 1958 to 1960, I was a Project Officer in the Army Reactor Branch of the Atomic Energy Commission with responsibility for managing, coordinating and technically supervising contractor activity on a research and development project leading to design of a pressurized water nuclear power plant.

After a 3-year break for an overseas tour and attendance at an Army school, I was assigned in 1963 to the Office of the Inspector General, Department of the Army, where I was responsible for inspecting the operations and safety of the Army's nuclear power plants and research reactor facilities. From 1964 to 1967, I was assigned to the Office of the Chief of Research and Development where I served as the point of contact within the Army General Staff on all matters pertaining to research and development on the Army's nuclear power plants and research reactor facilities. From 1968 until retirement from the Army in 1970, I was the Deputy Director of the U.S. Army Engineer Reactors Group, with responsibilities including operator training, nuclear power plant operation, engineering support to the operating plants, and limited research and development activity.

Upon retiring from the Army, I accepted employment with the U.S. Nuclear Regulatory Commission, (then the U.S. Atomic Energy Commission) as a Project Manager in what is now the Division of Project Management. In this capacity I was responsible for the safety evaluation of the Kewaunee Nuclear Power Plant which was licensed for operation in December 1973 and for the Alvin W. Vogtle Nuclear Plant which was Licensed for construction in June of 1974. I have had primary responsibility for the safety review of the Koshkonong Nuclear Plant. I am a Registered Professional Engineer in the District of Columbia.