UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	(	
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CONSUMERS POWER COMPANY	(	Docket Nos. 50-329
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(Midland Plant, Units 1 & 2)	(	
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NRC SUPPLEMENTAL DIRECT TESTIMONY
OF SIDNEY E. FELD ON THE ALTERNATIVE
OF DOW GENERATING ITS OWN STEAM & ELECTRIC
POWER

The staff has examined as an alternative to the Midland Nuclear Plant a combination of facilities which could result if Dow Chemical decided to provide its own steam and electricity requirements.

Dow has provided cost estimates[1/] which suggest that such an alternative is not significantly disadvantaged from their economic perspective. However, as this testimony will demonstrate, the combination of a Dow facility and a low sulfur coal plant capable of jointly producing an equivalent quantity of electricty and steam as the Midland Nuclear Plant is clearly disadvantaged. This more realistic comparison suggests that, from society's standpoint, the proposed nuclear plant is economically superior to separate plants for the production of steam and electricity.

The following analysis contrasts the total present worth dollars (1981) for the Midland facility vs. separate steam and electric plants. The basic present worth assumptions used throughout previous staff analyses are employed here. The staff assumes a 30 year plant life, 10% discount rate, and 5% escalation rate.

Each alternative would be capable of generating equivalent quantities of steam and electricity. Under the Midland nuclear option, the Midland Units 2 and 1 would have net electrical outputs of 811 and 534 MWe, respectively, and in addition, Unit 1 would produce 2400 M lb/hr steam. The total net electrical output from Midland would total 1345 MWe.

Under the separate facilities option, Dow would build and operate four high sulfur coal units capable of producing 2400 m lb/hr steam and 167 MW of electricity, and CP would construct and operate a low sulfur coal plant with a net electrical output of 1178 MWe. The net electrical output from the combined Dow and CP facilities (1345 MWe) would then total the net electrical output from the Midland Nuclear Power Plant.

MIDLAND

The total 1981 present worth cost for the Midland Nuclear plant has been estimated by the staff at about $3,816 million. This estimate appears in Table 5.1 of the staff's DES.[2/] This value is predicated on the staff's reference fuel cycle cost estimate. If the staff adopted the high end of the fuel cycle cost range[3/] this would add an additional $498 million, bringing the total 1981 present worth cost to $4,314 million.

ALTERNATIVE SEPARATE FACILITIES

A-Dow Facility

The Dow Chemical Co. has identified the costs associated with constructing and operating a four unit high sulfur coal plant capable of producing 2400 M lb/hr steam and 167 MW of electricity (Reference 1). Assuming a 15% rate of return on investment, the total annual cost in 1982, as calculated by Dow is $142 million. Assuming a 30 year plant life, 10% discount rate, and 5% escalation on all cost elements with the exception of depreciation and the rate of return, the 1982 present worth is estimated at 1,893 million dollars. Because the Midland alternative is expressed in 1981 dollars and an equitable comparison requires the Dow alternative to also be expressed in 1981 dollars, the Dow present worth estimate is discounted an additional year at 10% which produces a 1981 present worth of $1,721 million.

B-1178 MWe Coal Plant

In Table 5.1 of Reference 2, the staff has estimated the 1981 present worth costs for 1600 MWe high and low sulfur coal plants. Since its publication, the staff has updated (Reference) its coal fuel costs and consequently the coal fuel costs and interim power costs are understated in that table. Correcting for this change (as identified in Reference 4) produces 1981 present worth costs of $5,117 and $5,403 million for the low and high sulfur coal alternatives, respectively. Because the staff's analysis shows the low sulfur plant to be more cost effective than the high sulfur alternative, the low sulfur alternative will be used in calculating the present worth cost of an 1178 MWe coal plant.

The staff contends that the $5,117 million cost estimate for the 1600 MWe low sulfur plant can be used to derive an estimate for an 1178 MWe low sulfur plant. If one assumes costs are directly proportional to power output, the cost can be scaled downward by the ratio of the size of the new to old plant. However, the interim power cost of $388 million which is a component of the $5,117 million cost is independent of the size of the coal plant and consequently the scaling should be applied to $4,729 million ($5,117 million - $388 million). In this instance, the present worth cost would be $\frac{1178}{1600} \times \$4,729 + \$388 = \$3,482 + \$388 = \$3,870$. In actuality, because of economies of scale, costs are not directly proportionate, but rather increase per unit of output as the plant size is reduced. Consequently, the $3,870 million can be viewed as a conservative estimate for an 1178 MWe low sulfur coal plant.

Combining the cost of Dow's facilities and a separate 1178 MWe coal plant produces a 1981 present worth cost of approximately $5,591 million which makes it more costly than either of the alternatives to Midland that were initially reviewed by the staff. The results of this comparison for both the reference and high range nuclear fuel costs is presented in Table 1.

TABLE 1 - COMPARISON OF ALTERNATIVES

	Midland Dual Purpose Nuclear Plant	Self Generation By Dow	PLUS	Coal Electric Plant (Low Sulfur Coal)
Plant Capacity	2.4 million lbs/hour of steam, 1345 MWe	2.4 million lbs/hr steam, 167 MWe		1178 MWe
Total 1981 Present Worth Costs (millions of $)	ASSUMING: Reference nuclear fuel costs $3,816 High end of nuclear fuel cost range $4,314	$1,721		$3,870
DIFFERENCE:				
Assuming ref. nuclear fuel costs	BASE		+$1,775	
Assuming High end of nuclear fuel cost range	BASE		+$1,277	

REFERENCES

1. Midland Intervenor's Exhibit 26.
2. Draft Supplement to the Final Environmental Statement related to the construction of the Midland Plant Units 1 and 2 - Jan 1977.
3. NRC Staff Supplemental Testimony of Jack Roberts Regarding Nuclear Fuel Costs.
4. NRC Staff Supplemental Testimony of Sidney Feld Updating Coal Cost Estimates.

STATEMENT OF QUALIFICATIONS OF JACK O. ROBERTS

I am employed as a Senior Technology Assessment Analyst with the Cost-Benefit Analysis Branch, Division of Site Safety and Environmental Analysis, Office of Nuclear Reactor Regulation, located in Bethesda, Maryland. My educational and professional qualifications are set forth below.

Education

I obtained a B.S. degree in Chemical Engineering from the University of Colorado in 1949. In addition, I completed the Oak Ridge School of Reactor Technology Program at Oak Ridge, Tennessee in 1956. My formal educational program has encompassed mathematics, physics, chemistry, engineering and economics as they relate to industrial processes and production plants.

Experience

I joined the Cost-Benefit Analysis Branch of NRC in June 1976 as a Senior Technology Assessment Analyst. I am responsible for reviewing and analyzing Applicant's Environmental Reports and preparing cost-benefit portions of environmental statements. I am responsible for developing the criteria and methodology for analysis of alternative sites, alternative fuels and alternative cooling systems to be used in environmental statements. In addition, I conduct and manage technical and economic research on topics related to environmental impacts of nuclear power plants. In this connection I oversee the performance of outside consultants and contractors and arrange for expert review of the technology and economic research performed by these organizations. I prepare testimony and participate in environmental hearings regarding cost-benefit analysis, in particular, cost analysis of alternative energy producing systems and alternative fuels, land use impacts of power plant siting, regional impacts, and the need for the facility.

Other activities include review and propose revisions of Regulatory Guides, in particular Regulatory Guide 4.2 which pertains to preparation of Environmental Reports.

From the inception of NRC until I joined the Cost-Benefit Analysis Branch, I was Senior Task Leader on a special study, "Nuclear Energy Center Site Survey," where I was involved in the early planning and organization of the study. After the study plans were approved, I was responsible for developing the section of Assumptions and Bases and for overseeing the development of chapters on Heat Dissipation and Reactor Facility Siting - Layout and Construction.

I was with the Atomic Energy Commission from 1953 until that organization was terminated in 1975. The following is a summary of the more significant programs I was involved in while with the AEC.

From 1964-1975 I was with the Division of Reactor Research and Development and was involved in the following programs and studies:

- Economic and technical assessment of nuclear and coal based systems for meeting the process industry energy needs particularly in those areas of the U.S. where gas could no longer be considered a firm source of energy.
- Economic and technical evaluation of the potential of nuclear systems for meeting high temperature (1000°-2000°F) process heat needs.
- Economic and technical feasibility studies relating to the use of dry cooling towers for disposing of waste heat from power plants.
- Studies to assess the economic and practicality of beneficially using waste heat from power plants.
- Studies to investigate home and commercial space heating and cooling methods including an assessment of the

impact of changing energy cost on the economics of space conditioning methods and its effect on the electric utility industry.

- Studies relating to the use of nuclear energy for dual purposes (desalting sea water and electric power production) applications. These studies involved economic and technical feasibility assessment of nuclear dual purpose plants and comparing the alternative system of producing the same products.
- General studies relating to the siting of nuclear power plants including underground, offshore, siting characteristics associated with dry cooling, and the California siting study which investigated the economic and technical feasibility and impacts of about seventeen siting concepts for the western part of the country.

From 1962 to 1964 I was on loan to the International Atomic Energy Agency where I participated in the development and implementation of international safeguards system.

From 1958 to 1962 I was with the Division of Reactor Development, Evaluation and Planning Branch. I was involved with the evaluation of the technical status and the economic potential of various reactor concepts and planning the direction of research and development programs for the development of the more promising concepts. From 1953 to 1958 I was with the Division of Nuclear Materials Management. This group was responsible for establishing material control methods and monitoring the accountability of AEC's nuclear materials. My involvement related to the technical aspects of processes and related measurements for material control.

From 1949 to 1953 - Sandia Corporation. I was associated with the surveillance and modification of the nuclear components of atomic weapons at storage sites.