UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of METROPOLITAN EDISON COMPANY, et al (Three Mile Island Nuclear Station, Unit 1)	))))))	Docket No. 50-289

APPLICANTS' PREPARED TESTIMONY RELATED TO COST/BENEFIT ANALYSIS

Introduction

Construction of Three Mile Island Nuclear Station, Unit 1 (TMI 1), is estimated to be 95 percent complete. The present estimate of the initial capital cost for TMI 1 is $395,000,000. Of this total, $333,072,000, or 84.3 percent, had been spent through September 30, 1973. An updated table (Table 1) of the Annual Cost of Three Mile Island, Unit 1, for the years 1974 through 1979 is attached to this testimony.

Consideration of Certain Cost Factors

A. Cost of Administration and Regulation by Governmental Agencies

In 10 CFR Part 170 the AEC has established a schedule of licensing fees which include fees to be paid by applicants

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for construction permits and operating licenses, as well as annual operating fees to be paid each year by holders of operating licenses. At the time TMI 1 received its construction permit in May 1968, there was no requirement for a construction permit fee. The estimated operating license fee which must be paid by Applicants before AEC will issue an operating license for TMI 1 is $718,975. The annual operating license fee payable thereafter for the duration of the operating license is estimated to be $165,000 per year. Both the operating license ($718,975) and the annual operating license ($165,000) fees are included in the cost estimates for TMI 1.

B. Insurance Costs

The insurance costs for TMI 1 include premiums payable to the Nuclear Energy Liability Insurance Association (NELIA) and to the Nuclear Energy Property Insurance Association (NEPIA), and indemnity fees payable to the AEC pursuant to the Price Anderson Act.

The NELIA premium for the anticipated three month fuel storage period from January 1974 to March 1974 will be $490. Thereafter, the annual NELIA insurance premium will be $270,000.

The NEPIA premium for the period January 1, 1974 to July 29, 1974--the anticipated period between receipt of

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fuel onsite and the date of commercial operation--will be $336,500. Thereafter, the annual NEPIA insurance premium will be $1,030,000.

The fee for indemnity coverage under Price Anderson for the anticipated three month fuel storage period from January 1, 1974 to March 1, 1974 will be $100. With fuel loading anticipated for March, the fee for the remainder of 1974 will be $63,400. Thereafter, the annual Price Anderson fee will be $76,050.

The total costs of these insurance premiums and fees to be paid annually for TMI 1 is approximately $1,376,000. This cost, which will be reduced by about one fourth when Unit 2 becomes operational, is included in the cost estimates for TMI 1.

C. Costs of Water Consumption

TMI 1 employs a closed loop cooling system which has two natural draft cooling towers. As is reflected in Section 3.5 of the Environmental Report, Applicants have taken into consideration the cost of water consumption due to evaporation from these cooling towers. The expected maximum evaporation rate is 5000 gpm per tower, or 10,000 gpm maximum for the two towers. This evaporation is replaced by water from the Susquehanna River. The consumption of 10,000 gpm when compared with the mean annual average

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river flow of 34,000 cfs (15,300,000 gpm) is only 0.065 percent of total river flow. Even under the most adverse combination of conditions of maximum evaporation and minimum recorded river flow of 1700 cfs (762,960 gpm), the consumption is only 1.3 percent of total river flow.

Applicants have investigated the effects of this evaporative water consumption on downstream users. While the evaporation rate will result in slightly decreased output of the four downstream hydro plants, it is felt that the consumption of 10,000 gpm of river water will have no effect on any other downstream water users and the overall environmental cost is minimal.

D. Cost of the Containment Repouring

Applicants have included in the updated cost of the facility the cost of the containment ring girder repair work, which was approximately $3,000,000.

E. Capacity Factor

Plant capacity factor means actual plant generation (measured, for example, in kilowatt hours actually delivered in one year by the plant) divided by plant generation capability (measured, for example, by the product of the plant kilowatt rating and the total number of hours in a year). Thus, a capacity factor of 80% could indicate that, either

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in any given year or during the design life of the plant, it would operate at 100% power 80% of the time. At the present time, TMI 1 is intended to be base-loaded, i.e., operated at 100% power at all times that it is in operation.

The choice of an 80% capacity factor for TMI 1 is based upon industry experience to date. Industry experience has shown that while annual capacity factors are generally less than 80% during the initial years of plant operation, they improve to values considerably above 80%. After the initial years of plant operation, only periodically do dips occur in annual capacity factors as a result of, for example, extended outages for such things as in-service inspections. Thus, as of March 31, 1973, thirteen nuclear plants of about 500 MW or more were on their first fuel cycle. Problems incurred at the beginning of commercial operation of these plants was a significant factor in depressing the plant factor for nuclear units. Older pressurized water reactors, however, have shown considerably higher plant factors. For example, Connecticut Yankee had plant factors of 58.6, 80.1 and 87.8% for its first three fuel cycles. Yankee Rowe in fuel cycles 6-10 had plant factors of 77.6, 87.4, 81.3 and 78.2%. San Onofre had plant factors of 55.2 and 73.0% respectively, for its first two fuel cycles; it is currently in its third fuel cycle and to date has a plant factor in this cycle of 87.0%. As more

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nuclear plants gain more operating experience, we would expect the overall nuclear plant factor to improve. Based on the experience of nuclear plants which have matured past their initial fuel cycle, it is reasonable to use a plant factor of 80% in estimating the lifetime benefits to be derived from TMI 1.

In any event, even if, for example, a 60% plant capacity factor were used and a proportional reduction in electric energy to be produced were assumed, this reduction in income-producing output would have little effect on the economic considerations of alternatives. TMI 1 is nearly complete; most of the capital costs of construction are now sunk costs; and since the only practicable assessment of the costs of alternatives at this stage would be based on future costs, even a substantial reduction in plant capacity factor would not significantly effect Met Ed's choice of a nuclear facility. Furthermore, any reduction in plant operation (which a lower plant factor would indicate) would also reduce the already insignificant environmental costs.

F. Cost of This Facility as Opposed to Alternate Facilities to Rate Payers

In 1966 when TMI 1 was selected, cost comparisons were made between coal-fired and oil-fired base load generating units, and nuclear base load generating units. These cost

comparisons showed that a nuclear unit was more economical than its alternatives.

We recently have re-examined the cost comparisons leading to the 1966 selection of a nuclear unit at TMI. The results show that the decision made in 1966 was the proper economic choice, both as to the alternative of an eastern coal-fired plant under present day conditions, and as to the alternative of an oil-fired base-load type unit which has recently found wide usage in the area.

The specific cost breakdowns of each of the alternatives are reflected in Table 2 attached to this testimony. All costs in Table 2 are at 1974 cost levels--the period when TMI is scheduled for completion. In the case of coal we considered that the plant would be located at mine-mouth, with its output transmitted to the general load area of TMI. Necessary high voltage bulk transmission was included at $55 per kilowatt of plant rating. Such a configuration is, for the TMI area, more economical than moving coal by rail to a plant in that locality. All operation and maintenance estimates were similarly derived from current experience with comparable appropriate types of plants. Fuel costs in Table 2 correspond to experienced costs plus moderate escalation to the 1974 comparison period.

Table 2 shows that for the 7,000 hours per year operation contemplated for TMI 1, its annualized cost is estimated

to be $96.50 per kilowatt year. This annual cost compares favorably with the annual cost for a coal-fired plant of $105.10 per kilowatt-year and the annual cost for an oil-fired plant of $99.30 per kilowatt-year. Stated another way, the choice of nuclear over the closest alternative, oil-fired, will result in an annual savings of $2,254,000.

TMI 1 can also be compared, again, favorably, with either of the fossil-fired alternatives on the basis of present initial capital cost consideration. As of September 30, 1973, $333,072,000, or 84.3 percent of the total cost of construction ($395,000,000) had been sunk in the construction of TMI 1. In other words, from that date a total of $62,000,000 remained to be spent in order to complete construction of the present facility. In a comparison of alternative facilities at this stage in TMI's construction, it follows that the proper capital cost estimate to be used for TMI 1 is the cost of completion--$62,000,000. The capital cost of a comparable oil-fired plant, which is the cheapest alternative, is $193,200,000. Thus, while it is generally accepted that the capital cost of a nuclear power plant is greater than that of the fossil-fired alternatives and the economical savings of the nuclear alternative lies in the annual operating costs (primarily the cost of fuel), the only practicable method of comparison of the cost of TMI 1 with the costs of comparable fossil plants

leads to the conclusion that TMI 1 at this time is the least expensive choice--in terms of not only annual operating costs but also initial capital cost--to attain comparable electric generation capacity.

TABLE 1

ANNUAL COST OF THREE MILE ISLAND UNIT 1
($000)

	74 2 Mos. Year	75 1st. Year	76 2nd. Year	77 3rd. Year	78 4th. Year	79 5th. Year
Depreciation	2,174	13,022	13,022	13,022	13,022	13,022
Real Estate Taxes	1,783	1,847	1,785	1,723	1,661	1,600
Fuel	1,252	8,028	7,870	7,856	8,241	8,300
Other O&M	906	5,911	7,482	6,349	6,360	6,384
Insurance Premium	230	1,376	1,300	1,050	1,050	1,050
Return on Investment	6,220	36,700	35,463	34,226	32,989	31,752
TOTAL	12,565	66,884	66,922	64,226	63,323	62,108

TABLE 2

Hours operation per year			7,000
TMI UNIT 1			
Total Investment		$395,000,000	
Installed Capacity	MW	805	
Unit Investment Cost	$/KW	491	
Nuclear Fuel Investment	$/KW	38	
Total		529	
Annual Cost	$/KW-YR		
Fixed Charges at 15%			79.80
Operation and Maintenance, Nuclear Insurance			4.80
Fuel at 1.3 mills/kwh			11.90
Total			96.50
COAL BASE LOAD			
Unit Investment Cost	$/KW		
"Normal" Plant	295.00		
SO_2 Removal Equipment	50.00		
Total	345.00	345	
Bulk Transmission East	$/KW	55	
Total		400	
Annual Cost			
Fixed Charges at 15%			60.00
Operation and Maintenance, Including SO_2 Removal Costs			14.30
Fuel at 4.4 mills/kwh[(a)]			30.80
Total	$/KW-YR		105.10
OIL BASE LOAD			
Unit Investment Cost	$/KW	240	
Annual Cost	$/KW-YR		
Fixed Charges at 15%			36.00
Operation and Maintenance			3.10
Fuel at 8.6 mills/kwh[(b)]			60.20
Total	$/KW-YR		99.30

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(a) Coal at 4 .0 ¢/10^6 BTU
(b) Oil at 93.0 ¢/10^6 BTU