#30 Mich PSC U-7775

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

RE: THE APPLICATION OF THE DETROIT EDISON COMPANY FOR AUTHORITY TO IMPLEMENT A POWER SUPPLY COST RECOVERY PLAN FOR 1984	Case No. U-7775

TESTIMONY OF PAUL CHERNICK

ON BEHALF OF THE

PUBLIC INTEREST RESEARCH GROUP

IN MICHIGAN

February 21, 1984

I. QUALIFICATIONS

Q: Mr. Chernick, would you please state your name, position, and office address.

A: My name is Paul L. Chernick. I am employed by Analysis and Inference, Inc., as a Research Associate. My office address is 10 Post Office Square, Suite 970, Boston, Massachusetts 02109.

Q: Please describe briefly your professional education and experience.

A: I received a S.B. degree from the Civil Engineering Department of the Massachusetts Institute of Technology in June, 1974, and a S.M. degree from the same school in February, 1978 in Technology and Policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon, to membership in the engineering honorary society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi. I am the author of several publications, which are listed in my resume, attached as Appendix A.

My professional experience includes over three years as a

Utility Rate Analyst for the Utilities Division of the Massachusetts Attorney General. In this capacity, I was involved in review and analysis of utility proposals on a number of topics, particularly load forecasting, capacity planning, and rate design. One of my first major projects for the Attorney General was an investigation of the extended 1977-78 maintenance outages and associated derating of the Pilgrim I power plant.

My current position with Analysis and Inference, Inc. has involved a number of utility-related projects. These include a study of nuclear decommissioning insurance for the Nuclear Regulatory Commission, analyses of gas and electric rate designs, nuclear power cost estimation, design of conservation programs, and several other topics.

Q: Have you testified previously as an expert witness?

A: Yes. I have testified more than twenty-five times before the Massachusetts Department of Public Utilities, the Massachusetts Energy Facilities Siting Council, the Massachusetts Division of Insurance, the Atomic Safety and Licensing Board of the Nuclear Regulatory Commission, and before the utility commissions of Texas, New Mexico, Illinois, New Hampshire, Connecticut, and the District of Columbia. My resume lists my previous testimony.

I testified in Massachusetts Department of Public Utilities (MDPU) docket numbers 1048 and 1509, the first two reviews of Boston Edison's proposed power plant performance standards, under the new fuel clause statute, M.G.L. c. 164, section 94G (effective August 6, 1981). That statute eliminated the essentially automatic recovery of fuel costs, and required that the fuel adjustment charge be based on "the efficient and cost-effective operation of individual generating units". I have also testified on nuclear capacity factors in a number of other proceedings, including MDPU 20055, MDPU 20248, NHPUC DE 81-312, Illinois Commerce Commission 82-0026, CPUCA 83-03-01, and NMPSC 1794. This testimony is also listed in my resume.

II. Introduction

Q: Please describe the subject matter and purpose of your testimony.

A: My testimony discusses the capacity factors for Enrico Fermi 2 to be used in this proceeding and in subsequent proceedings. First, I describe the principles and concepts upon which power plant performance targets may be based. Second, I discuss the capacity factors proposed by Detroit Edison Company (DECo). I describe certain weaknesses and failings of DECo's derivation of its proposal, and explain why this approach is inappropriate to the purpose of this proceeding. Third, I provide a historical perspective on DECo's representations regarding the performance of Fermi 2, and suggest a mechanism for holding DECo to its earlier promises. Finally, I propose a method for insuring that Fermi 2 will not represent a net loss to the customers.

Q: Why is it appropriate to set standards for power plant performance, rather than simply allowing DECo to recover its actual fuel costs, regardless of how well, or how poorly, its units perform?

A: In establishing the power supply cost recovery clause (1982

PA 304), the Legislature repeatedly refers to the "reasonable and prudent" decisions, policies, and practices on the part of the utility. In order to determine whether the power supply costs were reasonable and prudent, the Commission must determine whether the prices paid for fuel and purchase power were appropriate, whether the efficiency (heat rate) of plants which burn large dollar amounts of fuel are adequate, and whether the units with the lowest running costs were available and utilized sufficiently.

Q: What is the fundamental goal of the standard-setting process?

A: In setting power plant performance standards, the objective is to develop <u>normative</u> or <u>prescriptive</u> goals, specifying how the plants <u>should</u> behave. This is a very different concept from <u>positive</u> or <u>descriptive</u> projections, which predict how the plants <u>will</u> behave. These two types of analyses have very different purposes and may yield very different results. For example, if a utility breaks a plant in 1983, an accurate positive analysis might project a 1984 capacity factor of zero. It may be appropriate to base 1984 power supply cost recovery on the "reasonable and prudent" costs which should have been incurred if the plant had not been broken. Thus, the normative standard may be different from both the actual performance, and from the best estimate of future performance.

III. Principles of Power Plant Performance Standard-Setting

Q: What basic approaches can be taken to establishing standards for power plant performance?

A: There are three basic types of alternative approaches. First, each unit's performance standard can be determined by a self-referent standard, based on the unit's past performance. Self-referent standards may be set at various levels of stringency, such as:

- The unit will perform at least as well as its best past performance.

- The unit will perform at least as well as its average past performance.

- The unit will perform at least as well as its worst past performance.

Any of these standards may be calculated from any time period (e.g., last year, or the plant's entire life) and for a variety of intervals (monthly data, annual data).

Q: Do these self-referent methods generally produce fair and even-handed standards?

A: Not usually. Self-referent standards are inherently stricter for those units with good performance histories than for those with poor past performance. This is hardly a fitting reward for those utilities which have historically taken the greatest care in plant operation. In fact, it penalizes the best past performers and rewards the worst. There is generally no compelling reason for believing that the unit's history is representative of an appropriate level of performance (neither extraordinary nor inadequate), so self-referent standards are not likely to be useful in identifying efficient and cost-effective operations.

Q: What is the next category in your taxonomy of standard-setting approaches?

A: In the second group of options, standards are based on <u>comparative</u> analyses, which aggregate the experience of other units. This approach would include such standards as:

- The unit will perform as well as the average comparable unit.

- The unit will perform as well as the average <u>competently run</u> unit.

- The unit will perform better than half (or any other percentage) of the comparable units.

Q: How may comparative targets be derived?

A: The comparisons may simply average data from a set of units which share some common characteristics, or they may involve more complex statistical analyses, such as regression. Simple comparisons are generally performed on a set of very similar units, as it is difficult to justify direct comparisons between units which are known to vary in any relevant manner. The differences which are relevant are those which can be expected to affect performance: vintage, age, operating pressure, size, fuel type, and so on. The resulting data sets tend to be small, and the comparability of the units is always subject to some dispute. Various statistical techniques may mitigate these limitations. In multiple regressions, for example, several descriptive variables may be incorporated simultaneously, facilitating the merging of data from a greater variety of units. Statistical tests can also be useful in determining whether particular units belong in a comparison group.

Q: You have stated that the purpose of analyzing power plant performance is to establish normative standards. Is this consistent with the use of actual operating data in these first two types of approaches?

A: Yes, it is consistent. Positive models describe the way things are (or have been), leading to such conclusions as "In their second year of operation, 1000-MW BWR's have an average capacity factor of 55%." This sort of statement is not a performance standard; it only becomes a standard when a prescription is added, such as "Therefore, Fermi 2 should have a 55% capacity factor in its second year." The way things are may be used as a basis for determining the way things should be, but this relationship is not automatic.

Q: What is the third group of standard-setting approaches?

A: Finally, standards may be based on <u>absolute</u> measures of proper performance, such as:

- The unit will perform as was promised, or expected.

- The unit will perform as well as the utility has assumed for other purposes, such as rate design, setting small power producer rates, and capacity planning.

- The unit will perform well enough to justify its fixed costs.

None of these various absolute standards depend on actual performance data, either for the subject plant or for other plants. The first example suggests that, when the utility (and hence, the ratepayers) buy a generating unit, it should get what it (and they) expected. The second example suggests the standards applied in a plant performance standard review, where over-optimistic projections cause problems for the utility, should be the same as those used in proceedings where over-optimistic projections cause problems for ratepayers, such as capacity planning and rate design. The last example suggests that, regardless of what the utility expected, or predicted, or should have expected for the unit, the real issue is whether the unit is paying its own way.

Q: Is one particular approach to standard-setting preferable in all applications?

A: No. The various kinds of standards are appropriate for different situations. As noted above, self-referent standards raise major equity issues. If applied on a rolling basis (e.g., if the standard in any year is determined by performance in the preceding three years), serious and perverse incentive problems may be created. Self-referent standards are also inherently inapplicable to new units. There are special circumstances in which self-referent standards are useful, particularly when no other basis for standard-setting exists; these are the exceptions, rather than the rule.

Comparative standards are appealing wherever a reasonable comparison group exists. They are not applicable for experimental units and other unique designs[1]. Comparative analyses establish business-as-usual standards, which simply ask utilities to keep up with general industry performance levels.

Absolute standard-setting approaches rely on other concepts of fairness, which may be applicable even where business is far from usual. For example, using pre-operational expectations to set performance standards is intrinsically appealing: if a utility sets out to build a plant which will operate in a particular manner, it should be able to explain why the actual plant is significantly different than the expected one. Similarly, utilities should not be allowed to change their stories to suit their positions in different proceedings, projecting wonderful operating results if they are allowed to build the plants of their choice; assuring regulators that good generating performance will make

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1. The concept of uniqueness must be applied carefully. In one sense, no steam power plant is unique, since all such plants are alike in having a boiler, a turbine, and a heat sink. In another sense, every unit is unique, except for those few sister units which are <u>exact</u> carbon copies. Generally speaking, if a group of similar units can be defined, a meaningful comparative analysis can be conducted, and statistical tests can determine whether differences between plants are important.

marginal costs so low that declining blocks are justified, conservation is counter productive, and small power producers are unnecessary; and then denying that it is realistic to expect performance at those levels.

The application of this approach is limited by performance factors and units for which expectations and representations are either unavailable or otherwise of limited usefulness. For many fossil units constructed prior to the establishment of regulatory review, no reliability measures were ever projected. For other technologies, early performance expectations were widely held, based on virtually no data, and seriously incorrect; this certainly was true of projections for nuclear capacity factors made in the 1960's and early 1970's. In such cases, it seems unfair to hold an individual utility responsible for a universal, and perhaps understandable, error.

As an alternative to the projection standard, the cost-effectiveness standard may be particularly appealing: this standard asks only that the ratepayers be better off with the plant than without it, but this may be all that can be expected from new (and especially from exotic) generating units. This standard can be derived for all units, regardless of the existence of a comparison group, of prior data on the unit's own performance, or of pre-operational projections.

Q: What type of performance standard is appropriate for Fermi 2 in this proceeding?

A: Pre-operational representations are especially appropriate for Fermi 2[2], since DECo was willing to predict high nuclear capacity factors, when ratepayer funds were at risk. If DECo believed that those capacity factor projections were reasonable, it can hardly argue that projections from the same source should not be applied once the plant comes on line. In general, the Commission can probably best encourage accurate projections by requiring DECo to tell the same story for all purposes.

A break-even standard would also be an attractive approach for setting Fermi 2 performance targets. The plant was built with the knowledge that it would be more expensive per installed kilowatt than other capacity sources, but with the expectation that it would pay off the additional capital costs through long hours of output at very low fuel cost. Even when it became clear that the plant would not be necessary in the near future for reliability purposes, DECo continued construction to realize the anticipated fuel savings. Since the plant was built to save rate-payers

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2. This is true for most new nuclear units.

money, it seems reasonable to expect it to do so.

Both the representations standard and the break-even standard are discussed more fully in Section V, infra.

Q: Does the intended use of a performance standard have any effect on the kind and level of standard which is appropriate?

A: Yes. It is important to remember that the performance standards to be set in this proceeding serve a particular (and quite limited) function. If DECo's plants perform below the level established in this case, the power supply cost recovery factor will produce rates which do not fully cover the utility's costs. However, it is my understanding that DECo will still have an opportunity in the reconciliation proceeding to explain and justify any deviations from expected performance.[3] Hence, the standards do not create an automatic penalty for operation which fails below the standards. Instead, the standards will basically flag performance which requires some scrutiny or explanation. Thus, a higher standard would be appropriate for this screening purpose than might be appropriate if there were

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3. The converse is also true: if performance is better than expected, DECo can keep its over-collections, at least until the reconciliation hearing.

automatic financial consequences when the utility failed to meet the standard. When several sources of standards are available, I would therefore tend to recommend standards from the higher end of the range.

IV. DECo's Approach

Q: How does DECo project the performance of Fermi 2?

A: DECo projects the capacity factor of Fermi 2 from the average performance of various samples of arguably comparable groups of units.[4]

Q: What plants has DECo used in this analysis?

A: There were several parts to the analysis, covering various phases of start-up and operation. These are provided in the workpapers to the testimony of D. B. Wehmeyer. Table 1 lists the analyses and the units used in each analysis.

Q: Is the choice of the type of units to include in the comparison groups appropriate?

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4. This discussion refers to the capacity factor analysis used in determining nuclear fuel costs, as presented by D. B. Wehmeyer. While it appears that J. H. Bryon claims to use the same monthly capacity factors for the production costing runs, his originally filed output figures for Fermi (Ex. JBH-2 and JBH-5) are not consistent with DECo's own projections, and do not seem to be supported by any other sources. It further appears that DECo's revised case has further reduced the 1985 capacity factor projection for Fermi, to below 50%, again with no documentation. I can not comment further of the derivation of Mr. Byron's capacity factor figures, except to note that they should at least reflect DECo's own projections, and not arbitrarily more pessimistic figures.

Unit	Attachment 4, WP DBW-1 Portion of Startup Period						Att. 7 WP	WP
	A	B	C	D	E	G	DBW-1	DBW-2
Vermont Yankee								*
Peach Bottom 2							*	*
Cooper		*						*
Browns Ferry 1							*	*
Peach Bottom 3	*						*	*
Duane Arnold		*						*
Browns Ferry 2	*						*	*
FitzPatrick		*	*	*	*	*	*	*
Brunswick 2							*	*
Hatch 1		*	*	*	*	*	*	*
Browns Ferry 3	*		*	*	*	*	*	*
Brunswick 1			*	*	*	X	*	*
Hatch 2			X	*	*	*	N	*

Table 1: Units Utilized in Wehmeyer Fermi Analyses

Notes: X = Excluded for specific reasons.
N = Not available at time of analysis.

A: Yes, at least in a general sense. The comparison units are all commercial scale[5] domestic boiling water reactors (BWR's). In addition, DECo eliminates from the comparison groups some of the earlier commercial BWR's; roughly speaking, units entering service before 1973 are excluded, but DECo is not consistent in its choice of a cut-off rule.

Q: Has DECo used all of the data available in setting its standards?

A: No. As shown in Table 1, DECo used data from a total of 13 units in one or more of the analyses. DECo rejects or ignores data from each of these units in one or more of the eight analyses; only six units are used in the average analysis in this set.

Some of the groups consist only of the five most recent units at the time of the analysis, while others include the nine (or thirteen) most recent, or the three largest of the nine most recent, or only units which are the first at their site, or some other set. While some rationale for exclusion of

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5. Each comparison unit is rated at more than 500 MW, in contrast to the early units of less than 250 MW.

6. For example, WP DBW-1, Att. 4, explains that the Hatch 2 data is not useful for Period C (Test Condition 1) because some of the testing normally performed in this period was performed previously. Other exclusions in the same document are justified simply as "Not valid for use in this manner, for various reasons."

particular units is provided,[6] there does not appear to be any consistent procedure for selecting the comparison groups. In particular, where smaller units, or older units, or second units are omitted from the comparison group, DECo has not demonstrated that there is any significant difference (in either a statistical sense or an engineering sense) between the rejected units and the retained ones.

In addition, DECo ignores all experience from the nine other early commercial BWR's. As shown in Table 2, there is no clear breakpoint between the units which are not used at all, those which are used for some comparisons, and those which are used in most of the comparisons. In addition, there are a few new units, licensed since the accident at Three Mile Island, whose experience may be particularly relevant to a comparative projection of Fermi 2 capacity factors.

Q: Which of these analyses is the most important in determining the power supply costs to be included in this and subsequent proceedings?

A: The most important analysis is that contained in WP DBW-2, from which estimates of capacity factors during commercial operation are derived. The underlying data for this workpaper, in its Enclosures 2 - 7, uses data for thirteen nuclear units, identified only by numbers. The data, apparently provided in this form by General Electric, is

Unit	Construction Permit Issued	First Electric Generation	Commercial Operation Date	Capacity MW DER	Number of Analyses in Which Used
Oyster Creek	Dec-64	Sep-69	Dec-69	650	
Nine Mile Pt.	Apr-65	Nov-69	Dec-69	610	
Dresden 2	Jan-66	Apr-70	Jul-70	794	
Millstone 1	May-66	Nov-70	Mar-71	652	
Monticello	Jun-67	Mar-71	Jun-71	545	
Dresden 3	Oct-66	Jul-71	Nov-71	794	
Vermont Yankee	Dec-67	Sep-72	Nov-72	514	1
Pilgrim	Aug-68	Jul-72	Dec-72	655	
Quad Cities 1	Feb-67	Apr-72	Feb-73	789	
Quad Cities 2	Feb-67	May-72	Mar-73	789	
Peach Bottom 2	Jan-68	Feb-74	Jul-74	1065	2
Cooper	Jun-68	May-74	Jul-74	778	2
Browns Ferry 1	May-67	Oct-72	Aug-74	1065	2
Peach Bottom 3	Jan-68	Sep-74	Dec-74	1065	3
Duane Arnold	Jun-70	May-74	Feb-75	538	2
Browns Ferry 2	May-67	Aug-74	Mar-75	1065	3
FitzPatrick	May-70	Feb-75	Jul-75	821	7
Brunswick 2	Feb-70	Apr-75	Nov-75	821	2
Hatch 1	Sep-69	Nov-74	Dec-75	786	7
Browns Ferry 3	Jul-68	Sep-76	Mar-77	1065	7
Brunswick 1	Feb-70	Dec-76	Mar-77	821	5
Hatch 2	Dec-72	Sep-78	Sep-79	786	4

Table 2: Comparison of BWR's Used by DECo Analyses With Those Not Used

organized by fuel cycle[7] rather than year of operation; each of these units has completed at least two fuel cycles. On discovery, DECo indicated that it could not match any of this data with individual units, so it could not make the selections for size, vintage, first-unit status, and so on. (See the response to question P-I5.11.)

Q: Have you been able to identify these units?

A: Yes. Since the time between refuelings and the duration of refueling outages are provided in WP DBW-2, it is a straight-forward task to match the numbered units with comparable data from NRC reports for individual BWR's. The results of this analysis are reported in Table 3. Many of these units were excluded from DECo's other analyses for various, and sometimes unspecified, reasons.

Q: Are there any problems in the use of this data set?

A: Yes. First, I find it curious that DECo was willing to use this data without knowing what units they covered. As I noted, DECo was very particular about the units it was willing to use for certain of the other analyses.

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7. Each fuel cycle, except the first, starts with the unit's return to service after refueling, and ends at the completion of the next refueling. The first fuel cycle starts with initial power generation, and is divided into pre-commercial startup and commercial operation.

General Electric/Detroit Edison Company Data [1]

Plant Number	Inferred Identity	Interim Cycle 1	Refuel	Interim Cycle 2	Refuel	Interim Cycle 3	Refuel	Interim Cycle 4	Refuel	Interim Cycle 5	Refuel
10	Fitzpatrick	870.0	96.8	355.0	83.3	515.0	96.8	445.0	129.8		
11	Browns Ferry 1	1430.0	127.3	312.0	54.8	348.0	78.7	384.0	173.0		
12	Browns Ferry 2	1299.0	101.6	304.0	34.1	463.0	78.4				
13	Browns Ferry 3	727.0	77.9	269.0	108.8	352.0	55.7	285.0	201.9		
14	Vermont Yankee	751.0	62.5	553.0	49.8	378.0	49.4	342.0	27.5	343.0	42.9
15	Peach Bottom 2	769.0	88.9	308.0	140.0	359.0	39.8	520.0	147.1	553.0	132.2
16	Peach Bottom 3	845.0	109.6	383.0	50.0	452.0	51.8	459.0	230.9		
17	Cooper	861.0	57.6	308.0	31.2	164.0	32.0	339.0	29.5	300.0	94.6
18	Hatch 1	851.0	71.1	285.0	44.1	371.0	129.2	549.0	109.8	115.0	47.5
19	Brunswick 1	769.0	94.0	406.0	88.0						
20	Brunswick 2	865.0	113.8	425.0	77.3	287.0	200.3	584.0	161.8		
21	Duane Arnold	637.0	61.8	330.0	63.0	308.0	40.0	653.0	68.7	337.0	73.1
22	Hatch 2	770.0	113.3	362.0	94.5						

NRC Data, 1974-82 [2]

Plant Name	[3]									
Fitzpatrick	871.0	94.8	358.0	82.3	517.0	96.2	446.0	129.9		
Browns Ferry 1	1429.0	126.7	311.0	54.8	348.0	78.7	385.0	172+		
Browns Ferry 2	1298.0	51.1	303.0	34.0	463.0	78.4				
Browns Ferry 3	726.0	77.9	272.1	106.4	352.0	38.1	302.9	152+		
Vermont Yankee	752.0	62.5	553.5	49.8	378.0	49.5	342.0	27.5	313.0	42.9
Peach Bottom 2	768.0	60.5	335.5	82.0	360.0	39.8	520.0	145.1	551.0	132.2
Peach Bottom 3	845.0	50.6	356.0	50.0	480.0	52.8	486.0	239.0		
Cooper	862.0	57.6	307.4	31.2	163.8	31.9	339.0	29.5	299.0	94.6
Hatch 1	852.0	56.9	285.0	42.0	370.0	129.2	772.0	[4]		48.0
Brunswick 1	769.0	94.0	406.0	66.4						
Brunswick 2	865.0	75.7	462.3	63.8	287.0	200.4	583.6	161.6		
Duane Arnold	636.0	62.9	331.0	61.8	309.0	40.0	653.0	68.7		
Hatch 2	771.0	60.9	415.0	94.4						

Table 3: Matching DECo Data to Specific Plants

Notes:

1. From Wehmeyer Working Paper #2 (part of memo NP-82-2635)
2. From NRC Gray Book, Operating Units Status Report, NUREG 0020, monthly 7/81-12/82.
   NRC Annual Report, Nuclear Power Plant Operating Experience, yearly 1974-80.
3. Days between first electricity generation and first identified refueling.
4. NRC data was also not readily available for the first six months of 1981. Therefore, Cycle 4 includes subsequent refueling and Cycle 5.

Second, some of the performance reported in the data is due to various kinds of management errors which should not be included in setting a target for prudent performance. Perhaps the most egregious example of this problem is found in the data for Cycle 1B, the period from the end of startup to the first refueling. Interim cycle days[8] range from 378 to 733, except for Units 11 and 12, which have interim cycles of 1140 and 1114 days, respectively. These units can only be Browns Ferry 1 and 2, which were out of service for about a year and a half due to the famous cable fire at that plant in 1975. Not suprisingly, the interim cycle capacity factors for these units in Cycle 1B are the lowest reported for any post-startup cycle, averaging 35.5%, as compared to 59.2% for the other 11 units. It would be highly inappropriate to include the Browns Ferry fire in setting performance targets for Fermi 2, or any other plant for that matter.

Q: Are there any other units which should be removed from the data base for particular cycles?

A: Yes. Both the owner of Duane Arnold and owner of the Brunswick units have been penalized by their respective state

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8. The interim cycle is the period between the beginning of the cycle (end of the previous refueling, or of startup) and the beginning of the next refueling. The total cycle includes the latter refueling. The interim cycle performance is the important result of this study, since DECo estimates the length of the refuelings separately.

utility commissions due to the poor performance of these plants. Two incidents in 1978 at Duane Arnold were found by the Iowa Commerce Commission to have been due to mismanagement by Iowa Electric Light and Power, and the associated replacement fuel costs were disallowed. In September, 1982, the North Carolina Public Utilities Commission reduced the equity return for Carolina Power and Light by a full point due to the poor performance of the Brunswick units since 1980.

Since the regulators of these utilities have found that the performance of the plants was improper, it seems inappropriate to include them in computing the performance target for Fermi 2. I would expect that, if TVA were regulated, the Browns Ferry accident would also have resulted in a substantial penalty.

Q: Have you recomputed the interim capacity factors from DECo's comparative data, excluding the units you have identified as inappropriate for this purpose?

A: Yes. This calculation is shown in Table 4. The result is the average of prudent experience (at least within the GE dataset), or more precisely, of unit-years to which no specific finding of imprudence can be attributed. As can be seen in Table 4, the "Prudent Average" capacity factor is well above DECo's proposal in several cycles.

Interim Cycle Capacity Factors from DECo/GE Data

Plant Number	Inferred Identity	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5
10	Fitzpatrick	59.5	77.9	50.3	81.3	
11	Browns Ferry 1	36.3 X	73.0	84.6	84.1	
12	Browns Ferry 2	34.6 X	87.5	79.8		
13	Browns Ferry 3	76.9	82.9	81.7	85.9	
14	Vermont Yankee	52.8	79.5	89.6	81.2	84.6
15	Peach Bottom 2	66.4	73.0	79.6	86.4	76.8
16	Peach Bottom 3	61.9	69.7	88.8	84.0	
17	Cooper	54.9	73.6	72.2	82.8	79.8
18	Hatch 1	60.2	75.8	72.9	70.0	78.6
19	Brunswick 1	60.1	62.7 X			
20	Brunswick 2	42.5	63.5	70.8 X	49.8 X	
21	Duane Arnold	52.9	65.7	77.0	44.7 X	76.0
22	Hatch 2	63.3	79.8			
	Average of Prudent Data	59.2%	75.2%	77.7%	82.0%	79.2%
	Average of All Data	55.6%	74.2%	77.0%	75.0%	79.2%
	GE/DECo Data Reported Average	52.7%	74.1%	77.1%	74.5%	78.5%
	DECo's Proposal	53.0%	75.0%	75.0%	75.0%	80.0%

Table 4: Recalculation of Interim Cycle Capacity Factors, Excluding Imprudent Data.

Notes: All data from Wehmeyer Working Paper #2

X = excluded from prudent average; see text for reasons.

Prudent data excludes plant performance which was found imprudent by regulators, or would have been so found for a regulated utility.

Q: If the Commission chooses to utilize a comparative analysis, what capacity factor targets for Fermi 2 would you recommend?

A: I have calculated annual capacity factors from the Prudent Average cycle factors, DECo's cycle lengths, and DECo's estimate of refueling duration. The results are displayed in Table 5. I would recommend that the Commission use the 59.2% capacity factor for any Fermi 2 commercial generation in 1984, and instruct DECo to use the same figure in preparing its 1985 filing.

Q: What would you recommend if the Commission chooses to employ a comparative analysis past 1985?

A: By that time, additional data will be available. The early post-TMI BWR's, such as LaSalle 1, may have completed their first (or even second) cycle, and data for Cycle 3 from Brunswick 1 and Hatch 2 should be available. In addition, Vermont Yankee has completed two mature cycles beyond Cycle 5, Cooper has completed one, and other units should add to this dataset soon. Since the data base can be expanded over time, there is no advantage to setting specific comparative targets now.

	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Refueling	Average Capacity Factor
	Months in						
Cycle Capacity Factor	59.2%	75.2%	77.7%	82.0%	79.2%	0.0%	
Year: 1984	NA						NA
1985	12						59.2%
1986	10					2	49.3%
1987		11				1	68.9%
1988		2	7			3	57.9%
1989			12				77.7%
1990			1	8		3	61.1%
1991				12			82.0%
Total cycle length:	22	13	20	20			

Table 5: Annual Capacity Factor from Revised Comparative Analysis

Notes: Assumes 12/31/84 commercial operation date.

Capacity factors from Table 4.

Cycle and refueling lengths from DECo.

NA = not applicable.

Q: How does DECo employ the data from this data set?

A: DECo uses the average interim cycle capacity factors, average refueling duration, and effective full power days between refuelings[9] reported in the data set. Unfortunately, the values reported as average interim cycle capacity factors in enclosures 2 - 7 are not the arithmetic average of the capacity factors for the available units.[10] While I have not been able to reproduce these figures, they appear to be result of weighting each unit's capacity factor by the number of days that unit spend in the cycle. Since there is a general tendency for very low capacity factors to correlate with long cycles,[11] this type of weighting is apt to produce lower capacity factors than the simple average of capacity factor across units. I see no rationale for placing greater emphasis on the experience of units which were in a particular cycle longer, so I have employed the arithmetic average of capacity factors across units. In any case, the source of the reported averages on which DECo bases its capacity factor projections remains unclear.

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9. The length of each interim cycle is estimated as (effective full-power days)/(capacity factors).

10. Data is available for five to thirteen units, depending on the cycle.

11. A plant which is not running need not refuel frequently.

Q: Does DECo derive its capacity factor projections for Fermi 2 directly from its comparative analyses?

A: No. The basic analysis leading to the DECo projections is contained in the 12/17/82 memo in WP DBW-2. The capacity factor estimates stated in that memo are slightly different than those produced by the actual analysis, which is included as a series of enclosures to the memo. The 12/17/82 projections are further modified in the 4/12/83 memo (WP DBW-4), "in order to 'smooth out' the previous forecast". The values actually used in DECo's filing are drawn from a memo of 6/3/83 (WP DBW-8), which modifies the previous projection to achieve "somewhat improved performance in later years".

Table 6 compares these four versions of DECo's capacity factor projections. The overall differences are not large, but the factor which is most important for this proceeding, the Cycle 1B interim capacity factor, is larger in the data set (even before the elimination of inappropriate data) than in DECo's recommendations. Conversely, DECo's projections beyond 1986 tend to be higher than the data would indicate.

Q: Why do DECo's projections for later-year capacity factors exceed the levels indicated by DECo's own data?

A: This phenomenon is not due to the interim cycle capacity

Source:	General Electric Data [1]		DECo Memo 12/17/82		DECo Memo 4/12/83		DECO Proposal (6/3/83)	
Cycle/ part	Months [2]	CF	Months	CF	Months	CF	Months	CF
Interim 1b	28.9	55.6%	22	53%	22	53%	22	53%
Refuel 1	3		3		3		3	
Interim 2	11.6	74.2%	13	74%	13	74%	13	75%
Refuel 2	2.3		3		3		3	
Interim 3	11.9	77.0%	20	77%	20	75%	20	75%
Refuel 3	2.5		3		3		3	
Interim 4	15	75.0%	20	75%	20	75%	20	75%
Refuel 4	4.2		5		3		3	
Interim 5	10.8	79.2%	19	79%	19	79%	19	80%
Refuel 5	2.6		3		3		3	

Table 6: Comparison of DECo Projections to Source Data

Notes: 1. Before elimination of inappropriate data.
2. Assumes 30.5 days/month.

factor projections: DECo's projections for interim capacity factors are somewhat higher than the data in cycles 2 and 5, but this is largely balanced by a lower projection in cycle 3. The higher performance in later years results from assuming very long cycles, and hence infrequent refuelings, after cycle 2.

The derivation of these very long cycles is shown in WP DBW-2, Enclosure 1; assumed Full Power Days were divided by the then-current estimate of cycle capacity factor to determine cycle length. This approach seems reasonable enough, except that the Full Power Days assumed are completely out of line with experience. DECo's data indicates that the average power output in cycles 3 through 5 was 295 Full Power Days, with a range from 90 to 449. But DECo assumes that Fermi 2 will produce 454 to 458 Full Power Days, or about 50% better than average experience, and a bit better than the best experience in the 16 unit-years of data DECo presents.

The general pattern of the difference between DECo's projections and its data is quite familiar. DECo is very pessimistic about the short-term performance of Fermi 2, for which DECo may soon have to account. On the other hand, DECo is quite optimistic regarding Fermi's performance in the relatively distant future: DECo will have several opportunities to change those projections before the day of reckoning. I would recommend that, when the time comes, the Commission treat DECo's projections for later cycles as it would any other optimistic performance promise.

V. Recommendations

Q: What techniques would you recommend using in the determination of Fermi 2 capacity factor targets for this proceeding?

A: I would recommend two techniques, as discussed in Section III <u>supra</u>. First, it seems appropriate to hold DECo to the levels of Fermi 2 performance which it promised in support of its efforts to complete the plant. Second, Fermi 2 should not cost ratepayers more than it is worth in fuel savings.

Q: What were DECo's preoperational representations for Fermi 2 performance?

A: I have been able to find only a subset of DECo's prior representations. The capacity factor projections from two rate cases are laid out in Table 7, which also calculates running average capacity factors and mature capacity factors for these two sources. The same calculations are also presented for DECo's current projections, based both on DECo's monthly figures and on a smoothed version, which averages capacity factor over the entire cycle, including refueling. The second version is included to facilitate comparison with the U-5502 projections, which are clearly

Source of Estimate	U-5108 Exh. A-25 p. 4		U-5502 Exh. A-17 p. 24		U-7775		U-7775 Smoothed by Cycle [4]	
Estimate Date	May-76		Jul-77		Jun-83		Jun-83	
Estimated Fermi 2 In-Service Date [1]	Sep-80		Dec-80		Dec-84		Dec-84	
Capacity Factor Projections:								
	Annual	Average to this Year	Annual	Average to this Year	Annual	Average to this Year	Annual	Average to this Year
Year 1 (Partial)	15% [5]		50%		NA		NA	
2	68%		60%		53%		47%	
3	59%	58%	65%	63%	40%	46%	47%	47%
4	59%	58%	70%	65%	75%	56%	60%	51%
5	72%	62%	70%	66%	56%	56%	63%	54%
6	64%	62%	70%	67%	75%	60%	65%	56%
7			70%	68%	56%	59%	65%	58%
8					69%	61%	65%	59%
9					67%	61%	68%	60%
10					80%	63%	69%	61%
Mature Capacity Factor	68% [2]		70% [2]		69% [3]			

Table 7: Comparison of DECo's Past and Current Projections of Fermi 2 Capacity Factors

Notes:
1. Last day of month assumed for calculation of averages.
2. Average of years 5 and 6.
3. Nineteen months of operation at 80%, with 3 months refueling.
4. Cycle average capacity factor used in each month.
5. The first-year capacity factor appears to include the pre-commercial period, and is therefore understated.

smoothed in this way.

The mature capacity factors vary by only a point or two from one set of projections to another, but the timing of maturity differs significantly. In U-5502, DECo projected that Fermi 2 would reach maturity in year 4: it now projects maturity only in year 10.[12] Similarly, the U-5502 projections show a 60% capacity factor in year 2, and 65% by year 3, while DECo's current expectations put these milestones back to years 4 and 6. Clearly, DECo was forecasting much better performance for Fermi 2 in the middle to late 1970's than it is now.

By the end of the 1970's, DECo had become more realistic. For example, DECo's original filing in response to PURPA section 133, dated July 1980, predicted a mature capacity factor of 67% - 68%, and a capacity factor of only 50% in the first full year. Similarly, the 3/19/80 report to the DECo Board on the Greenwood project assumes a "most likely" capacity factor of 63%, presumably as a levelized average. This greater realism may have been resulted from DECo's perception that Fermi was nearing commercial operation. By July 1980, DECo expected Fermi to be in service within 20

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12. It is more difficult to interpret the irregular projections from U-5108, but it appears that Fermi is assumed to be mature by year 5.

months, compared to 52 months in U-5108 and 41 months in U-5502.

Q: Which of these representations would you use in setting performance standards?

A: Based on the promises summarized in Table 7, and particularly those in U-5502, by which time DECo should have known better, fair targets for Fermi 2 capacity factors would be 50% in 1984, 60% in 1985, 65% in 1986, and 70% thereafter. Figure 1 compares this standard to three products of the GE dataset comparison: the raw data, DECo's projection, and my corrected Prudent Average projection. The point plotted for each month is the levelized[13] capacity factor through that month. The representations standard is much stricter than any of the comparative analyses, because DECo was promising too much.

Q: At the time that DECo presented the projections listed in Table 7, was enough data available to permit realistic estimates of nuclear power plant capacity factors?

A: Yes. The poor reliability of nuclear plants was evident by the mid-1970's, as can be seen in several ways. Figure 2 plots the average annual capacity factor for BWR's over the

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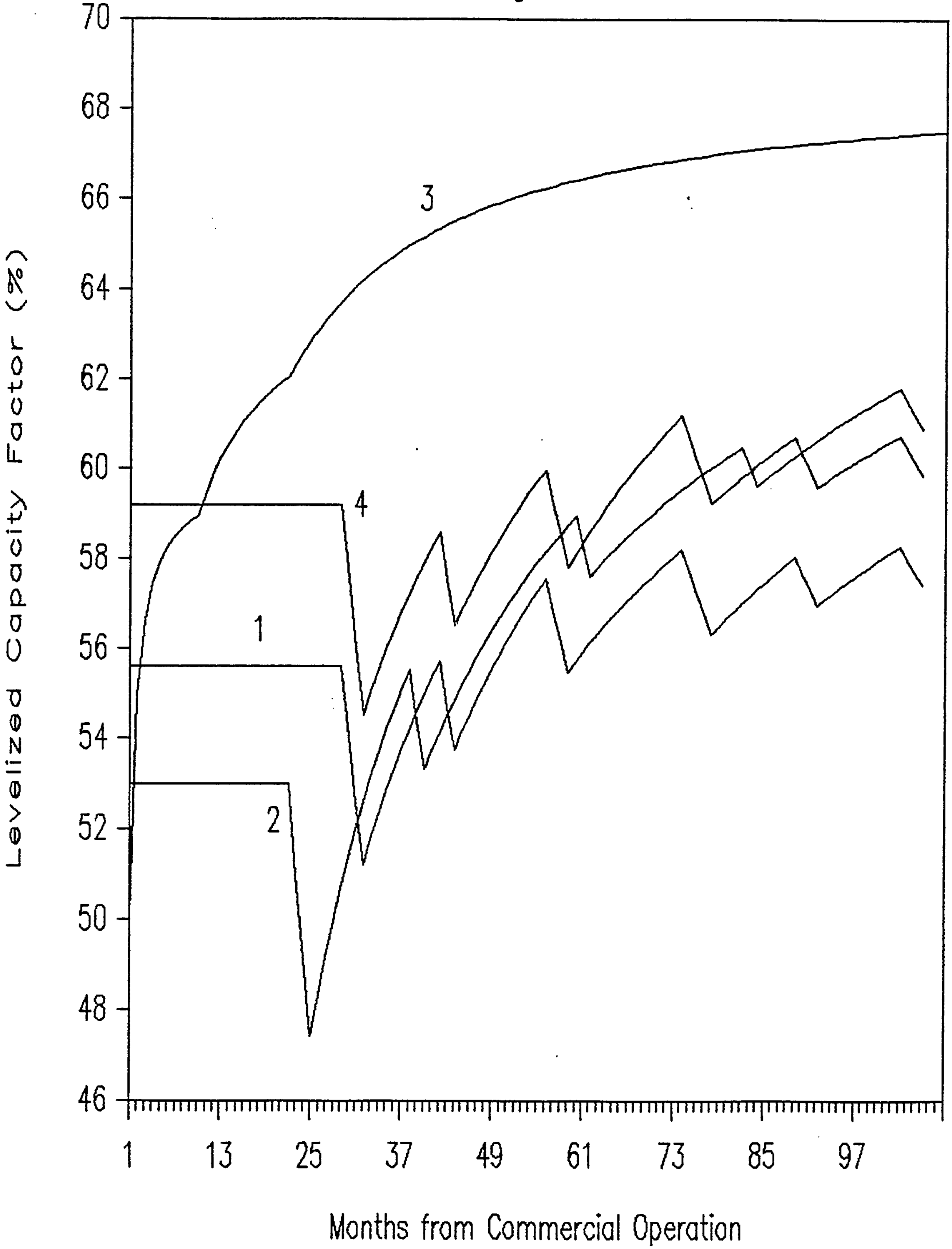
13. A discount rate of 15% is used for illustrative purposes.

Comparison of Capacity Factors

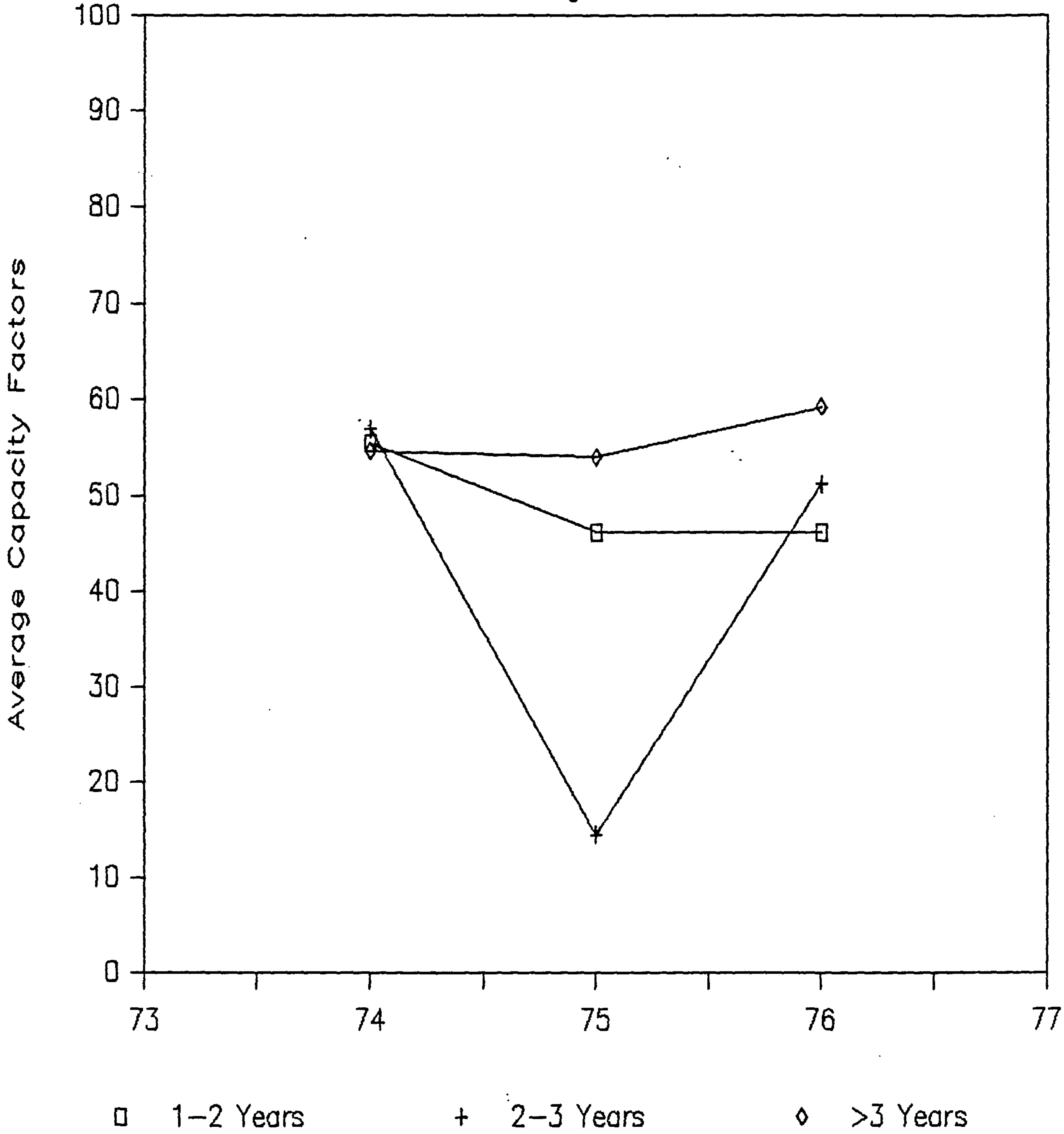
Figure 1



1: GE Data
2: DECO Proposal
3: U-5502 Projection
4: Prudent Experience

Average BWR Capacity Factors

Figure 2



1974-76 period for units between one and two years of age,[14] between two and three years, and over three years, corresponding to the point of maturity assumed in U-5502. Attention was initally focussed on the nuclear reliability problem by David D. Comey (1974). The first of a series of more detailed statistical analyses of nuclear capacity factors by Charles Komanoff was published by the Council on Economic Priorities in 1976 (Komanoff, 1976, 1977, 1978). The capacity factors predicted by these studies are listed in Table 8 alongside DECo's past and current expectations. Thus, independent analysts were able to discern that nuclear capacity factors were running well below DECo's expectation, as early as the mid-1970's. The reliability problems utilities were having with nuclear plants were also evident from the most cursory review of the raw data, as displayed in Figure 2.

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14. Age is measured from first electric generation, but the capacity factor is computed only for the period of commercial operation.

Study Author	Date	Levelized 10-year Capacity Factor
Comey	1974	38%to 54% [1]
Komanoff	1976	41% to 49% [2]
Komanoff	1977	38% to 49%
Komanoff	1978	43% to 46%

Table 8: Results of Nuclear Capacity Factor Analyses from the 1970's

Notes: 1. Comey values range from units over seven years (38%), to the average of all commercial experience (54%).

2. Komanoff values are for 1150 MW BWR's: a 1093 unit would have a capacity factor 1 - 2 points higher.

Cites: Comey, David Dinsmore, "Will Idle Capacity Kill Nuclear Power?", SCIENCE AND PUBLIC AFFAIRS, November 1974, and BULLETIN OF THE ATOMIC SCIENTISTS, October 1975.

Komanoff, Charles, "Power Plant Performance", November 30, 1976, Council on Economic Priorities publication S6-1.

Komanoff, Charles, "Power Plant Performance Update", May, 1977, Council on Economic Priorities publication R7-1.

Komanoff, Charles, "Power Plant Performance Update 2", June, 1978, Komanoff Energy Associates.

Q: How should the breakeven standard be set?

A: Quite simply, the capacity factor required for Fermi 2 to pay for itself, under current conditions, is

(annual cost)/[(fuel saving)*874*8760]

where

annual cost	= Fermi 2 non-fuel costs in base rates, in $'s
fuel saving	= average cost differential between nuclear fuel and displaced fossil fuel
874	= DECo's share of Fermi 2 capacity, in MW
8760	= hours/year.

The breakeven capacity factor is dependent on the Commission's rate treatment of Fermi 2 investment and expenses. In general, the breakeven capacity factors would be expected to decrease over the first few years of the unit's life, as fossil fuel prices rise and as depreciation decreases the unit's contribution to rate base.

Q: How would you recommend using these standards?

A: Slightly different approaches are appropriate for applying the two types of standards. It is to be expected that Fermi 2 will fail the breakeven standard for several of its early years. So long as this is the case, I would recommend that DECo be allowed to accrue interest on the difference between its actual power supply costs, due to actual Fermi 2 operation, and the fuel charges allowed under the breakeven target. If Fermi 2 eventually pays off, the actual costs will be less than those under the (gradually decreasing) breakeven standard, and DECo can collect its deferred fuel costs.

If, on the other hand, DECo determines at some point in the future that Fermi 2 is not likely to repay its initial investment, the company should ask the Commission for explicit ratemaking treatment, just as it would for any other large investment which must be written off. The breakeven standard for power plant performance avoids the usual unfortunate sequence of events, in which

1. the plant costs more than it is worth for the first few years of its life,

2. the utility projects better performance (or larger savings) later in the plant's life,

3. the regulators must decide whether to penalize the utility before finding out whether the projections are correct, and

4. by the time that the plant's lifetime economics become clear, it is likely to be saving money in current rates (although not necessarily enough to cover the initial

years of net losses), and the rational time for assessing a penalty has passed.

At best, conventional ratemaking in this situation substantially subsidizes future ratepayers at the expense of current ratepayers; at worst, it may penalize utilities for units that will eventually pay off, and fail to recognize that other units never do.

As the breakeven standard becomes less strict, the pre-operational representations standard becomes slightly more demanding. In the ordinary case, the breakeven standard would eventually become obsolete, and the applicable standard would then become the 70% mature capacity factor projection.

Q: If the Commission chooses to use a comparative standard for Fermi 2's capacity factor, what values should be used?

A: At least for 1984 and 1985, I would recommend the use of the Prudent Average 59.2% capacity factor derived _supra_.

Q: Does this conclude your testimony?

A: Yes.

Appendix A

Resume of Paul L. Chernick

PAUL L. CHERNICK

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PROFESSIONAL EXPERIENCE

Research Associate, Analysis and Inference, Inc.
May, 1981 - present (Consultant, 1980-1981)

Research, consulting and testimony in various aspects of utility and insurance regulation. Designed self-insurance pool for nuclear decommissioning; estimated probability and cost of insurable events, and rate levels; assessed alternative rate designs. Projected nuclear power plant construction, operation, and decommissioning costs.

Consulted on utility rate design issues including small power producer rates; retail natural gas rates; public agency electric rates; and comprehensive electric rate design for a regional power agency. Developed electricity cost allocations between customer classes.

Reviewed district heating system efficiency. Proposed power plant performance standards. Analyzed auto insurance profit requirements. Designed utility-financed, decentralized conservation program. Reviewed cost-effectiveness analyses for transmission lines.

Utility Rate Analyst, Massachusetts Attorney General
December, 1977 - May, 1981

Analyzed utility filings and prepared alternative proposals. Participated in rate negotiations, discovery, cross-examination, and briefing. Provided extensive expert testimony before various regulatory agencies.

Topics included: demand forecasting, rate design, marginal costs, time-of-use rates, reliability issues, power pool operations, nuclear power cost projections, power plant cost-benefit analysis, energy conservation and alternative energy development.

EDUCATION

S.M., Technology and Policy Program, Massachusetts Institute of Technology, February, 1978

S.B., Civil Engineering Department, Massachusetts Institute of Technology, June, 1974

HONORARY SOCIETIES

Chi Epsilon (Civil Engineering)
Tau Beta Pi (Engineering)
Sigma Xi (Research)

OTHER HONORS

Institute Award, Institute of Public Utilities, 1981

PUBLICATIONS

Fairley, W., Meyer, M., and Chernick, P., "Insurance Market Assessment of Technological Risks," presented at the Session on Monitoring for Risk Management, Annual meeting of the American Association for the Advancement of Science, Detroit, Michigan, May 27, 1983.

Chernick, P., "Revenue Stability Target Ratemaking," Public Utilities Fortnightly, February 17, 1983 ,pp. 35-39.

Chernick, P., and Meyer, M., "An Improved Methodology for Making Capacity/Energy Allocations for Generation and Transmission Plant," in Award Papers in Public Utility Economics and Regulation, Institute for Public Utilities, Michigan State University, 1982.

Chernick, P., Fairley, W., Meyer, M., and Scharff,L., Design, Costs and Acceptability of an Electric Utility Self-Insurance Pool for Assuring the Adequacy of Funds for Nuclear Power Plant Decommissioning Expense (NUREG/CR-2370), U.S. Nuclear Regulatory Commission, December, 1981.

Chernick, P., Optimal Pricing for Peak Loads and Joint Production: Theory and Applications to Diverse Conditions (Report 77-1), Technology and Policy Program, Massachusetts Institute of Technology, September, 1977.

EXPERT TESTIMONY

In each entry, the following information is presented in order: jurisdiction and docket number; title of case; client; date testimony filed; and subject matter covered. Abbreviations of jurisdictions include: MDPU (Massachusetts Department of Public Utilities); MEFSC (Massachusetts Energy Facilities Siting Council); PUC (Public Utilities Commission); and PSC (Public Service Commission).

1. MEFSC 78-12/MDPU 19494, Phase I; Boston Edison 1978 forecast; Mass. Attorney General; June 12, 1978.

   Appliance penetration projections, price elasticity, econometric commercial forecast, peak demand forecast. Joint testimony with S.C. Geller.

2. MEFSC 78-17; Northeast Utilities 1978 forecast; Mass. Attorney General; September 29, 1978.

   Specification of economic/demographic and industrial models, appliance efficiency, commercial model structure and estimation.

3. MEFSC 78-33; Eastern Utilities Associates 1978 forecast; Mass. Attorney General; November 27, 1978.

   Household size, appliance efficiency, appliance penetration, price elasticity, commercial forecast, industrial trending, peak demand forecast.

4. MDPU 19494, Phase II; Boston Edison Company Construction Program; Mass. Attorney General; April 1, 1979.

   Review of numerous aspects of the 1978 demand forecasts of nine New England electric utilities, constituting 92% of projected regional demand growth, and of the NEPOOL demand forecast. Joint testimony with S.C. Geller.

5. MDPU 19494, Phase II; Boston Edison Company Construction Program; Mass. Attorney General; April 1, 1979.

   Reliability, capacity planning, capability responsibility allocation, customer generation, co-generation rates, reserve margins, operating reserve allocation. Joint testimony with S. Finger.

6. Atomic Safety and Licensing Board, Nuclear Regulatory Commission 50-471; Pilgrim Unit 2, Boston Edison Company; Commonwealth of Massachusetts; June 29, 1979.

   Review of the Oak Ridge National Laboratory and the NEPOOL demand forecast models; cost-effectiveness of oil displacement; nuclear economics. Joint testimony with S.C. Geller.

7. MDPU 19845; Boston Edison Time-of-Use Rate Case; Mass. Attorney General; December 4, 1979.

   Critique of utility marginal cost study and proposed rates; principles of marginal cost principles, cost derivation, and rate design; options for reconciling costs and revenues. Joint testimony with S.C. Geller. Testimony eventually withdrawn due to delay in case.

8. MDPU 20055; Petition of Eastern Utilities Associates, New Bedford G. & E., and Fitchburg G. & E. to purchase additional shares of Seabrook Nuclear Plant; Mass. Attorney General; January 23, 1980.

   Review of demand forecasts of three utilities purchasing Seabrook shares, Seabrook power costs, including construction cost, completion date, capacity factor, O & M expenses, interim replacements, reserves and uncertainties; alternative energy sources, including conservation, cogeneration, rate reform, solar, wood and coal conversion.

9. MDPU 20248; Petition of Massachusetts Municipal Wholesale Electric Company to Purchase Additional Share of Seabrook Nuclear Plant; Mass. Attorney General; June 2, 1980.

   Nuclear power costs; update and extension of MDPU 20055 testimony.

10. MDPU 200; Massachusetts Electric Company Rate Case; Mass. Attorney General; June 16, 1980.

    Rate design; declining blocks, promotional rates, alternative energy, demand charges, demand ratchets; conservation: master metering, storage heating, efficiency standards, restricting resistance heating.

11. MEFSC 79-33; Eastern Utilities Associates 1979 Forecast; Mass. Attorney General; July 16, 1980.

    Customer projections, consistency issues, appliance efficiency, new appliance types, commercial specifications, industrial data manipulation and trending, sales and resale.

12. MDPU 243; Eastern Edison Company Rate Case; Mass. Attorney General; August 19, 1980.

    Rate design: declining blocks, promotional rates, alternative energy, master metering.

13. PUCT 3298; Gulf States Utilities Rate Case; East Texas Leg Services; August 25, 1980.

    Inter-class revenue allocations, including production plan in service, O & M, CWIP, nuclear fuel in progress, amortization of cancelled plant residential rate design; interruptible rates; off-peak rates. Joint testimony with M.B. Meyer.

14. MEFSC 79-1; Massachusetts Municipal Wholesale Electric Company Forecast; Mass. Attorney General; November 5, 1980

    Cost comparison methodology; nuclear cost estimates; cost conservation, cogeneration, and solar.

15. MDPU 472; Recovery of Residential Conservation Service Expenses; Mass. Attorney General; December 12, 1980.

    Conservation as an energy source; advantages of per-kwh allocation over per-customer month allocation.

16. MDPU 535; Regulations to Carry Out §210 of PURPA; Mass. Attorney General; January 26, 1981 and February 13, 1981.

    Filing requirements, certification, qualifying facility (Q status, extent of coverage, review of contracts; energy rates; capacity rates; extra benefits of QF's in specific areas; wheeling; standardization of fees and charges.

17. MEFSC 80-17; Northeast Utilities 1980 Forecast; Mass. Attorney General; March 12, 1981 (not presented).

    Specification process, employment, electric heating promotion and penetration, commercial sales model, industrial model specification, documentation of price forecast and wholesale forecast.

18. MDPU 558; Western Massachusetts Electric Company Rate Case Mass. Attorney General; May, 1981.

    Rate design; declining blocks, marginal cost, conservation impacts, promotional rates; conservation: terms and conditions limiting renewables, cogeneration, small power production; scope of current conservation program; efficie insulation levels; additional conservation opportunities.

19. MDPU 1048; Boston Edison Plant Performance Standards; Mass. Attorney General; May 7, 1982.

    Critique of company approach, data, and statistical analysis; description of comparative and absolute approaches to standard-setting; proposals for standards and reporting requirements.

20. District of Columbia PSC FC785; Potomac Electric Power Rate Case: DC People's Counsel; July 29, 1982.

    Inter-class revenue allocations, including generation, transmission, and distribution plant classification; fuel and O & M classification; distribution and service allocators. Marginal cost estimation, including losses.

21. New Hampshire PUC DE81-312; Public Service of New Hampshire - Supply and Demand; Conservation Law Foundation, et al., October 8, 1982.

    Conservation program design, ratemaking, and effectiveness. Cost of nuclear power, including construction cost and duration, capacity factor, O&M, replacements, insurance, and decommissioning.

22. Massachusetts Division of Insurance; Hearing to Fix and Establish 1983 Automobile Insurance Rates; Massachusetts Attorney General; October, 1982.

    Profit margin calculations, including methodology, interest rates, surplus flow, tax flows, tax rates, and risk premium.

23. Illinois Commerce Commission 82-0026; Commonwealth Edison Rate Case; Illinois Attorney General; October 15, 1982.

    Review of Cost-Benefit Analysis for nuclear plant. Nuclear cost parameters (construction cost, O & M, capital additions, useful life, capacity factor), risks, discount rates, evaluation techniques.

24. New Mexico Public Service Commission 1794; Public Service of New Mexico Application for Certification; New Mexico Attorney General; May 10, 1983.

    Review of Cost-Benefit Analysis for transmission line. Review of electricity price forecast, nuclear capacity factors, load forecast. Critique of company ratemaking proposals; development of alternative ratemaking.

25. Connecticut Public Utility Control Authority 830301; United Illuminating Rate Case; Connecticut Consumers Counsel; June 17, 1983.

    Cost of Seabrook nuclear power plants, including construction cost and duration, capacity factor, O & M, replacements, insurance, and decommissioning.

26. MDPU 1509; Boston Edison Plant Performance Standards; Massachusetts Attorney General; July 15, 1983.

    Critique of company approach and statistical analysis; regression model of nuclear capacity factor; proposals for standards and for standard-setting methodologies.

27. Massachusetts Division of Insurance; Hearing to Fix and Establish 1983 Automobile Insurance Rates; Massachusetts Attorney General; October, 1983.

    Profit margin calculations, including methodology, interest rates, surplus flow, tax rates, and recognition of risk.

28. Connecticut Public Utility Control Authority 83-07-15; Connecticut Light and Power Rate Case; Alloy Foundry; October 3, 1983.

    Industrial rate design. Marginal and embedded costs; classification of generation, transmission, and distribution expenses; relative importance of demand and energy charges.

29. MEFSC 83-24; New England Electric System Forecast of Electric Resources and Requirements; Massachusetts Attorney General; November 14, 1983, Rebuttal, February 2, 1984.

    Need for transmission line. Status of supply plan, especially Seabrook 2. Review of interconnection requirements. Analysis of cost-effectiveness for power transfer, line losses, generation assumptions.

30. Michigan PSC U-7775; Detroit Edison Fuel Cost Recovery Plan; Public Interest Research Group in Michigan; February 21, 1984.

    Review of proposed performance target for new nuclear power plant. Formulation of alternative proposals.