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STATE OF VERMONT
BEFORE THE PUBLIC SERVICE BOARD

IN RE: MILLSTONE 3: COSTS AND IN-SERVICE BOARD	Docket No. 4936

TESTIMONY OF PAUL CHERNICK
ON BEHALF OF THE
DEPARTMENT OF PUBLIC SERVICE

January 21, 1985

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1 - INTRODUCTION AND QUALIFICATIONS

Q: Mr. Chernick, would you state your name, occupation and business address?

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

Q: Mr. Chernick, would you please briefly summarize your professional education and experience?

A: I received a S.B. degree from the Massachusetts Institute of Technology in June, 1974 from the Civil Engineering Department, and a S.M. degree from the Massachusetts Institute of Technology in February, 1978 in Technology and Policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon, and the engineering honor society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi.

I was a Utility Analyst for the Massachusetts Attorney General for over three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and evaluation of power supply options. My work has considered, among other things, the need for new power supply investments, and the likely costs of those investments, particularly in nuclear power, and the availability and cost of alternatives to proposed supply sources.

In my current position, I have advised a variety of clients on utility matters. My resume is attached to this testimony as Appendix A.

Q: Mr. Chernick, have you testified previously in utility proceedings?

A: Yes. I have testified approximately thirty-five times on utility issues before such agencies as the Massachusetts Energy Facilities Siting Council, the Massachusetts Department of Public Utilities, the Maine Public Utilities Commission, the Texas Public Utilities Commission, the Illinois Commerce Commission, the New Mexico Public Service Commission, the District of Columbia Public Service Commission, the New Hampshire Public Utilities Commission, the Connecticut Department of Public Utility Control, the Michigan Public Service Commission, the Pennsylvania Public Utilities Commission, and the Atomic Safety and Licensing

Board of the U.S. Nuclear Regulatory Commission. A detailed list of my previous testimony is contained in my resume. Subjects I have testified on include cost allocation, rate design, long range energy and demand forecasts, costs of nuclear power, conservation costs and potential effectiveness, generation system reliability, fuel efficiency standards, and ratemaking for utility production investments and conservation programs.

Q: Do you have a track record of accurate predictions in capacity planning?

A: Several of my criticisms of utility projections have been confirmed by subsequent events or by the utilities themselves. In the late 1970's, I pointed out numerous errors in New England utility load forecasts, and predicted that growth rates would be lower than the utilities expected. Many of my criticisms have been incorporated in subsequent forecasts, and load growth has almost universally been lower than the utility forecast.

In DPU 19494 and NRC 50-471, I reviewed the NEPOOL forecast, both for the 1978 edition (which was the last version to be compiled as the sum of the utilities' own forecasts) and the 1979 edition (the first of the new end-use forecasts by state). I identified many overstatements and other errors in both versions. The 1978 version predicted a winter peak in

1983/84 of 19670 MW (compared to 15019 MW in 1977/78), and a ten-year growth rate of 4.5%; corresponding figures from the 1979 forecast were 19755 MW and 3.8% growth. Actual 1983/84 winter peak was 15949 MW, and the 1984 NEPOOL forecast predicts 2.0% annual growth in the long term. The history of NEPOOL load forecasts is presented in Figure 1.1.

My analyses of other utility forecasts, including Northeast Utilities, Boston Edison, Public Service of New Hampshire, Central Maine Power, and various smaller utilities, have been similarly confirmed by the low load growth over the past few years, and by repeated downward revisions in utility forecasts.

My projections of nuclear power costs have been somewhat more recent, but utility projections have already confirmed my analyses. For example, in the Pilgrim 2 construction permit proceeding (NRC 50-471), Boston Edison was projecting a cost of $1.895 billion. With techniques similar to those used in this testimony, I projected a cost between $3.40 and $4.93 billion in my testimony of June, 1979. Boston Edison's final cost estimate (issued when Pilgrim 2 was canceled in September 1981) stood at $4.0 billion. Figure 1.2 compares my Pilgrim 2 estimates to those of BECo.

In MDPU 20055, PSNH projected in-service dates for Seabrook

of about 4/83 and 2/85, at a total cost of $2.8 billion. My testimony of January, 1980 predicted in-service dates of 10/85 and 10/87, with a cost around $5.3-$5.8 billion on PSNH's schedule or $7.8 billion on a more realistic schedule. At the time I filed my testimony in NHPUC DE 81-312 (October 1982), PSNH was projecting in-service dates of 2/84 and 5/86, with a total cost of $3.6 billion, while I projected dates of about 3/86 and 6/89, and a cost of about $9.6 billion. Within two months of my filing, PSNH had revised its estimates to values of 12/84, 7/87, and $5.2 billion. In June 1983, I updated my analysis for CPUCA 83-03-01, and estimated a total cost of $10.3 billion, with COD's of 11/86 and 3/91.[1] On March 1, 1984, PSNH released a new cost estimate of $9 billion, with in-service dates of 7/86 and 12/90. Thus, PSNH's estimates of Seabrook in-service dates and costs have increased by a factor of more than three since the filing of DPU 20055, and are now relatively close to my projections. Figure 1.3 compares the history of PSNH cost estimates for Seabrook to my estimates.

In MDPU 84-25, Northeast Utilities (NU) projected a total cost for Millstone 3 of $3.54 billion. In my testimony dated April 9, 1984, I estimated that the final cost of the unit

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1. Those results were averages, which included methodologies which I knew to be biased on the low side. The methods used in this testimony produced COD estimates of 10/87 and 6/94.

would be between $4.5 and $5.5 billion. In the Spring of 1984, NU acknowledged that the cost of the plant would be higher than its previous estimate. While no comprehensive re-estimation has been performed, NU now expects the plant to cost $3.75 to $3.90 billion, with the in-service date still projected at May of 1986.[2] Within six months of my testimony (or less than one quarter of NU's projected remaining construction time for Millstone 3), the cost estimate has risen by 37.5% of the difference between NU's earlier estimate and the lower end of my range, and by 18.4% of the difference with my higher value.

Critiquing and improving on utility load forecasts and nuclear power cost projections has not been very difficult over the last few years. Many other analysts have also noticed that various of these utility projections were inconsistent with reality.

Q: What is the subject of your testimony?

A: I have been asked to review the cost estimate and scheduled commercial operation date (COD) for Millstone Unit 3, as prepared by the lead owner of that unit, Northeast Utilities (NU).

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2. I will treat this limited revision as a $3.9 billion partial estimate in June 1984; it is possible that the revision was not completed until September.

Q: How is your testimony structured?

A: Section 2 presents my analysis of the schedule for Millstone 3, and my projection of its likely in-service date. Section 3 presents a similar analysis of the cost estimate for Millstone 3, and recommends a range of costs to be used in generation planning.

2 - MILLSTONE 3 CONSTRUCTION DURATION

Q: Are there any special problems in determining whether NU's current in-service date estimate for Millstone 3 is reasonable?

A: Yes. I have generally assessed the reasonableness of nuclear construction schedules by examining the actual construction durations and the schedule estimation records of the individual utility, the architect-engineer, and/or the nuclear industry as a whole. This is more difficult for Millstone 3, for three reasons, all related to NU's decision in 1977 to reschedule the unit's in-service date to 1986. First, there is very little history of Millstone 3 schedule estimates, since NU has not attempted to project the earliest date at which Millstone 3 could be completed, which is the normal utility practice. Instead, NU has determined some years ago that it wants to complete Millstone 3 by May 1986, and has not yet found (or acknowledged) that goal to be unattainable. Secondly, the fact that NU's schedule projections are different in kind and purpose than those of other utilities[3] makes extrapolation from other plants'

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3. The Millstone 3 schedule projections are also not readily comparable even to those of NU for Millstone 2, for the same reasons.

experience rather more complicated. The relationship between NU's schedule for Millstone 3 and conventional utility nuclear schedules must be established before the industry data can be applied to Millstone 3. Finally, since Millstone 3 can not be expected to be quite like other units which started construction at the same time, nor quite like other units which are completed at the same time, the straightforward comparisons offered by techniques such as regression analysis are less applicable than they are for more conventionally scheduled units.

Q: Are there specific reasons to believe that Millstone 3 will reach commercial operation somewhat after the date projected by NU?

A: Yes. Those reasons include:

1. NU'S allowance for the interval between operating license issuance (OLIS) or fuel load (FLD) and commercial operation date (COD) is much shorter than recent experience.

2. NU's construction duration projection is now quite similar to those of other nuclear plants at similar stages of construction, and actual nuclear construction durations have almost always exceeded projections by substantial amounts.

Q: What is the recent experience for the start-up interval from OLIS to COD?

A: Table 2.1 provides this data for all units in commercial operation which have received operating licenses since the beginning of 1978.[4] The shortest start-up period, 4.1 months, was that of St. Lucie 2. The corresponding intervals for the other units range from 8.1 months, to over 20 months, with a 17-plant average of 13.4 months. In addition, Diablo Canyon 1, which has been listed as 99% or more complete since at least late 1977, received a low power operating license in September, 1981, only to have it suspended two months later, and restored only in April, 1984. Its full power license is currently held up in the courts. Diablo Canyon 1 will increase the average start-up period when it finally reaches commercial operation, if the earlier license date is used. Three other units received operating licenses before June 1984, but have not yet reached commercial operation: Grand Gulf 1 received a low power license on 6/16/82, and a full power license on 7/31/84; La Salle 2 received a low power license on 12/16/83, and a full power license on 3/23/84; and Susquehanna 2 received a low power license on 3/19/84, and a full power license on 6/27/84. Grand Gulf will certainly

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4. This analysis is complicated somewhat by the apparent use of two commercial operation dates (COD's) for some units, such as San Onofre and La Salle: one date is used for ratemaking and another for other purposes. I have used the COD reported to the NRC.

increase the average startup when it enters service. The effect of the other units on the average start-up period can not yet be determined, but all are more than nine months from their first license. Other units received low power licenses in 1984: Callaway in June, Catawba in July, Limerick 1 and Byron 1 in October, and Waterford and Palo Verde 1 in December.

Q: What is NU's projection for the Millstone 3 start-up period?

A: NU currently projects a start-up period of six months for Millstone 3 from fuel load to commercial operation.[5] This projection is considerably more optimistic than would be suggested by the historical experience. If NU's projections of construction progress and fuel load date were correct, but the start-up period were the average 13 month duration from Table 2.1, Millstone 3 would enter commercial operation in December, 1986.

Q: What are the construction duration projections for other nuclear power plants, and how do they compare to those for Millstone 3?

A: Table 2.2 lists the reported percent complete and the scheduled in-service date for each nuclear unit which was

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5. The plants in Table 2.1 generally loaded fuel within days of licensing. NU projects an operating license two or three months before fuel load.

within 10 percentage points of the reported percent complete for Millstone 3 as of June 30, 1984. On average, these eleven units were 88.7% complete and were projected to reach commercial operation in June 1986. At its reported construction pace over the last reported year,[6] the percentage completion for Millstone 3 was about two months behind the average: a typical utility estimate for an 86% complete plant would thus predict an August 1986 COD. Table 2.2 also notes changes in the status of this cohort to the present time, which would increase the average estimated COD. Since Wolf Creek still has no license, even its revised date is extremely optimistic.

Q: Was NU more or less optimistic than the industry as a whole, as of the time of the last official cost estimate for Millstone 3?

A: Oddly enough, the answer to that question is critically dependent on how the completion percentage for Millstone 3 as of August 1982 is estimated. Table 2.3 repeats the previous comparison for June 1982, the date of the last Nuclear News survey prior to the Millstone 3 cost forecast: all units within 15 points of the 45% completion reported for Millstone 3 are included. The fifteen units in Table 2.3 which had scheduled completion dates were reported to be an average of

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6. NU reports progress from 77.7% complete in September 1983, to 89.6% complete by September 1984, or about 1% per month.

45% complete, and were projected to be in service in October 1986, five months later than the Millstone 3 schedule.[7] It therefore appears that a standard industry projection in mid-1982 would have anticipated an in-service date of October 1986 for a 45% complete unit, such as Millstone 3 was said to be. The 45% figure appears to be representative of NU's contemporaneous estimate of Millstone 3 progress, since NU also reported to DOE that Millstone 3 was 47.9% complete on September 30, 1982.

At some point after the 1982 cost estimate, NU radically revised its estimated of Millstone 3 completion, and reported 60.3% progress by the end of the year. Extrapolating subsequent reported progress back to June 1982,[8] it is reasonable to infer that NU's new approach (whatever that is) would have estimated that Millstone 3 was about 50% complete at the time of the survey. Table 2.4 presents a comparison of the cohort ranging from 35% to 65% complete in June 1982. This comparison indicates that, by NU's new definition of progress, the Millstone 3 commercial operation date projection was still somewhat more optimistic than industry

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7. In addition, three TVA units in the comparison group were on indefinite status.

8. 1.8% monthly progress was reported for 12/82 to 12/83.

projections.[9]

Q: How would you summarize this comparison of the Millstone 3 projected commercial operation date to those of other units?

A: On the whole, a slightly generous interpretation would conclude that NU's estimate of the Millstone 3 COD has been essentially identical to the industry consensus for units at the same reported stage of construction. A more critical view would find that NU was more optimistic than the industry consensus as of the date of its last estimate, and that it still is. On the whole, it appears that the extrapolation of industry construction duration experience to Millstone 3 is more likely to err on the optimistic side than on the pessimistic side.

Q: Have the construction duration estimates of the nuclear industry as a whole generally been accurate?

A: No. The U.S. nuclear industry has been universally over-confident in its construction schedule projections. Appendix B presents the estimated and actual construction durations for all the units which have reached commercial operation and for which I have been able to obtain one or more estimates of the in-service date made when the plant was believed to be one to five years from COD. A total of 641

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9. The two indefinite units were again excluded from the analysis.

estimates for at least one year in the future were available for 72 of the 77 domestic light-water reactors which have reached commercial operation,[10] based on DOE compilations of a series of utility reports to the AEC, ERDA, and now the EIA of the DOE. These are versions of the "Quarterly Progress Report on Status of Reactor Construction," identified as Form HQ-254, and later as Form EIA-254. Some supplementary data was taken from compilations of these quarterly utility reports (AEC, various; ERDA, various), and from other reports by various utilities for their own units.[11]

It is important to remember that this data excludes all of the units which have been cancelled (including such disasters as WPPSS 4 and 5, Zimmer, Midland, and Marble Hill), as well as the units which are still under construction (including such troubled projects as Diablo Canyon, Shoreham, Grand Gulf, Nine Mile Point 2, and Seabrook). As a result, the average duration ratios reported are the average for completed plants, which is a smaller ratio than the average

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10. I excluded all units under 300 MW (most of which were very early, in any case). I also excluded San Onofre 1 and Connecticut Yankee (for lack of data), and the three units which went commercial in 1984 and have not yet been transfered to my completed plant data set (McGuire 2, San Onofre 3, and WPPSS 2).

11. The quarterly reports were voluntary, and were not filed under the legal sanctions which apply to utility reports to the FERC or to the SEC, for example. Thus, not all utilities filed these reports for all periods of time during which plants were under construction, and errors or inconsistencies in reporting may have occurred in some of these documents.

for all plants. This is particularly true for the longer duration ranges: for the 4-5 year estimates made in the mid-1970's, for example, units with poor schedule performance have been cancelled or are still under construction, while the most successful units have been completed and have thus been entered in my data base. Table 2.5 summarizes the results of that analysis.

For the typical estimate in the three-to-four year range (comparable to the 8/82 estimate for Millstone 3), the actual construction duration was almost twice the projected remaining duration. Even interpolating with the more favorable data for estimates in the 4-5 year range produces a ratio of 1.90, which would yield COD projections only a couple months earlier than would the results from the 3-4 year data.

As of the August 1982 estimate, Millstone 3 was anticipated to be 45 months from COD. As discussed above, this was quite close to the standard industry projection for a unit at Millstone 3's stage of completion. Multiplying this interval by the duration ratio for the three-to-four year range yields a prediction of commercial operation 88 months from August 1982, or in December 1989. Using the interpolated ratio of 1.90 yields a prediction of 86 months, or October 1989.

This analysis assumes that the comparison group of utilities is just as over-optimistic as the historical group from which the duration ratio was estimated. It is possible that other utilities are generally more realistic now than they were in the 1960's and 1970's, and hence that NU's estimate is still better than the historical average.

Q: Why did you not use the NU estimate of June 1984, rather than the estimate from August 1982?

A: The 1984 revision was not really a new cost estimate. Rather than developing a new estimate, NU simply adjusted the 1982 estimate to recognize some specific cost overruns. This appears to be a fairly unusual procedure in the nuclear industry.

Q: Do you have any evidence that the limited re-estimation procedure, used by NU in 1984 to modify an existing estimate, produces substantially different results than a new estimate would produce?

A: Yes. Following the November 1982 estimate in which the Seabrook estimate increased 47%, from $3.56 billion to $5.25 billion, PSNH and the Joint Owners of that plant instituted an unusually detailed cost-tracking program, which produced monthly reports on the status of the plant and on the validity of its cost estimate. As of December 1983, this process had detected $50 million in known cost overruns,

another $150 million in potential cost overruns, and only 7 months slippage in the critical path for Unit 1, from its COD estimate of 12/84. A re-estimate by the A/E, United Engineers and Constructors (UE&C), in January 1984, predicted a total cost of $10.1 billion, with a Unit 1 COD of 4/87: PSNH released an estimate of $9 billion, with a Unit 1 COD of 7/86, on March 1, 1984. At least for Seabrook, the "living" cost estimates were totally unsuccessful in anticipating the majority of future cost increases. If the continuous re-estimation process failed for Seabrook, it is hard to see why a single limited re-estimate would work for Millstone 3.

Q: Can you repeat your duration calculation as if the 1984 cost figure were a real estimate?

A: I can do the calculations, even though there is ample reason to believe that a full estimate in June 1984 would have produced a different result than NU's 1984 projection. From June 1984, the estimated COD for Millstone 3 lay 23 months in the future. Multiplying 23 months by the historical average duration ratio for 1-1.99 years, which is 2.05, produces a corrected duration of 47 months from June 1984, or May 1988.

Q: Can we repeat any of these calculations for NU-specific data?

A: Yes. NU's last nuclear unit was Millstone 2, which received its construction permit in December 1970, and which entered

commercial operation in December 1975. Table 2.6 presents the cost and schedule estimate history of Millstone 2. NU's experience with that unit was somewhat better than that of the industry as a whole. The only HQ-254 estimate for Millstone 2 between 3 and 4 years was the December 1970 estimate, for which the duration ratio was 1.50. If the August 1982 estimate for Millstone 3 is just off by that much, it would enter service in March 1988.

Interestingly, NU stuck by the same COD estimate for Millstone 2 for over five years, and did not revise that estimate until the plant was only a little more than a year from the original COD. The estimate then slipped over twenty months. If NU follows the same pattern with Millstone 3, the scheduled COD will start to slip this spring, and the unit will enter service in January 1988.[12]

Q: Is there any other nuclear schedule data specific to NU?

A: Yes, although it is old and incomplete. Table 2.7 provides the cost estimate histories of Connecticut Yankee and Millstone 1. The NU estimates are rather vague, and Millstone 1 was a turnkey unit. The duration ratios for Millstone 1 are as bad or worse than those for Millstone 2, and the schedule history shows the same tendency to maintain

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12. Given the historical preference of utilities for December COD's, December 1987 is more likely.

an original schedule until about a year from the scheduled COD, followed by large slippage.

Q: Was Stone & Webster the A/E for any of the units in Appendix B?

A: Yes. Table 2.8 lists the completed units for which Stone & Webster (S&W) was the A/E.[13] The Table also lists the average duration ratio for the estimates made for each unit when it was projected to be 3 to 4 years from COD, and when it was projected to be 1 to 2 years from COD. It would appear that S&W's experience at projecting nuclear construction durations was better than average in the 3 - 4 year range (at 1.66 rather than 2.05), and essentially the same as the industry average in the 1 - 2 year range (at 1.93 rather than 1.97).[14] Since Maine Yankee was declared commercial at 75% of full power (which is not usually considered to represent commercial operation), its duration ratio is somewhat understated compared to standard practice. Applying the duration ratios for the 3 - 4 year range would suggest COD estimates of 11/88 based on the six units with estimates in Table 2.8, or 3/89 if Maine Yankee is excluded.

Q: Is S&W the A/E for any other nuclear plants?

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13. S&W was also the A/E for Connecticut Yankee.

14. S&W experience in projecting costs, on the other hand, is very similar to industry experience.

A: Yes. Table 2.9 lists the plants which are still under construction for which S&W is the A/E, along with the unit's estimated COD in December 1977, the unit's current COD estimate, and the slippage to date (the ratio of the duration estimated in 1977 to the duration currently estimated, less one). Of the five units listed in Table 2.9, all but Millstone were scheduled to be in service by the end of 1983. None of these units are yet on line, and their cost estimates have doubled, tripled, or even quadrupled. Table 2.10 lists the S&W units which were planned in 1977, and have since been cancelled, along with their date of cancelation, permit status, and percent complete at the time of cancelation.

Q: What dates are realistic for commercial operation at Millstone 3?

A: Table 2.11 summarizes my previous calculations. Over all, if the historic industry trends continued, Millstone 3 might enter commercial operation late in 1989. The limited experience of NU and S&W has been somewhat better than industry averages; if that experience can be repeated, Millstone 3 might enter service in the first half of 1988. A quite optimistic projection would put Millstone's COD at the end of 1987, earlier than any of the historical results would suggest. I will use December 1987 as an optimistic COD projection, in deriving cost estimates. This date is better

than the best case which can be supported by the historical record, and basically assumes that NU will improve on the past performance of NU, S&W, and the industry as a whole. Utility planning should allow for an additional overrun of a year or so.

3 - MILLSTONE 3 CAPITAL COSTS

Q: Do NU's estimates of Millstone 3 capital costs properly incorporate historical experience?

A: No. As I noted in connection with schedule estimates, NU's unusual estimation procedures and construction schedule complicate the projection of Millstone 3's cost. However, there is evidence which indicates that NU is still being optimistic in its projection of Millstone 3's final cost. This evidence includes the historical tendency of architect/engineers (A/E's) and utilities to underestimate nuclear construction costs, and the continuing increases in cost estimates for nuclear plants under construction.[15]

Q: How does the past record of A/E cost estimates indicate that the capital cost projections for Millstone 3 are apt to be low?

A: In a report prepared by Analysis and Inference for the NRC (Chernick, et al., 1981), we calculated the ratio of actual to forecast costs for several nuclear power plants, and derived four regression equations estimating the relationship

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15. For these two analyses, we have data specific to NU, and even to Millstone 3.

between real cost overruns and the length of time into the future for which the forecast is being made. We defined this relationship as myopia: a failure to forecast future cost increases.[16]

I have recently completed an analysis of both nominal and real cost myopia using the most intuitively appealing[17] of the equations developed in the NRC report, and a much larger data base. The equation is

$$R = (1 + m)^t$$

where R is the ratio of actual to expected costs in nominal or real dollars, depending on the analysis, m is the calculated myopia factor, and t is the expected years to completion at the time of the estimate. A total of 589 estimates for more than one year in the future were available for the non-turnkey units which have reached commercial operation.[18] Appendix B provides the data for estimates for

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16. This particular modelling technique was an original development, but it is similar to approaches taken by Blake, et al., 1976, and by Merrow, et al., 1981.

17. The cost ratio equals 1.0 for t = 0, and the error rate increases with the remoteness of expected operation.

18. The turnkey units are excluded from the analysis, since their reported costs are understated. I do not yet have the final costs of McGuire 2, San Onofre 3, nor WPPSS 2, all of which entered service in 1984. I also do not have cost estimates for Connecticut Yankee or San Onofre 1, because the data was not available.

more than a year into the future, along with the nominal cost overrun and the value of **m** (the myopia factor) for each estimate.

Table 3.1 presents the nominal cost overrun and myopia factor for each of several ranges of projected duration, or **t**. As noted above, NU's value of **t** is consistent with the industry consensus, given the reported state of completion for Millstone 3.

The average estimate in the 3 - 3.99 year range had an actual-to-forecast nominal cost ratio of 2.39, and a myopia factor of 27%. Evaluating that myopia factor for the 3.75 year duration projected in August 1984 for Millstone 3, would result in a cost ratio of 2.45.[19] Multiplying NU's forecast cost of $3.54 billion by 2.39 yields a corrected estimate of $8.46 billion; using the specific cost ratio derived from the projected duration and the average myopia factor (2.45) produces a corrected estimate of $8.67 billion.

The average cost ratio in the 1 - 1.99 year range was 1.39, and the average myopia factor was 25%, which for the 23-month duration of the 6/84 projection predicts a cost ratio of 1.53. Multiplying these cost ratios by the $3.9 billion cost

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19. $(1.27)^{3.75}$.

figure produces corrected estimates in the range of $5.4 - 6.0 billion. The 1984 projection duration was almost two years, so it would probably be appropriate to include some of the data from 2 - 2.99 years in the myopia analysis. Since the myopia factor for that interval was 32%, this refinement would increase the corrected estimate.

Q: What were the results of your myopia analysis in real dollars?

A: Appendix B deflates the estimated and actual nominal costs by the GNP deflator, and calculates the cost overruns and myopia in real terms. Thus, the effects of actual general inflation between the estimated and actual inservice dates are eliminated from the computation. As demonstrated in Chernick, et al. (1981), projections of actual inflation rates have not been very far off for most of the time period of interest; in any case, inflation projections are not available for most of the nuclear cost estimates. The average value of the real cost overrun and the real myopia factor for each group of cost forecasts are reproduced in Table 3.2. For the Millstone 3 estimate of August 1982, the estimated time to completion was again 3.75 years, so the relevant results are those for t between 3 and 4 years, for which the average real cost ratio was 1.84. Stated alternatively, the cost overrun was 84%. The average real myopia for those estimates was 18%; raised to the 3.75 power,

this myopia factor predicts a cost overrun of 85%. Applying these cost overruns to the estimate of $3.54 billion produces an adjusted estimate in the range of $6.5 to $6.6 billion in May 1986. Adding 6% inflation to an in-service date of December 1987 raises the cost to $7.1 to $7.2 billion for the unit.

Repeating this analysis for the June 1984 partial estimate of $3.9 billion, using the average real cost ratio of 1.25 and the real myopia factor of 16% for the 1 - 1.99 year range (for a cost ratio of $1.16^{1.92} = 1.33$), produces corrected estimates in May 1986 dollars of about $4.9 - 5.2 billion. With 1.58 years of inflation, this would be about $5.3 - 5.7 billion in December 1987.

Q: What would the results of these myopia analyses be, based on the experience of Millstone 2?

A: Table 2.6 lists the nominal and real cost ratios and myopia factors for Millstone 2 estimates. Table 3.3 presents the results of applying this experience to Millstone 3. The corrected cost estimate falls in the $5.3 - 6.6 billion range; the lower end would be $5.8 billion on a realistic schedule.

Q: Have these myopia techniques been successfully applied previously?

A: Yes. In MDPU 20055, in 1980, PSNH was projecting that Seabrook would cost $2.8 billion; based on a very limited data set, my myopia analysis predicted a cost of $5.9-11.5 billion. In CPUCA 83-03-01, PSNH was predicting a cost of $5.2 billion; myopia analysis corrected this to $10.5-11.3 billion. Since the last known UE&C estimate for a two-unit Seabrook plant was for $10.1 billion, it is clear that myopia analysis has been more successful than conventional estimation techniques in predicting the cost of Seabrook, and has allowed me to predict each cost increase at least a year or two before PSNH did.

Myopia analysis was also the basis for my predicting in 1979 that the cost of Pilgrim 2, then estimated by Boston Edison at $1.895 billion, would increase to $3.8-4.9 billion. In September 1981, Boston Edison canceled the unit, and announced a cost estimate of $4 billion.

In October 1982, Commonwealth Edison was predicting that the Braidwood plant would cost $2.74 billion. Myopia analysis (in my testimony in ICC 82-0026) suggested that it would cost $4.78 to $5.25 billion, plus inflation during any delay in the units' startup dates. The final results are not yet in, since the first unit is scheduled for commercial operation in 10/86, with the second unit following in 12/87, but the utility's cost estimate for Braidwood now stands at $4.11

billion, including a delay of 12-14 months.

Q: Have you performed a similar analysis for Millstone 3's cost history?

A: Yes. Table 3.4 derives the annual percentage rate of increase in the Millstone 3 cost estimate from various starting points to the 8/82 estimate. The annual rate of escalation of NU's estimate has stabilized appreciably since the large cost increase which accompanied the delay of Millstone 3 to 1986. The more recent time periods display average cost trends of around 15%, while the average annual percentage increase in the Millstone 3 cost estimate from 1/75 to 7/78 was 30%.

Given a COD, and assuming the continuation of a historic rate of escalation in the cost estimate, we can calculate the value of the cost estimate at the time Millstone 3 enters service. For NU's COD estimate of May 1986, 3.75 years of escalation must be added: at 15% annually, this would increase the final cost by about 69%, to around $6.0 billion. Using the best estimate of the COD derived above (12/87), we must add 1.58 more years of cost estimate revisions, or an additional 25%. This translates to a plant cost estimate of $7.5 billion (or $6500/kw) when the unit goes commercial.

Q: Is there any reason to believe that the most recent full NU

cost estimate is any more reliable than NU's previous cost estimates, or than utility cost estimates in general?

A: Unfortunately, the formal treatment of contingency is still quite minimal: only about a 3% contingency is provided, despite a historical record which indicates that estimates four years into the future should include a contingency on the order of 100%. Nonetheless, there is some cause for hope that the estimate may be a little more conservative than usual. The reasons for optimism include:

- NU claims to use a "no exclusions" approach to cost estimating, which is said to increase the latest estimate by $100 million compared to standard practice,
- NU further asserts that S&W "utilized a more detailed analytical technique when developing the allowance for indeterminates", which increased the estimate $130 million, and
- the inflation rate of 10% is almost certain to be excessive, and may result in the estimate being overstated (compared to normal utility practice) by as much as $150 million.[20]

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20. This effect is estimated at two years (half the remaining construction period) of inflation at a 5% differential (the 10% assumed, minus perhaps 5% actual), times the $1.5 billion in direct costs remaining to be spent.

Since NU indicates that the first item would have been covered by contingency in normal practice, and since contingency has indeed been decreased by $125 million since the previous estimate, this probably does not represent any unusual conservatism on the part of NU, but I will include it to establish a highly optimistic cost trend. With these adjustments, the standard-practice version of the 8/82 estimate would be $3160 million. That would represent a 21.5% increase over the previous estimate, or 9.8% annually. If costs continue to increase at this rate to 5/86, Millstone 3 would come in at about $4.5 billion. Continuing this rate of increase to 12/87 would result in a final cost of $5.2 billion.

Q: How would these projections change if the June 1984 cost revision were treated as a full official estimate?

A: Table 3.5 repeats the analysis of Table 3.4, ending with the June 1984 projection. The average cost growth rate since 1978 has been 11.9%. If this continues to 5/86, the plant will cost $4.8 billion. Continuing this trend to 12/87 would produce a total cost of $5.8 billion.

Q: Has the Stone & Webster cost estimate experience been better than the industry as a whole?

A: No. S&W cost estimate experience has been very close tot he industry average, as shown in Table 2.8. Table 3.3

extrapolates these results to Millstone 3.

Q: Has the rate of NRC regulatory changes decreased since the August 1982 estimate?

A: Table 3.6 lists the total number of NRC (or AEC) regulatory documents for 1970 to 1983. This list includes generic letters, I&E documents, and regulatory guides.

The annual document production rate was lower in 1981-83 then in 1979-80, but there is no downward trend, and the rate remains well above the pre-TMI level.

Q: Were the 1970-81 regulations primarily responsible for the 1982 cost estimate increase?

A: According to NU, many earlier regulations were instrumental in the increase, including regulations issued long before the 1980 estimate. Some of the effects were attributed to regulatory changes in the early 1970's. Table 3.6 computes the ratio of the documents from each year which NU cited in the 1982 estimate, to the total NRC documents in the same year. The regulations most likely to affect the cost estimate were 3-8 years old. If the same lag occurred for a complete re-estimate in 1984, that estimate would reflect considerably more regulatory change than did the 1982 estimate, as shown in Table 3.6. About 37 regulatory actions would be expected to affect the 1984 estimate, as compared to

24 regulation in 1982. Thus, it appears that a 1984 estimate which incorporated scope changes would produce a significantly higher estimate than did NU's partial re-estimation.

Q: Is it appropriate to use data which includes the regulatory affects of the accidents at Browns Ferry and Three Mile Island in projecting nuclear construction cost overruns?

A: I believe that it is for three reasons. First, another major nuclear accident or near-miss may well occur before Millstone 3 enters commercial operation. Various recent estimates of major accident probabilities range from 1/200 to 1/1000- per reactor year (See Chernick, et al., 1981; Miniarick and Kukielka, 1982). Since the implicit probability assessments of insurers agree with the engineering models of actual 1970's performance, the weight (and perhaps the entirety) of the evidence supports the conculsions that additional major accidents must be expected. Thus, major accidents can be expected every three to thirteen years with 75 operating reactors, and every two to ten years once 100 reactors are operating. Second, as illustrated in Table 3.6, the regulatory effects of the TMI accident are likely to further increase the cost of Millstone 3. Third, the pattern of revisions in nuclear cost estimates pre-dates the Brown's Ferry fire, and already has continued well past the TMI accident; from the construction cost perspective, these

events are simply special cases of a general trend.

Q: What Millstone 3 construction cost estimates do you find most reasonable?

A: Table 3.7 displays the results of the various methodologies I used. The estimates of total plant cost range from about $4.5 to $8.7 billion. If we could correct for past errors in inflation projections, the top end of the range would probably be more like $7.5 billion. I would recommend the use of $5.5 billion (or $4800/kw) as a mid-range value in subsequent analyses. Financial planning should include preparation for costs up to at least $7 billion. Perhaps NU can actually bring the unit in near $4.0 billion, in which case it will certainly be considered one of the more successful nuclear-constructing utilities,[21] but I strongly doubt that the cost can be held below $4.5 billion, which I would use as a low-end projection.

Q: Does this conclude your testimony?

A: Yes.

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21. At least in terms of constraining cost overruns in the last four years of construction.

4 - BIBLIOGRAPHY

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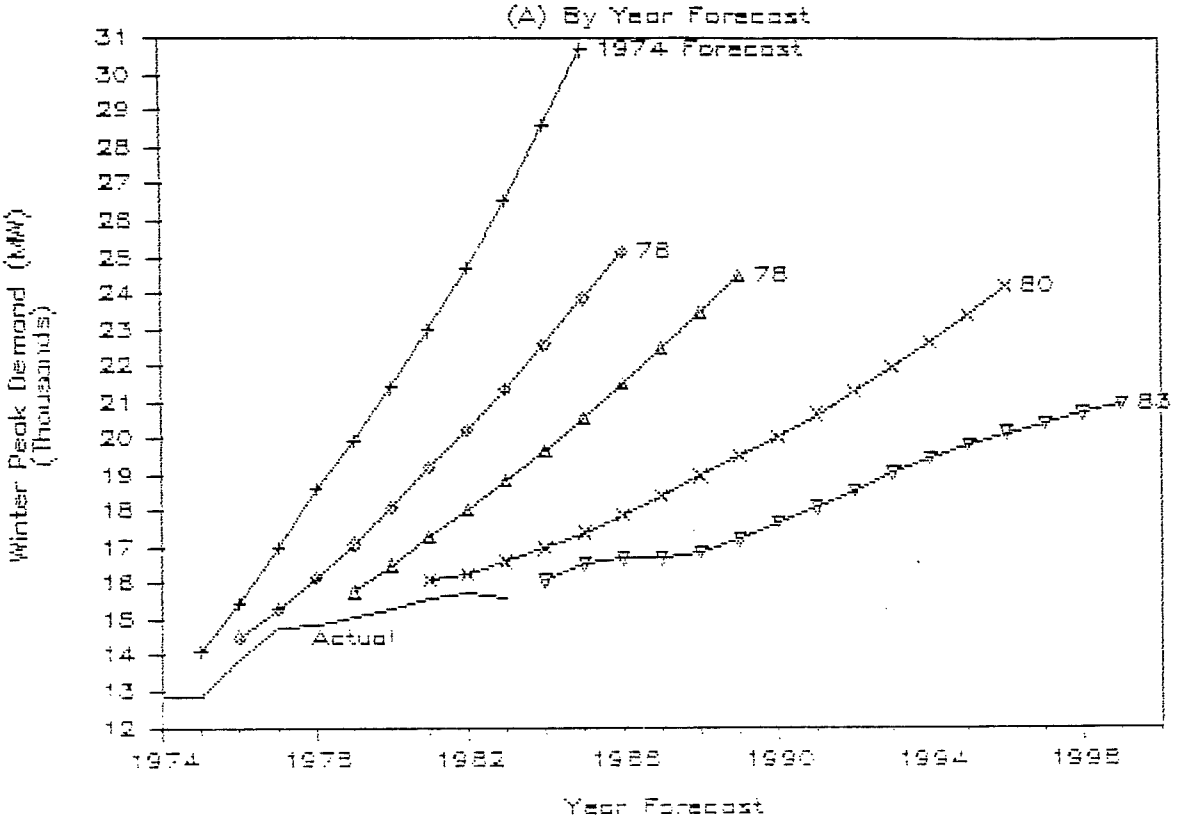
5 - TABLES AND FIGURES

Figure 1.1: NEPOOL Forecast History



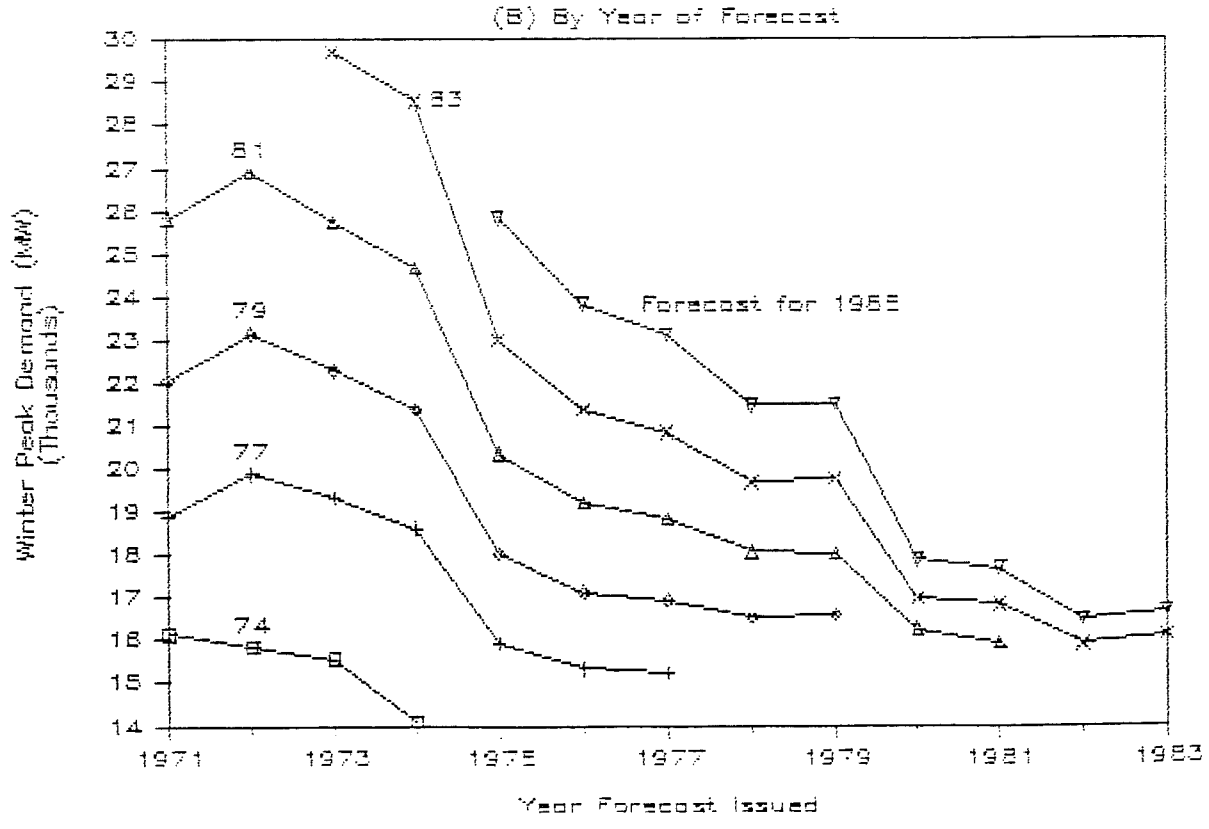


Figure 1.2: Pilgrim 2 Cost Estimates

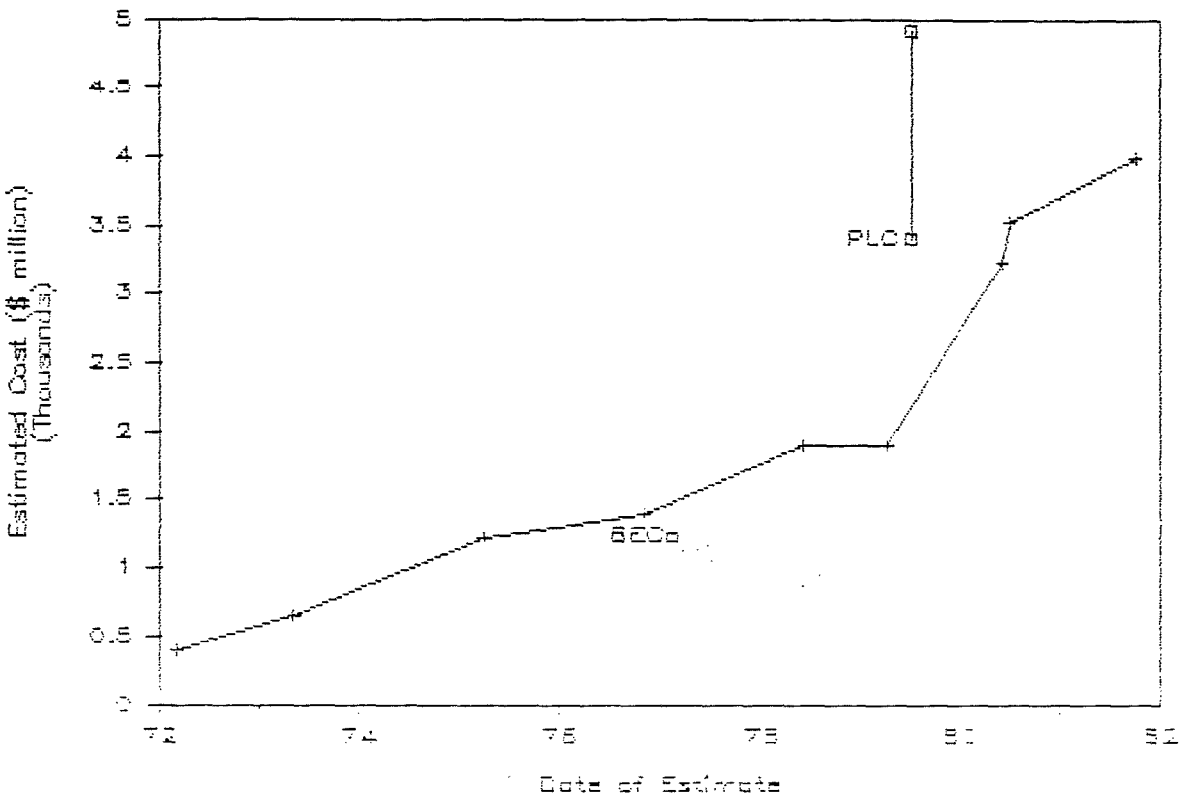


Figure 1.3: History of Seabrook Cost Estimates

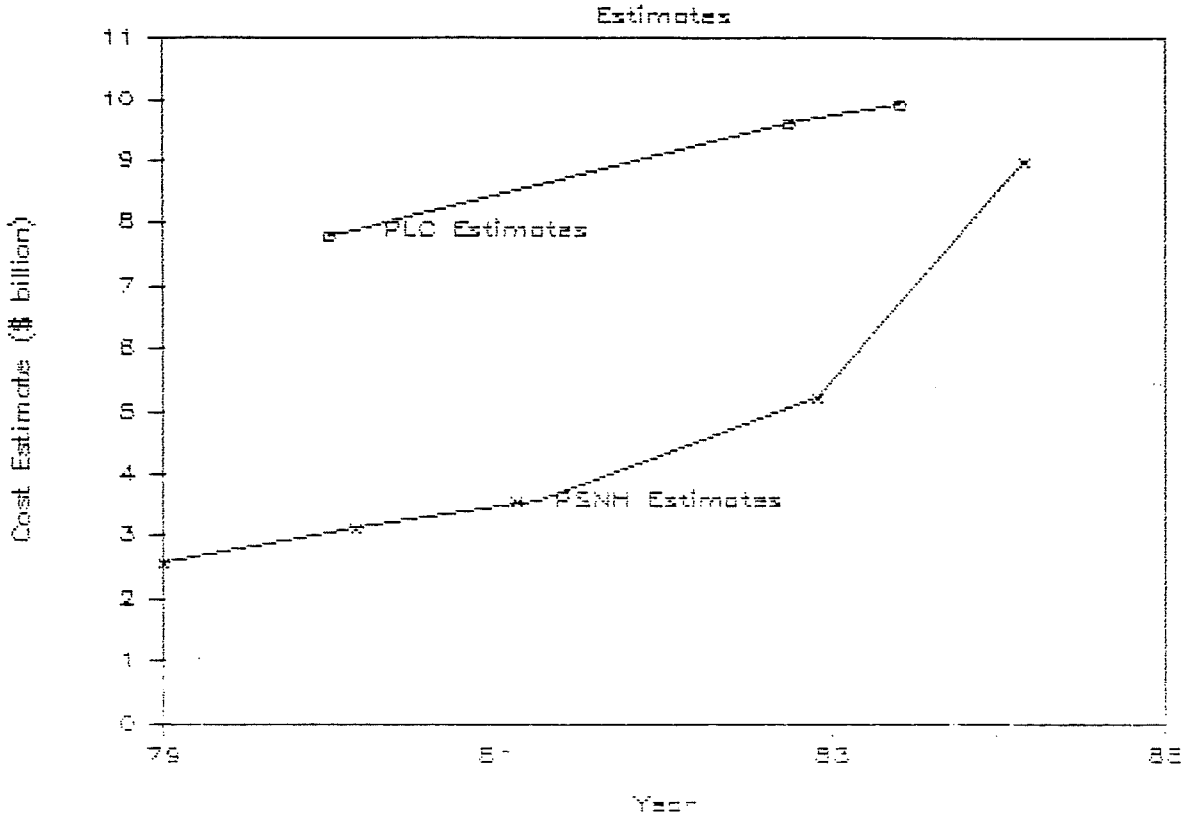


TABLE 2.1: RECENT EXPERIENCE IN START-UP INTERVALS

Unit	Date of Issuance, First Operating License [1] (OLIS)	Commercial Operation Date [2] (COD)	Start-up Interval [3] (months)
Three Mile Island 2	08-Feb-78 (F)	30-Dec-78	10.7
Hatch 2	13-Jun-78 (F)	05-Sep-79	14.8
Arkansas 2	01-Sep-78 (L)	26-Mar-80	18.8
Sequoyah 1	29-Feb-80 (L)	01-Jul-81	16.0
North Anna 2	11-Apr-80 (L)	14-Dec-80	8.1
Salem 2	18-Apr-80 (L)	13-Oct-81	17.9
Farley 2	23-Oct-80 (L)	30-Jul-81	9.2
McGuire 1	23-Jan-81 (Z)	01-Dec-81	10.3
Sequoyah 2	25-Jun-81 (L)	01-Jun-82	11.2
San Onofre 2	16-Feb-82 (L)	08-Aug-83	17.7
LaSalle 1	17-Apr-82 (Z)	01-Jan-84 [4]	20.5
Susquehanna 1	17-Jul-82 (L)	08-Jun-83	10.7
Summer 1	06-Aug-82 (L)	01-Jan-84	16.9
San Onofre 3	15-Nov-82 (L)	01-Apr-84	16.5
McGuire 2	03-Mar-83 (L)	01-Mar-84	11.9
St Lucie 2	06-Apr-83 (L)	08-Aug-83	4.1
WPPSS 2	20-Dec-83 (L)	13-Dec-84	11.8
AVERAGE:			13.36

Notes:

[1] From NRC Gray Books and "Historical Profile of U.S. Nuclear Power Development", Atomic Industrial Forum, 12/31/81 and 1/1/83.
Full licenses are indicated by (F), low power licenses by (L), and zero-power licenses by (Z).

[2] Same sources as for OLIS.

[3] All months are treated as having 30.5 days.

[4] Utility had previously announced COD of 10/20/82; apparently now amended.

TABLE 2.2: JUNE 30, 1984 ESTIMATED COMMERCIAL OPERATION DATES
Percent complete comparable to Millstone 3 (76% to 96%)

Unit	Construction Stage (% complete) Aug. 1984	Estimated COD Aug. 1984	Estimated COD Current [1]
Limerick 1	96.0%	Apr-85	Aug-85 [3]
Wolf Creek	96.0%	Apr-85	Jun-85 [6]
Byron 1	95.0%	Feb-85	Mar-85 [5]
Perry 1	94.0%	May-85	Dec-85 [4]
Palo Verde 3	91.1%	Jun-87 [2]	
River Bend 1	89.4%	Dec-85	
Shearon Harris 1	86.0%	Mar-86	
Millstone 3	86.0%	May-86	
Hope Creek 1	85.6%	Dec-86	
Clinton 1	84.7%	Nov-86	
Bellefonte 1	79.0%	Apr-89	
Beaver Valley 2	78.5%	Oct-86	
AVERAGE	88.7% [7]	Jun-86 [7]	

Source: Nuclear News, August 1984, except as noted.

Notes:
[1] Updated from clippings or telephone calls, cited below.
[2] Month not stated; June assumed.
[3] Wall Street Journal, 10/29/84; "third quarter of 1985."
[4] Wall Street Journal, 7/12/84; "about the end of 1985."
[5] Per telephone from Commonwealth Edison Co, 1/15/85.
[6] Per telephone from Kansas Gas & Electric, 1/16/85; "May/June 1985."
[7] Excluding Millstone 3

TABLE 2.3: JUNE 30, 1982 ESTIMATED COMMERCIAL OPERATION DATES
30% - 60% Complete

Unit	Reported % Complete (1)	Estimated Commercial Operation Date
South Texas 1	60	Jun-86 (2)
WPPSS 3	53.8	Dec-86
Beaver Valley 2	53.3	May-86
Watts Bar 2	52	Dec-85
Hope Creek 1	50	Dec-86
River Bend 1	50	Dec-85
Commanche Peak 2	49	Jun-85 (2)
Braidwood 2	48	Oct-86
Hartsville A1	44	(3)
Nine Mile Pt. 2	44	Oct-86
Perry 2	42.4	May-88
Catawba 2	41.8	Jun-87
Palo Verde 3	39.1	May-86
Marble Hill 1	35	Jun-86 (2)
Yellow Creek 1	35	(3)
Hartsville A2	34	(3)
Vogtle 1	32	Mar-87
Limerick 2	30	Oct-87
Average	44.1 (4)	Oct-86

Notes:
(1) From Nuclear News, August 1982. All units between 30% and 60% complete are listed.
(2) Month not given, June assumed.
(3) Commercial Operation Date Indefinite.
(4) Average excluding plants with indefinite commercial operation dates is 45.4%.

TABLE 2.4: JUNE 30, 1982 ESTIMATED COMMMERCIAL OPERATION DATES
35% - 65% Complete

Unit	Reported % Complete (1)	Estimated Commercial Operation Date
Bellefonte 2	65	Nov-89
Susquehanna 2	65	Oct-84 (2)
Byron 2	64	Feb-85
Shearon Harris 1	64	Sep-85
WPPSS 1	62.5	(3)
Braidwood 1	62	Oct-85
South Texas 1	60	Jun-86 (4)
WPPSS 3	53.8	Dec-86
Beaver Valley 2	53.3	May-86
Watts Bar 2	52	Dec-85
Hope Creek 1	50	Dec-86
River Bend 1	50	Dec-85
Commanche Peak 2	49	Jun-85 (4)
Braidwood 2	48	Oct-86
Hartsville A1	44	(3)
Nine Mile Pt. 2	44	Oct-86
Perry 2	42.4	May-88
Catawba 2	41.8	Jun-87
Palo Verde 3	39.1	May-86
Marble Hill 1	35	Jun-86 (4)
Yellow Creek 1	35	(3)
Average	51.4 (5)	Jul-86

Notes:
(1) From Nuclear News, August 1982. All units between 35% and 65% complete are listed.
(2) Date indicated as late-84, October assumed.
(3) Commercial Operation Date indefinite.
(4) Month not given, June assumed.
(5) Average excluding plants with indefinite commercial operation dates is 52.1%.

TABLE 2.5: HISTORICAL NUCLEAR DURATION MYOPIA

Estimated Time to Completion	Number of Estimates	Average Projected Time to Complete	Average Duration Ratio
(years)		(years)	
1 - 1.99	218	1.41	2.05
2 - 2.99	175	2.40	2.13
3 - 3.99	103	3.44	1.97
4 - 4.99	63	4.40	1.76
5 +	82	5.77	1.61

TABLE 2.6: Millstone 2 Cost and Schedule Estimate History

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
1. Appendix B													
Millstone 2	418	Dec-75	332	Dec-67	150	Apr-74	130	6.33	2.79	1.18	2.55	1.16	1.26
Millstone 2	418	Dec-75	332	Mar-68	146	Apr-74	127	6.08	2.86	1.19	2.62	1.17	1.27
Millstone 2	418	Dec-75	332	Dec-68	179	Apr-74	156	5.33	2.34	1.17	2.14	1.15	1.31
Millstone 2	418	Dec-75	332	Dec-69	183	Apr-74	159	4.33	2.28	1.21	2.09	1.19	1.36
Millstone 2	418	Dec-75	332	Dec-70	239	Apr-74	208	3.33	1.75	1.18	1.60	1.15	1.50
Millstone 2	418	Dec-75	332	Sep-71	252	Apr-74	219	2.58	1.66	1.22	1.52	1.18	1.65
Millstone 2	413	Dec-75	332	Sep-72	282	Apr-74	245	1.58	1.48	1.26	1.36	1.21	2.06
Millstone 2	418	Dec-75	332	Mar-73	341	Dec-74	296	1.75	1.23	1.12	1.12	1.07	1.57
Millstone 2	418	Dec-75	332	Dec-73	380	May-75	302	1.41	1.10	1.07	1.10	1.07	1.41
Millstone 2	418	Dec-75	332	Sep-74	399	Aug-75	317	0.92	1.05	1.05	1.05	1.05	1.37
Millstone 2	418	Dec-75	332	Jun-75	399	Oct-75	317	0.33	1.05	1.15	1.05	1.15	1.51
Millstone 2	418	Dec-75	332	Sep-75	416	Nov-75	331	0.17	1.00	1.07	1.00	1.03	1.43
2. NU Cost Estimates [1]													
Millstone 2	418	Dec-75	332	Nov-67	141	Apr-74	123	6.42	2.96	1.18	2.71	1.17	1.26
Millstone 2	418	Dec-75	332	Nov-70	240	Apr-74	209	3.42	1.74	1.19	1.59	1.16	1.48
Millstone 2	418	Dec-75	332	Nov-72	381	Aug-75	303	1.75	1.10	1.05	1.10	1.05	1.44

Notes: [1] NNECo Docket #20279, AG Data Request 7, Q-7-66.
[2] NU uses final cost figure of $434 million.

TABLE 2.7: Millstone 1 and Connecticut Yankee
Cost and Schedule Histories

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
1. Appendix B (Quarterly Progress Reports)													
Millstone 1	97	Mar-71	101	Dec-65		Aug-69		3.67					1.43
Millstone 1	97	Mar-71	101	Mar-67	81	Aug-69	93	2.42	1.20	1.08	1.08	1.03	1.65
Millstone 1	97	Mar-71	101	Sep-67	84	Aug-69	97	1.92	1.15	1.08	1.04	1.02	1.82
Millstone 1	97	Mar-71	101	Dec-68	90	Jan-70	98	1.08	1.08	1.07	1.02	1.02	2.07
Millstone 1	97	Mar-71	101	Mar-69	90	Mar-70	98	1.00	1.08	1.08	1.02	1.02	2.00
Millstone 1	97	Mar-71	101	Sep-69	92	Oct-70	101	1.08	1.05	1.05	1.00	1.00	1.38
Millstone 1	97	Mar-71	101	Jan-70	92	Nov-70	101	0.42	1.05	1.13	1.00	1.01	1.75
Millstone 1	97	Mar-71	101	Sep-70	92	Dec-70	101	0.25	1.05	1.23	1.00	1.01	1.99
Millstone 1	97	Mar-71	101	Dec-70	92	Feb-71	96	0.17	1.05	1.35	1.05	1.35	1.45
2. Utility Estimates [1]													
Millstone 1	97	Mar-71	101	1966	87	1969							
Millstone 1	97	Mar-71	101	1963 [2]	96	1969							
Millstone 1	97	Mar-71	101	1970	103	1970							
Conn. Yankee	104	Jan-68	126	1962	86	1967							
Conn. Yankee	104	Jan-68	126	1963	99	1967							
Conn. Yankee	104	Jan-68	126	1967	104	1967							

Notes: [1] DPU 20055, 9/14/79 AG IR, Question CL-5
Utility reports final cost of $103 million for Millstone 1
and $103 million for Connecticut Yankee as well.
[2] Appears to be error in utility response.

TABLE 2.8: Completed Stone & Webster Units

	Unit Averages for Estimates Made 3-4 Years from Estimated COD (3 <= t < 4)					Unit Averages for Estimates Made 1-2 Years from Estimated COD (1 <= t < 2)				
		NOMINAL		REAL			NOMINAL		REAL	
STONE & WEBSTER UNITS	DURATION RATIO	COST RATIO	MYOPIA FACTOR	COST RATIO	MYOPIA FACTOR	DURATION RATIO	COST RATIO	MYOPIA FACTOR	COST RATIO	MYOPIA FACTOR
Nine Mile Point 1	1.37	2.39	1.25	2.27	1.24	1.45	1.21	1.20	1.21	1.20
Beaver Valley 1	1.95	3.12	1.38	2.49	1.30	2.04	1.46	1.34	1.36	1.27
Maine Yankee	1.16	1.67	1.15	1.67	1.15	NA	NA	NA	NA	NA
Surry 1	1.54	1.71	1.19	1.64	1.17	1.87	1.38	1.24	1.34	1.21
Surry 2	1.36	1.22	1.06	1.15	1.04	1.34	1.06	1.04	1.02	1.02
North Anna 1	NA	NA	NA	NA	NA	2.02	1.53	1.32	1.38	1.24
North Anna 2	2.56	2.72	1.33	1.92	1.20	2.57	1.43	1.24	1.20	1.11
Fitzpatrick	NA	NA	NA	NA	NA	2.20	1.39	1.34	1.22	1.20
Stone & Webster Units Number of Data Points:	6	6	6	6	6	7	7	7	7	7
Average:	1.66	2.14	1.23	1.86	1.18	1.93	1.39	1.24	1.25	1.18
Excluding Maine Yankee Average:	1.76	2.23	1.24	1.89	1.19					
Industry Average from Appendix B:	1.97	2.39	1.27	1.94	1.18	2.05	1.29	1.25	1.25	1.16

Notes: From Appendix B.
Connecticut Yankee and Yankee Rowe are not included for lack of data.
NA = No estimates available.

TABLE 2.9: Stone & Webster Units Under Construction in 1985

Stone & Webster Unit	Estimate as of December 1977		Current Estimate [3]		Schedule Slippage	Cost Increase
	COD [1]	COST [2]	COD	COST	[4]	[5]
Shoreham	Sep-80 [6]	1188	Apr-84	4100	130%	245%
Beaver Valley 2	May-82	942	Nov-86	3466	102%	268%
Nine Mile Point 2	Oct-83	1505	Oct-86	5100	51%	239%
River Bend 1	Oct-83	1172	Dec-85	2473	37%	111%
Millstone 3	May-86	1173	May-86	3539	0%	202%

Notes: [1] COD from Nuclear News, February 1979
[2] Cost from Quarterly Progress Reports (HQ-254)
[3] Latest DOE printout of EIA-254 data:
Estimates as of June 1984 (Shoreham as of March 1984;now outdated)
[4] Slippage = (Current COD - Dec-77) / (Dec-77 COD - Dec-77) -1
[5] Cost Increase = Current COST / Dec-77 COST -1
[6] Month from Quarterly Progress Reports

TABLE 2.10: Cancelled Stone & Webster Units

Stone & Webster Unit	Year of Cancellation	Construction Status	Percent Complete
River Bend 2	1984	CP	0.0%
North Anna 3	1982	CP	7.0%
Haven 1	1980	Order	
Jamesport 1	1980	CP	0.0%
Jamesport 2	1980	CP	0.0%
Montague 1	1980	Order	
Montague 2	1980	Order	
North Anna 4	1980	CP	4.0%
Greene County	1979	Order	
Haven 2	1978	Order	
Sundesert 1	1978	Order	
Sundesert 2	1978	Order	
Surry 3	1977	CP	0.0%
Surry 4	1977	CP	0.0%
Fulton 1	1975	Order	
Fulton 2	1975	Order	

Source: Atomic Industrial Forum, Background Info, January 1984 .

TABLE 2.11: Summary of Estimates for Millstone 3 Commercial Operation Date

Method	Projected COD
1. NU Fuel Load Date, plus Historic Startup	Dec-86
2. Industry Duration Estimate Experience	
-from NU 8/82 Estimate	Oct-89 to Dec-89
-from Hypothetical 6/84 Estimate (with 5/86 COD)	May-88
3. Millstone 2 Duration Estimate Experience	
-from NU 8/82 Estimate	Mar-88
4. Millstone 2 Slippage History	
-from NU 8/82 Estimate	Jan-88
5. Stone & Webster Duration Estimate Experience	
-from NU 8/82 Estimate	
3-4 year duration	
with Maine Yankee	Nov-88
without Maine Yankee	Mar-89
1-2 year duration	Feb-88

TABLE 3.1: NOMINAL COST OVERRUNS AND MYOPIA FACTORS

Estimated Time to Completion	Number of Estimates	Average Cost Ratio	Average Myopia
(years)			
1 - 1.99	188	1.39	25%
2 - 2.99	167	2.02	32%
3 - 3.99	91	2.39	27%
4 - 4.99	61	2.78	24%
5 +	82	3.63	22%

TABLE 3.2: REAL COST OVERRUNS AND MYOPIA FACTORS

Estimated Time to Completion	Number of Estimates	Average Real Cost Ratio	Average Real Myopia
(years)			
1 - 1.99	188	1.25	19%
2 - 2.99	167	1.64	22%
3 - 3.99	91	1.84	18%
4 - 4.99	61	2.15	18%
5 +	82	2.69	17%

TABLE 3.3: Extrapolation of Millstone 2 and Stone & Webster Cost Estimate History Results to Millstone 3 (in $ Billion)

Method		Based on Estimate of: 8/82	6/84
1. MILLSTONE 2 EXPERIENCE			
Nominal cost ratio		$6.2	$5.8
Nominal myopia	[1]	$6.6	$6.3
Real cost ratio to 5/86		$5.7	$5.3
Real myopia to 5/86	[2]	$6.0	$5.6
Real cost ratio to 12/87	[3]	$6.2	$5.8
Real Myopia to 12/87	[3]	$6.6	$6.2
2. STONE & WEBSTER EXPERIENCE			
Nominal cost ratio		$7.6	$5.3
Nominal myopia	[4]	$7.7	$5.9
Real cost ratio to 5/86		$6.6	$4.9
Real myopia to 5/86	[5]	$6.6	$5.4
Real cost ratio to 12/87	[3]	$7.2	$5.3
Real Myopia to 12/87	[3]	$7.2	$5.9

Notes: [1] See Table 2.6 for Millstone 2 experience:
Nominal myopia for 3-4 yrs to COD = 18%
for first estimate in 1-2 yrs to COD range = 28%

[2] Real myopia for 3-4 yrs to COD = 15%
for 1-2 yrs to COD = 21%

[3] Assumes 6% inflation.

[4] See Table 2.8 for Stone & Webster averages:
Nominal Myopia for 3-4 yrs to COD = 23% (incl. Maine Yankee)
for 1-2 yrs to COD = 24%

[5] Real Myopia for 3-4 yrs to COD = 18%
for 1-2 yrs to COD = 18%

TABLE 3.4: GROWTH RATES IN NU COST ESTIMATES FOR MILLSTONE 3
Estimates to August 1982

DATE OF ESTIMATE:	Jul-71	Mar-73	Jan-75	Jan-76	Mar-77	Jul-78	Jul-80	Aug-82
1. MONTHS SINCE LAST ESTIMATE	---	20	22	12	14	16	24	25
2. MONTHS TO 8/82	133	113	91	79	65	49	25	---
3. ESTIMATED COST ($M)	$400	$650	$807	$1,010	$1,185	$2,000	$2,600	$3,540
4. INCREASE SINCE LAST EST. (%)	---	62.5%	24.2%	25.2%	17.3%	68.8%	30.0%	36.2%
5. INCREASE SINCE LAST EST. (ANNUALIZED)	---	33.8%	12.5%	25.2%	14.7%	48.3%	14.0%	16.0%
6. INCREASE TO 8/82 (%)	785.0%	444.6%	338.7%	250.5%	198.7%	77.0%	36.2%	---
7. INCREASE TO 8/82 (ANNUAL)	21.7%	19.7%	21.5%	21.0%	22.4%	15.0%	16.0%	---
8. FINAL COST IF TREND CONTINUES								
A. TO 5/86	$7,399	$6,949	$7,353	$7,221	$7,347	$6,979	$6,163	---
B. TO 12/87	$10,106	$9,243	$10,017	$9,781	$10,395	$7,460	$7,900	---

Notes: Line 8A equals line 3 multiplied by (1+line 7)^(Years between Date of Estimate and 5/86).

Line 8B equals line 3 multiplied by (1+line 7)^(Years between Date of Estimate and 12/87).

TABLE 3.5: GROWTH RATES IN NU COST ESTIMATES FOR MILLSTONE 3
Estimates to June 1984

DATE OF ESTIMATE:	Jul-71	Mar-73	Jan-75	Jan-76	Mar-77	Jul-78	Jul-80	Aug-82	Jun-84
1. MONTHS SINCE LAST ESTIMATE	---	20	22	12	14	16	24	25	22
2. MONTHS TO 6/84	155	135	113	101	87	71	47	22	---
3. ESTIMATED COST ($M)	$400	$650	$807	$1,010	$1,185	$2,000	$2,600	$3,540	$3,900
4. INCREASE SINCE LAST EST. (%)	---	62.5%	24.2%	25.2%	17.3%	68.8%	30.0%	36.2%	10.2%
5. INCREASE SINCE LAST EST. (ANNUALIZED)	---	33.9%	12.5%	25.2%	14.7%	48.0%	14.0%	16.0%	5.4%
6. INCREASE TO 6/84 (%)	875.0%	500.0%	383.3%	286.1%	229.1%	95.0%	50.0%	10.2%	---
7. INCREASE TO 6/84 (ANNUAL)	19.3%	17.2%	18.2%	17.4%	17.8%	11.9%	10.9%	5.4%	---
8. FINAL COST IF TREND CONTINUES									
A. TO 5/86	$5,445	$5,289	$5,372	$5,303	$5,340	$4,840	$4,754	$4,315	---
B. TO 12/87	$7,226	$6,806	$7,004	$6,839	$6,929	$5,788	$5,602	$4,691	---

Notes: Line 8A equals line 3 multiplied by (1+line 7)^(Years between Date of Estimate and 5/86).

Line 8B equals line 3 multiplied by (1+line 7)^(Years between Date of Estimate and 12/87).

TABLE 3.6: Regulatory Effects on New Nuclear Cost Estimates

Year	Number of NRC Documents [A]	Time Lag to 1982	Documents Cited by NU as responsible for 1982 Estimate Changes [B] Number	Percent [1]	Time Lag to 1984	Documents Expected to Change 1984 Estimate
1970	4	12			14	
1971	17	11			13	
1972	14	10			12	0
1973	40	9			11	0
1974	39	8	2	5.1%	10	0
1975	22	7	1	4.5%	9	0
1976	31	6	1	3.2%	8	2
1977	42	5	3	7.1%	7	2
1978	68	4	4	5.9%	6	2
1979	172	3	9	5.2%	5	12
1980	162	2	3	1.9%	4	10
1981	103	1	2	1.9%	3	5
1982	101	0			2	2
1983	139				1	3
Totals:	954		25			37

Sources: [A] DPU 84-152, 9/26/1984, AG Request 2-115.

[B] DPU 84-25, 2/25/84, AG Request 6.

Notes: [1] Fraction of the number of NRC documents that year.

TABLE 3.7: SUMMARY OF CONSTRUCTION COST PROJECTIONS
(in $ billion)

METHOD	PROJECTED CONSTRUCTION COST Based on NU COD and:		PROJECTED CONSTRUCTION COST Based on 12/87 COD and:	
	8/82 cost estimate	6/84 partial cost estimate	8/82 cost estimate	6/84 partial cost estimate
A. INDUSTRY EXPERIENCE				
1. Nominal Cost Ratio			$8.5	$5.4
2. Nominal Myopia			$8.7	$6.0
3. Real Cost Ratio	$6.5	$4.9	$7.1	$5.3
4. Real Myopia	$6.6	$5.2	$7.2	$5.7
B. MILLSTONE 2 EXPERIENCE				
1. Nominal Cost Ratio			$6.2	$5.3
2. Nominal Myopia			$6.6	$6.1
3. Real Cost Ratio	$5.7	$5.3	$6.2	$5.9
4. Real Myopia	$6.0	$5.6	$6.6	$6.2
C. STONE & WEBSTER EXPERIENCE				
1. Nominal Cost Ratio			$7.6	$5.3
2. Nominal Myopia			$7.7	$5.9
3. Real Cost Ratio	$6.6	$4.9	$7.2	$5.3
4. Real Myopia	$6.6	$5.4	$7.2	$5.9
D. MILLSTONE 3 EXPERIENCE				
1. NU Estimate	$6.0	$4.8	$7.5	$5.8
2. "Adjusted"	$4.5	--	$5.2	--

APPENDIX A

RESUME OF PAUL CHERNICK

ANALYSIS AND INFERENCE, INC. RESEARCH AND CONSULTING

10 POST OFFICE SQUARE, SUITE 970 ~ BOSTON, MASSACHUSETTS 02109 ~ (617) 542-0611

PAUL L. CHERNICK

Analysis and Inference, Inc.
10 Post Office Square
Boston, Massachusetts 02109
(617) 542-0611

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. Design 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. Assessed reasonableness of earlier estimates of nuclear power plant construction schedules and costs. Reviewed prudence of utility construction decisions.

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

Chernick, P., "Power Plant Performance Standards: Some Introductory Principles," Public Utilities Fortnightly, 1985, forthcoming.

Chernick, P., "Opening the Utility Market to Conservation: A Competitive Approach," presented at the Sixth Annual North American Meeting of the International Association of Energy Economists, San Francisco, California, November, 1984.

Meyer, M., Chernick, P., and Fairley, W., "Insurance Market Assessment of Technological Risks," presented at the Annual Meeting of the Society of Risk Analysis, Knoxville, Tennessee, October, 1984.

Eden, P., Fairley, W., Aller, C., Vencill, C., Meyer, B., and Chernick, P., "Forensic Economics and Statistics: An Introduction to the Current State of the Art," The Practical Lawyer, forthcoming, 1984.

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.

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); PSC (Public Service Commission); and PUC (Public Utilities 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.

   Reviewed 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 deplacement; nuclear economics. Joint testimony with S.C. Geller.

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

   Critiquing 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 prevention.

9. MDPU 20248; Petition of MMWEC 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. Texas PUC 3298; Gulf States Utilities Rate Case; East Texas Legal Services; August 25, 1980.

    Inter-class revenue allocations, including production plant in service, O & M, CWIP, nuclear fuel in progress, amortization of cancelled plant residential rate design; interrruptible 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 of 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 Section 210 of PURPA; Mass. Attorney General; January 26, 1981 and February 13, 1981.

    Filing requirements, certification, qualifying facility (QF) 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 Massachsuetts Electric Company Rate Case; Mass. Attorney General; May, 1981.

    Rate design; declinig blocks, marginal cost, conservation impacts, promotional rates; conservation: terms and conditions limiting renewables, cogeneration, small power production; scope of current conservation program; efficient 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. DCPSC 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. NHPUC 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.

    Critiquing 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; demand U.S. 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.

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.

31. MDPU 84-25; Western Massachusetts Electric Company Rate Case; Mass. Attorney General; April 6, 1984.

    Need for Millstone 3. Cost of completing and operating unit, cost-effectiveness compared to alternatives, and its effect on rates. Equity and incentive problems created by CWIP. Design of Millstone 3 phase-in proposals to protect ratepayers: limitation of base-rate treatment to fuel savings benefit of unit.

32. MDPU 84-49 and 84-50; Fitchburg Gas & Electric Financing Case; Massachusetts Attorney General; April 13, 1984.

    Cost of completing and operating Seabrook nuclear units. Probability of completing Seabrook 2. Recommendations regarding FG&E and MDPU actions with respect to Seabrook.

33. Michigan PSC U-7785; Consumers Power Fuel Cost Recovery Plan; Public Interest Research Group in Michigan; April 16, 1984.

    Review of proposed performance targets for two existing and two new nuclear power plants. Formulation of alternative proposals.

34. FERC ER81-749-000 and ER82-325-000; Montaup Electric Rate Cases; Massachusetts Attorney General; April 27, 1984.

    Prudence of Montaup and Boston Edison in decisions regarding Pilgrim 2 construction: Montaup's decision to participate, the utilities' failure to review their earlier analyses and assumptions, Montaup's failure to question Edison's decisions, and the utilities' delay in canceling the unit.

35. Maine PUC 84-113; Seabrook 1 Investigation; Maine Public Advocate; September 13, 1984.

    Cost of completing and operating Seabrook Unit 1. Probability of completing Seabrook 1. Comparison of Seabrook to alternatives. Rate effects. Recommendations regarding utility and PUC actions with respect to Seabrook.

36. MDPU 84-145; Fitchburg Gas and Electric Rate Case; Massachusetts Attorney General; November 6, 1984.

    Prudence of Fitchburg and Public Service of New Hampshire in decisions regarding Seabrook 2 construction: FGE's decision to participate, the utilities' failure to review their earlier analyses and assumptions, FGE's failure to question PSNH's decisions, and the utilities' delay in halting construction and canceling the unit. Review of literature, cost and schedule estimate histories, cost-benefit analyses, and financial forecasts.

37. Pennsylvania PUC R-842651; Pennsylvania Power and Light Rate Case; Pennsylvania Consumer Advocate; November, 1984.

    Need for Susquehanna 2. Cost of operating unit, power output, cost-effectiveness compared to alternatives, and its effect on rates. Design of phase-in and excess capacity proposals to protect ratepayers: limitation of base-rate treatment to fuel savings benefit of unit.

38. NHPUC 84-200; Seabrook 1 Investigation; New Hampshire Public Advocate; November 15, 1984.

    Cost of completing and operating Seabrook Unit 1. Probability of completing Seabrook 1. Comparison of Seabrook to alternatives. Rate and financial effects.

39. Massachusetts Division of Insurance; Hearing to Fix and Establish 1985 Automobile Insurance Rates; Massachusetts Attorney General; November, 1984.

    Profit margin calculations, including methodology and implementation.

40. MDPU 84-152; Seabrook Unit 1 Investigation; Massachusetts Attorney General; December 12, 1984.

    Cost of completing and operating Seabrook. Probability of completing Seabrook 1. Seabrook capacity factors.

41. Maine PUC 84-120; Central Maine Power Rate Case; Maine PUC Staff; December 11, 1984.

    Prudence of Central Maine Power and Boston Edison in decisions regarding Pilgrim 2 construction: CMP's decision to participate, the utilities' failure to review their earlier analyses and assumptions, CMP's failure to question Edison's decisions, and the utilities' delay in canceling the unit. Prudence of CMP in the planning and investment in Sears Island nuclear and coal plants. Review of literature, cost and schedule estimate histories, cost-benefit analyses, and financial forecasts.

42. Maine PUC 84-113; Seabrook 2 Investigation; Maine PUC Staff; December 14, 1984.

    Prudence of Maine utilities and Public Service of New Hampshire in decisions regarding Seabrook 2 construction: decisions to participate and to increase ownership share, the utilities' failure to review their earlier analyses and assumptions, failure to question PSNH's decisions, and the utilities' delay in halting construction and canceling the unit. Review of literature, cost and schedule estimate histories, cost-benefit analyses, and financial forecasts.

43. MDPU 1627; Massachusetts Municipal Wholesale Electric Company Financing Case; Massachusetts Executive Office of Energy Resources; January 14, 1985.

    Cost of completing and operating Seabrook nuclear units. Probability of completing Seabrook 2. Cost of conservation and other alternatives to completing Seabrook.

44. VTPSB 4936; Millstone 3: Costs and In-Service Date; Vermont Department of Public Service; January 21, 1985.

    Costs and benefits of completing and operating Millstone Unit 3.

APPENDIX B

COST AND SCHEDULE HISTORIES

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
Arkansas 1	233	Dec-74	202	Mar-73	200	Mar-74	174	1.00	1.17	1.17	1.17	1.17	1.75
Beaver Valley 1	599	Oct-76	452	Jun-74	419	Jun-75	333	1.00	1.43	1.43	1.36	1.36	2.34
Beaver Valley 1	599	Oct-76	452	Dec-74	451	Dec-75	359	1.00	1.33	1.33	1.26	1.26	1.84
Crystal River 3	366	Mar-77	261	Mar-74	283	Mar-75	225	1.00	1.29	1.29	1.16	1.16	3.00
Farley 1	727	Dec-77	519	Jun-76	614	Jun-77	438	1.00	1.18	1.18	1.18	1.18	1.50
Fitzpatrick	419	Jul-75	333	Jun-73	301	Jun-74	262	1.00	1.39	1.39	1.27	1.27	2.08
Indian Point 2	206	Aug-74	179	Dec-70		Dec-71		1.00					3.67
Kewaunee	202	Jun-74	176	Mar-72	134	Mar-73	127	1.00	1.51	1.51	1.39	1.39	2.25
Kewaunee	202	Jun-74	176	Sep-72	163	Sep-73	154	1.00	1.24	1.24	1.14	1.14	1.75
Kewaunee	202	Jun-74	176	Jun-72	158	Jun-73	149	1.00	1.28	1.28	1.18	1.18	2.00
Lasalle 1	1336	Jan-84	603	Jun-80	1107	Jun-81	567	1.00	1.21	1.21	1.06	1.06	3.59
Millstone 1	97	Mar-71	101	Mar-69		Mar-70		1.00					2.00
Nine Mile Point	162	Dec-69	187	Jun-68	134	Jun-69	154	1.00	1.21	1.21	1.21	1.21	1.50
Nine Mile Point	162	Dec-69	187	Dec-68	134	Dec-69	154	1.00	1.21	1.21	1.21	1.21	1.00
North Anna 2	532	Dec-80	298	Mar-78	467	Mar-79	286	1.00	1.14	1.14	1.04	1.04	2.76
Peach Bottom 3	220	Dec-74	191	Dec-73	284	Dec-74	247	1.00	0.77	0.77	0.77	0.77	1.00
Point Beach 1	74	Dec-70	81	Dec-69		Dec-70		1.00					1.00
Point Beach 2	71	Oct-72	71	Sep-70		Sep-71		1.00					2.08
St. Lucie 1	470	Dec-76	355	Dec-74	401	Dec-75	319	1.00	1.17	1.17	1.11	1.11	2.00
Summer 1	1283	Jan-84	579	Jun-82	1174	Jun-83	544	1.00	1.09	1.09	1.06	1.06	1.59
Surry 2	150	May-73	142	Mar-72	147	Mar-73	139	1.00	1.02	1.02	1.02	1.02	1.17
Browns Ferry 3	301	Mar-77	215	Jun-75	246	Jun-76	186	1.00	1.22	1.22	1.16	1.16	1.75
Farley 2	781	Jul-81	400	Sep-79	684	Sep-80	383	1.00	1.14	1.14	1.04	1.04	1.83
Lasalle 1	1336	Jan-84	603	Mar-79	808	Mar-80	453	1.00	1.65	1.65	1.33	1.33	4.83
Lasalle 1	1336	Jan-84	603	Dec-79	1003	Dec-80	562	1.00	1.33	1.33	1.07	1.07	4.08
Prairie Isl 1	233	Dec-73	221	Dec-71	190	Dec-72	190	1.00	1.22	1.22	1.16	1.16	2.00
Sequoyah 1	984	Jul-81	504	Jun-79	632	Jun-80	354	1.00	1.56	1.55	1.42	1.42	2.08
Turkey Point 4	123	Sep-73	116	Jun-71	96	Jun-72	96	1.00	1.28	1.28	1.21	1.21	2.25
Turkey Point 4	123	Sep-73	116	Dec-71	126	Dec-72	126	1.00	0.97	0.97	0.92	0.92	1.75
Arkansas 1	233	Dec-74	202	Sep-72	185	Oct-73	175	1.08	1.26	1.24	1.16	1.14	2.08
Beaver Valley 1	599	Oct-76	452	Sep-74	454	Oct-75	359	1.08	1.33	1.30	1.26	1.24	1.93
Cooper	246	Jul-74	214	Jun-72	207	Jul-73	196	1.08	1.19	1.17	1.09	1.09	1.92
Ginna	83	Jun-70	91	Sep-68		Oct-69		1.08					1.62
Indian Point 3	570	Aug-76	431	Sep-73	400	Oct-74	348	1.08	1.43	1.39	1.24	1.22	2.73
Millstone 1	97	Mar-71	101	Sep-69		Oct-70		1.08					1.38
Prairie Isl 1	233	Dec-73	221	Sep-72	210	Oct-73	199	1.08	1.11	1.10	1.11	1.10	1.15
Quad Cities 1	100	Feb-73	95	Jun-70		Jul-71		1.08					2.47
Rancho Seco	344	Apr-75	273	Sep-73	328	Oct-74	285	1.08	1.05	1.04	0.96	0.96	1.46
Sequoyah 1	984	Jul-81	504	Sep-78	632	Oct-79	387	1.08	1.56	1.51	1.30	1.28	2.62
Summer 1	1283	Jan-84	579	Sep-82	1174	Oct-83	544	1.08	1.09	1.09	1.06	1.06	1.23
Trojan	452	May-76	342	Sep-74	366	Oct-75	291	1.08	1.23	1.22	1.17	1.16	1.54
Browns Ferry 1	256	Aug-74	223	Sep-71	185	Oct-72	185	1.08	1.39	1.35	1.20	1.19	2.69
Browns Ferry 3	301	Mar-77	215	Dec-74	149	Jan-76	113	1.08	2.02	1.91	1.91	1.81	2.07
Brunswick 2	382	Nov-75	304	Dec-73	339	Jan-75	269	1.08	1.13	1.12	1.13	1.12	1.77
Dresden 2	83	Jun-70	90	Dec-68		Jan-70		1.08					1.38
Millstone 1	97	Mar-71	101	Dec-68		Jan-70		1.08					2.07
North Anna 1	782	Jun-78	520	Mar-76	567	Apr-77	405	1.08	1.38	1.34	1.28	1.26	2.08
Calvert Cliffs 2	335	Apr-77	239	Dec-75	251	Jan-77	179	1.09	1.34	1.31	1.34	1.31	1.23
Nine Mile Point	162	Dec-69	187	Dec-67	134	Jan-69	154	1.09	1.21	1.19	1.21	1.19	1.84
Oyster Creek 1	90	Dec-69	104	Mar-67		Apr-68		1.09					2.53
Beaver Valley 1	599	Oct-76	452	Mar-74	419	May-75	333	1.17	1.43	1.36	1.36	1.30	2.22

	Actuals		ACTUAL	Estimates			EST.	Est.	NOMINAL		REAL		
			COST	Date of	Total		COST	Years	COST	MYOPIA	COST	MYOPIA	DURATION
Unit Name	Cost	COD	1972$	Estimate	Cost	COD	1972$	to COD	RATIO	FACTOR	RATIO	FACTOR	RATIO
Indian Point 2	206	Aug-74	179	Mar-69		May-70		1.17					4.65
Salem 2	820	Oct-81	420	Mar-78	619	May-79	379	1.17	1.32	1.27	1.11	1.09	3.08
Three Mile I. 1	398	Sep-74	346	Jun-73	393	Aug-74	342	1.17	1.01	1.01	1.01	1.01	1.07
Zion 2	290	Sep-74	252	Mar-72	235	May-73	222	1.17	1.23	1.20	1.13	1.11	2.15
Browns Ferry 1	256	Aug-74	223	Mar-71	185	May-72	185	1.17	1.39	1.32	1.20	1.17	2.93
McGuire 1	906	Dec-81	464	Dec-78	549	Feb-80	308	1.17	1.65	1.53	1.51	1.42	2.57
Quad Cities 2	100	Mar-73	95	Mar-71		May-72		1.17					1.71
Surry 1	247	Dec-72	247	Dec-70	189	Feb-72	189	1.17	1.31	1.26	1.31	1.26	1.71
Zion 1	276	Dec-73	261	Jun-71	232	Aug-72	232	1.17	1.19	1.16	1.12	1.11	2.14
Brunswick 1	318	Mar-77	227	Dec-75	329	Mar-77	235	1.25	0.97	0.97	0.97	0.97	1.00
Brunswick 1	318	Mar-77	227	Dec-74	281	Mar-76	212	1.25	1.13	1.11	1.07	1.06	1.80
Brunswick 2	382	Nov-75	304	Sep-73	309	Dec-74	269	1.25	1.24	1.19	1.13	1.10	1.73
Davis-Besse 1	558	Jul-78	371	Dec-75	533	Mar-77	381	1.25	1.05	1.04	0.97	0.98	2.07
Peach Bottom 3	220	Dec-74	191	Sep-73	316	Dec-74	275	1.25	0.70	0.75	0.70	0.75	1.00
Summer 1	1283	Jan-84	579	Sep-80	827	Dec-81	424	1.25	1.55	1.42	1.37	1.28	2.67
Surry 2	150	May-73	142	Dec-71	145	Mar-73	137	1.25	1.03	1.03	1.03	1.03	1.13
Dresden 3	104	Nov-71	108	Mar-70		Jun-71		1.25					1.33
Kewaunee	202	Jun-74	176	Sep-71	134	Dec-72	134	1.25	1.51	1.39	1.31	1.24	2.20
Oconee 3	160	Dec-74	139	Mar-73	137	Jun-74	119	1.25	1.17	1.13	1.17	1.13	1.40
Peach Bottom 2	522	Jul-74	454	Jun-72	352	Sep-73	333	1.25	1.48	1.37	1.36	1.28	1.66
Prairie Isl 1	233	Dec-73	221	Sep-71	148	Dec-72	148	1.25	1.58	1.44	1.49	1.38	1.80
Rancho Seco	344	Apr-75	273	Mar-73	327	Jun-74	284	1.25	1.05	1.04	0.96	0.97	1.67
San Onofre 2	2502	Aug-83	1160	Mar-81	2010	Jun-82	972	1.25	1.24	1.19	1.19	1.15	1.93
Summer 1	1283	Jan-84	579	Mar-80	827	Jun-81	424	1.25	1.55	1.42	1.37	1.28	3.07
Surry 2	150	May-73	142	Sep-71	141	Dec-72	141	1.25	1.06	1.05	1.01	1.00	1.33
Turkey Point 3	109	Dec-72	109	Mar-70	111	Jun-71	116	1.25	0.98	0.98	0.94	0.95	2.20
Brunswick 1	318	Mar-77	227	Mar-75	281	Jun-76	212	1.25	1.13	1.10	1.07	1.06	1.60
Crystal River 3	366	Mar-77	261	Jun-75	420	Sep-76	317	1.25	0.87	0.90	0.82	0.86	1.40
Davis-Besse 1	558	Jul-78	371	Jun-75	461	Sep-76	348	1.25	1.21	1.16	1.06	1.05	2.46
Farley 2	781	Jul-81	400	Jun-79	687	Sep-80	385	1.25	1.14	1.11	1.04	1.03	1.66
Turkey Point 4	123	Sep-73	116	Mar-71	83	Jun-72	83	1.25	1.48	1.36	1.40	1.30	2.00
Cook 1	538	Aug-75	428	Dec-73	427	Apr-75	339	1.33	1.26	1.19	1.26	1.19	1.25
Hatch 1	390	Dec-75	310	Dec-72	282	Apr-74	245	1.33	1.38	1.28	1.27	1.19	2.25
Lasalle 1	1336	Jan-84	603	Dec-80	1184	Apr-82	572	1.33	1.13	1.10	1.05	1.04	2.32
Browns Ferry 2	256	Mar-75	204	Mar-73	149	Jul-74	130	1.33	1.72	1.50	1.57	1.40	1.50
Browns Ferry 3	301	Mar-77	215	Jun-69	149	Oct-70	163	1.33	2.02	1.69	1.32	1.23	5.81
Calvert Cliffs 1	429	May-75	341	Jun-72	250	Oct-73	236	1.33	1.72	1.50	1.44	1.32	2.18
Cook 1	538	Aug-75	428	Jun-72	416	Oct-73	393	1.33	1.29	1.21	1.09	1.06	2.37
Cook 1	538	Aug-75	428	Jun-73	427	Oct-74	371	1.33	1.26	1.19	1.15	1.11	1.62
Duane Arnold	202	Feb-75	161	Sep-72	192	Jan-74	167	1.33	1.05	1.04	0.96	0.97	1.81
Fitzpatrick	419	Jul-75	333	Jun-72	301	Oct-73	285	1.33	1.39	1.28	1.17	1.13	2.31
Indian Point 2	206	Aug-74	179	Jun-69		Oct-70		1.33					3.87
Indian Point 3	570	Aug-76	431	Mar-73	317	Jul-74	275	1.33	1.80	1.55	1.56	1.40	2.60
McGuire 1	906	Dec-81	464	Mar-78	549	Jul-79	336	1.33	1.65	1.46	1.38	1.27	2.82
North Anna 1	782	Jun-78	520	Dec-75	536	Apr-77	383	1.33	1.46	1.33	1.36	1.26	1.87
Oyster Creek 1	90	Dec-69	104	Sep-66		Jan-68		1.33					2.44
Quad Cities 1	100	Feb-73	95	Mar-70		Jul-71		1.33					2.19
Rancho Seco	344	Apr-75	273	Jun-72	264	Oct-73	250	1.33	1.30	1.22	1.09	1.07	2.12
Sequoyah 1	984	Jul-81	504	Mar-78	535	Jul-79	327	1.33	1.84	1.58	1.54	1.38	2.50
Surry 1	247	Dec-72	247	Jun-70	189	Oct-71	197	1.33	1.31	1.22	1.25	1.18	1.88
Susquehanna 1	1947	Jun-83	903	Sep-80	1841	Jan-82	890	1.33	1.06	1.04	1.01	1.01	2.06

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
Three Mile I. 1	398	Sep-74	346	Mar-73	373	Jul-74	324	1.33	1.07	1.05	1.07	1.05	1.13
Vermont Yankee	172	Nov-72	172	Mar-70	133	Jul-71	139	1.33	1.29	1.21	1.24	1.18	2.00
Farley 1	727	Dec-77	519	Jun-75	487	Oct-76	368	1.34	1.49	1.35	1.41	1.29	1.87
Surry 2	150	May-73	142	Jun-71	139	Oct-72	139	1.34	1.08	1.06	1.02	1.02	1.43
Indian Point 2	206	Aug-74	179	Dec-69		May-71		1.41					3.30
Millstone 2	418	Dec-75	332	Dec-73	380	May-75	302	1.41	1.10	1.07	1.10	1.07	1.41
Susquehanna 1	1947	Jun-83	903	Dec-81	2292	May-83	1063	1.41	0.85	0.89	0.85	0.89	1.06
Fort Calhoun 1	174	Jun-74	151	Dec-71	159	May-73	150	1.42	1.09	1.07	1.01	1.00	1.77
Zion 1	276	Dec-73	261	Dec-70	232	May-72	232	1.42	1.19	1.13	1.12	1.09	2.12
Calvert Cliffs 1	429	May-75	341	Sep-72	250	Feb-74	217	1.42	1.72	1.46	1.57	1.37	1.88
Dresden 3	104	Nov-71	108	Mar-69		Aug-70		1.42					1.88
Farley 1	727	Dec-77	519	Sep-74	456	Feb-76	345	1.42	1.60	1.39	1.51	1.34	2.29
North Anna 2	532	Dec-80	298	Mar-77	426	Aug-78	283	1.42	1.25	1.17	1.05	1.04	2.65
Palisades	147	Dec-71	153	Mar-69	110	Aug-70	120	1.42	1.33	1.23	1.27	1.18	1.94
Point Beach 1	74	Dec-70	81	Mar-69		Aug-70		1.42					1.24
Point Beach 2	71	Oct-72	71	Mar-70		Aug-71		1.42					1.82
Rancho Seco	344	Apr-75	273	Sep-72	300	Feb-74	261	1.42	1.15	1.10	1.05	1.03	1.82
Three Mile I. 1	398	Sep-74	346	Jun-72	328	Nov-73	310	1.42	1.21	1.15	1.12	1.08	1.59
Oconee 2	160	Sep-74	139	Sep-71	137	Feb-73	130	1.42	1.17	1.12	1.07	1.05	2.11
Hatch 1	390	Dec-75	310	Sep-72	184	Mar-74	160	1.49	2.12	1.65	1.94	1.56	2.17
North Anna 2	532	Dec-80	298	Sep-77	426	Mar-79	261	1.49	1.25	1.16	1.14	1.09	2.17
Cook 1	538	Aug-75	428	Dec-72	427	Jun-74	371	1.50	1.26	1.17	1.15	1.10	1.78
Cook 2	444	Jul-78	295	Dec-76	437	Jun-78	291	1.50	1.02	1.01	1.02	1.01	1.05
Summer 1	1283	Jan-84	579	Dec-80	1032	Jun-82	499	1.50	1.24	1.16	1.16	1.11	2.06
Surry 1	247	Dec-72	247	Dec-69	189	Jun-71	197	1.50	1.31	1.19	1.25	1.16	2.00
Calvert Cliffs 1	429	May-75	341	Dec-71	210	Jun-73	199	1.50	2.04	1.61	1.72	1.43	2.28
Calvert Cliffs 2	335	Apr-77	239	Jun-74	273	Dec-75	217	1.50	1.23	1.15	1.10	1.07	1.89
Crystal River 3	366	Mar-77	261	Jun-73	283	Dec-74	246	1.50	1.29	1.19	1.06	1.04	2.50
Dresden 3	104	Nov-71	108	Jun-69		Dec-70		1.50					1.61
Farley 1	727	Dec-77	519	Dec-75	589	Jun-77	421	1.50	1.24	1.15	1.24	1.15	1.33
Oyster Creek 1	90	Dec-69	104	Jun-66		Dec-67		1.50					2.33
St. Lucie 1	470	Dec-76	355	Jun-74	366	Dec-75	291	1.50	1.28	1.18	1.22	1.14	1.67
Turkey Point 4	123	Sep-73	116	Dec-70	81	Jun-72	81	1.50	1.51	1.32	1.43	1.27	1.83
Arkansas 1	233	Dec-74	202	Mar-72	175	Sep-73	165	1.50	1.33	1.21	1.22	1.14	1.83
Browns Ferry 3	301	Mar-77	215	Mar-74	149	Sep-75	119	1.50	2.02	1.60	1.81	1.49	2.00
Calvert Cliffs 2	335	Apr-77	239	Mar-74	273	Sep-75	217	1.50	1.23	1.15	1.10	1.07	2.05
Lasalle 1	1336	Jan-84	603	Jun-79	918	Dec-80	515	1.50	1.46	1.28	1.17	1.11	3.05
Sequoyah 1	984	Jul-81	504	Mar-77	475	Sep-78	315	1.50	2.07	1.62	1.60	1.37	2.88
Davis-Besse 1	558	Jul-78	371	Mar-75	434	Sep-76	328	1.51	1.29	1.18	1.13	1.09	2.21
Salem 1	850	Jun-77	607	Mar-75	678	Sep-76	512	1.51	1.25	1.16	1.19	1.12	1.50
Sequoyah 2	623	Jun-82	301	Mar-79	632	Sep-80	354	1.51	0.99	0.99	0.85	0.90	2.16
Browns Ferry 3	301	Mar-77	215	Sep-73	149	Apr-75	119	1.58	2.02	1.56	1.81	1.46	2.21
Indian Point 2	206	Aug-74	179	Sep-68		Apr-70		1.58					3.74
Millstone 2	418	Dec-75	332	Sep-72	282	Apr-74	245	1.58	1.48	1.28	1.36	1.21	2.06
Sequoyah 2	623	Jun-82	301	Dec-80	1094	Jul-82	529	1.58	0.57	0.70	0.57	0.70	0.95
Dresden 2	83	Jun-70	90	Sep-67		Apr-69		1.58					1.74
Farley 1	727	Dec-77	519	Dec-74	456	Jul-76	345	1.58	1.60	1.34	1.51	1.30	1.90
Farley 2	781	Jul-81	400	Sep-78	652	Apr-80	365	1.58	1.20	1.12	1.10	1.06	1.79
Browns Ferry 2	256	Mar-75	204	Jun-72	149	Jan-74	130	1.59	1.72	1.41	1.57	1.33	1.73
Calvert Cliffs 1	429	May-75	341	Mar-72	210	Oct-73	199	1.59	2.04	1.57	1.72	1.41	2.00
Quad Cities 1	100	Feb-73	95	Jun-69		Jan-71		1.59					2.32

	Actuals		ACTUAL	Estimates			EST.	Est.	NOMINAL		REAL		
			COST	Date of	Total		COST	Years	COST	MYOPIA	COST	MYOPIA	DURATION
Unit Name	Cost	COD	1972$	Estimate	Cost	COD	1972$	to COD	RATIO	FACTOR	RATIO	FACTOR	RATIO
Rancho Seco	344	Apr-75	273	Mar-72	215	Oct-73	203	1.59	1.60	1.34	1.34	1.20	1.94
Surry 2	150	May-73	142	Mar-71	138	Oct-72	138	1.59	1.09	1.05	1.03	1.02	1.37
Beaver Valley 1	599	Oct-76	452	Sep-73	409	May-75	325	1.66	1.46	1.26	1.39	1.22	1.86
North Anna 2	532	Dec-80	298	Sep-76	363	May-78	241	1.66	1.47	1.26	1.24	1.14	2.56
Oconee 1	156	Jul-73	147	Sep-69	109	May-71	114	1.66	1.42	1.24	1.29	1.17	2.30
Sequoyah 1	984	Jul-81	504	Sep-76	475	May-78	315	1.66	2.07	1.55	1.60	1.33	2.91
Three Mile I. 1	398	Sep-74	346	Sep-72	363	May-74	315	1.66	1.10	1.06	1.10	1.06	1.20
Calvert Cliffs 2	335	Apr-77	239	Dec-73	243	Aug-75	193	1.66	1.38	1.21	1.24	1.14	2.00
Dresden 3	104	Nov-71	108	Dec-68		Aug-70		1.66					1.75
Fort Calhoun 1	174	Jun-74	151	Sep-71	125	May-73	118	1.66	1.39	1.22	1.28	1.16	1.65
North Anna 2	532	Dec-80	298	Dec-76	381	Aug-78	253	1.66	1.40	1.22	1.18	1.10	2.40
Pilgrim 1	231	Dec-72	231	Jan-70	153	Sep-71	160	1.66	1.51	1.28	1.45	1.25	1.75
Surry 2	150	May-73	142	Sep-70	138	May-72	138	1.66	1.09	1.05	1.03	1.02	1.60
Farley 1	727	Dec-77	519	Jun-74	415	Feb-76	314	1.67	1.75	1.40	1.66	1.35	2.10
North Anna 2	532	Dec-80	298	Mar-76	311	Nov-77	222	1.67	1.71	1.38	1.34	1.19	2.85
Susquehanna 1	1947	Jun-83	903	Jun-79	1285	Feb-81	658	1.67	1.52	1.28	1.37	1.21	2.39
Three Mile I. 1	398	Sep-74	346	Mar-71	261	Nov-72	261	1.67	1.53	1.29	1.33	1.18	2.09
Calvert Cliffs 2	335	Apr-77	239	Sep-73	243	Jun-75	193	1.75	1.38	1.20	1.24	1.13	2.05
Surry 1	247	Dec-72	247	Sep-69	165	Jun-71	172	1.75	1.50	1.26	1.44	1.23	1.86
Three Mile I. 2	715	Dec-78	476	Aug-76	637	May-78	423	1.75	1.12	1.07	1.12	1.07	1.32
Turkey Point 3	109	Dec-72	109	Sep-69	99	Jun-71	103	1.75	1.10	1.06	1.05	1.03	1.86
Brunswick 1	318	Mar-77	227	Jun-75	328	Mar-77	234	1.75	0.97	0.98	0.97	0.98	1.00
Cook 1	538	Aug-75	428	Jun-71	356	Mar-73	337	1.75	1.51	1.27	1.27	1.15	2.38
Davis-Besse 1	558	Jul-78	371	Sep-74	434	Jun-76	328	1.75	1.29	1.15	1.13	1.07	2.19
Peach Bottom 2	522	Jul-74	454	Jun-71	288	Mar-73	272	1.75	1.81	1.41	1.67	1.34	1.76
Salem 1	850	Jun-77	607	Dec-73	497	Sep-75	395	1.75	1.71	1.36	1.54	1.28	2.00
Sequoyah 2	623	Jun-82	301	Sep-79	442	Jun-81	227	1.75	1.41	1.22	1.33	1.18	1.57
Sequoyah 2	623	Jun-82	301	Sep-78	632	Jun-80	354	1.75	0.99	0.99	0.85	0.91	2.14
Browns Ferry 3	301	Mar-77	215	Mar-73	149	Dec-74	130	1.75	2.02	1.49	1.66	1.33	2.28
Crystal River 3	366	Mar-77	261	Dec-74	375	Sep-76	283	1.75	0.98	0.99	0.92	0.95	1.28
Duane Arnold	202	Feb-75	161	Mar-72	177	Dec-73	167	1.75	1.14	1.08	0.96	0.98	1.67
Millstone 2	418	Dec-75	332	Mar-73	341	Dec-74	296	1.75	1.23	1.12	1.12	1.07	1.57
Oyster Creek 1	90	Dec-69	104	Mar-66		Dec-67		1.75					2.14
San Onofre 2	2502	Aug-83	1160	Mar-80	1824	Dec-81	935	1.75	1.37	1.20	1.24	1.13	1.95
Sequoyah 1	984	Jul-81	504	Dec-75	364	Sep-77	260	1.75	2.71	1.76	1.94	1.46	3.19
Oconee 2	160	Sep-74	139	Mar-71	109	Dec-72	109	1.75	1.47	1.25	1.28	1.15	2.00
Summer 1	1283	Jan-84	579	Mar-79	756	Dec-80	424	1.75	1.70	1.35	1.37	1.20	2.76
McGuire 1	906	Dec-81	464	Sep-77	466	Jul-79	285	1.83	1.94	1.44	1.63	1.31	2.32
Trojan	452	May-76	342	Sep-73	334	Jul-75	266	1.83	1.35	1.18	1.29	1.15	1.46
Vermont Yankee	172	Nov-72	172	Sep-69	120	Jul-71	125	1.83	1.43	1.22	1.38	1.19	1.73
Beaver Valley 1	599	Oct-76	452	Dec-72	340	Oct-74	295	1.83	1.76	1.36	1.53	1.26	2.09
Browns Ferry 2	256	Mar-75	204	Sep-71	149	Jul-73	141	1.83	1.72	1.34	1.44	1.22	1.91
Oconee 2	160	Sep-74	139	Sep-70	109	Jul-72	109	1.83	1.47	1.23	1.28	1.14	2.18
Quad Cities 1	100	Feb-73	95	Dec-68		Oct-70		1.83					2.28
Surry 1	247	Dec-72	247	Jun-69	165	Apr-71	172	1.83	1.50	1.25	1.44	1.22	1.91
Browns Ferry 1	256	Aug-74	223	Jun-70	149	Apr-72	149	1.83	1.72	1.34	1.49	1.24	2.27
Browns Ferry 2	256	Mar-75	204	Jun-70	149	Apr-72	149	1.83	1.72	1.34	1.37	1.18	2.59
Browns Ferry 3	301	Mar-77	215	Jun-70	149	Apr-72	149	1.83	2.02	1.47	1.44	1.22	3.68
San Onofre 2	2502	Aug-83	1160	Dec-79	1740	Oct-81	892	1.83	1.44	1.22	1.30	1.15	2.00
Three Mile I. 1	398	Sep-74	346	Dec-70	262	Oct-72	262	1.83	1.52	1.26	1.32	1.16	2.04
Zion 1	276	Dec-73	261	Jun-70	232	Apr-72	232	1.83	1.19	1.10	1.12	1.07	1.91

	Actuals		ACTUAL	Estimates			EST.	Est.	NOMINAL		REAL		
			COST	Date of	Total		COST	Years	COST	MYOPIA	COST	MYOPIA	DURATION
Unit Name	Cost	COD	1972$	Estimate	Cost	COD	1972$	to COD	RATIO	FACTOR	RATIO	FACTOR	RATIO
McGuire 1	906	Dec-81	464	Mar-77	466	Jan-79	285	1.84	1.94	1.44	1.63	1.30	2.59
Calvert Cliffs 2	335	Apr-77	239	Mar-75	253	Jan-77	181	1.84	1.33	1.17	1.33	1.17	1.13
North Anna 1	782	Jun-78	520	Mar-75	536	Jan-77	383	1.84	1.46	1.23	1.36	1.18	1.77
Fort Calhoun 1	174	Jun-74	151	Jun-69	92	May-71	96	1.91	1.89	1.40	1.58	1.27	2.61
McGuire 1	906	Dec-81	464	Jun-76	384	May-78	255	1.91	2.36	1.57	1.82	1.37	2.87
Point Beach 2	71	Oct-72	71	Sep-69		Aug-71		1.91					1.61
Sequoyah 1	984	Jul-81	504	Jun-76	364	May-78	242	1.91	2.71	1.68	2.09	1.47	2.66
Crystal River 3	366	Mar-77	261	Dec-72	283	Nov-74	246	1.92	1.29	1.14	1.06	1.03	2.22
Millstone 1	97	Mar-71	101	Sep-67		Aug-69		1.92					1.82
North Anna 1	782	Jun-78	520	Dec-73	431	Nov-75	343	1.92	1.81	1.36	1.52	1.24	2.35
Rancho Seco	344	Apr-75	273	Jun-71	215	May-73	203	1.92	1.60	1.28	1.34	1.17	2.00
Fort Calhoun 1	174	Jun-74	151	Dec-70	125	Nov-72	125	1.92	1.39	1.19	1.21	1.10	1.82
North Anna 2	532	Dec-80	298	Dec-75	301	Nov-77	215	1.92	1.77	1.35	1.39	1.19	2.61
Calvert Cliffs 2	335	Apr-77	239	Mar-73	204	Feb-75	162	1.92	1.64	1.30	1.48	1.22	2.13
For: 1 <= t < 2 (t = Estimated Years to COD)													
Number of Data Points:								218	188	188	188	188	218
Average:								1.41	1.39	1.25	1.25	1.16	2.05
Standard Deviation:								0.29	0.33	0.19	0.24	0.15	0.67
Browns Ferry 3	301	Mar-77	215	Aug-72	149	Aug-74	130	2.00	2.02	1.42	1.66	1.29	2.29
Brunswick 1	318	Mar-77	227	Dec-73	269	Dec-75	214	2.00	1.18	1.09	1.06	1.03	1.62
Brunswick 2	382	Nov-75	304	Dec-72	256	Dec-74	222	2.00	1.49	1.22	1.37	1.17	1.46
Calvert Cliffs 2	335	Apr-77	239	Jun-72	204	Jun-74	177	2.00	1.64	1.28	1.35	1.16	2.42
Farley 1	727	Dec-77	519	Dec-73	395	Dec-75	314	2.00	1.84	1.36	1.65	1.29	2.00
Fort Calhoun 1	174	Jun-74	151	Sep-69	92	Sep-71	96	2.00	1.89	1.38	1.58	1.26	2.38
Lasalle 1	1336	Jan-84	603	Sep-77	675	Sep-79	413	2.00	1.98	1.41	1.46	1.21	3.17
North Anna 1	782	Jun-78	520	Dec-72	407	Dec-74	354	2.00	1.92	1.39	1.47	1.21	2.75
Point Beach 2	71	Oct-72	71	Dec-69		Dec-71		2.00					1.42
St. Lucie 1	470	Dec-76	355	Dec-73	318	Dec-75	253	2.00	1.48	1.22	1.40	1.19	1.50
Trojan	452	May-76	342	Sep-72	243	Sep-74	211	2.00	1.86	1.36	1.62	1.27	1.83
Crystal River 3	366	Mar-77	261	Sep-71	190	Sep-73	180	2.00	1.93	1.39	1.45	1.21	2.75
Kewaunee	202	Jun-74	176	Sep-70	123	Sep-72	123	2.00	1.64	1.28	1.43	1.20	1.87
Kewaunee	202	Jun-74	176	Jun-70	123	Jun-72	123	2.00	1.64	1.28	1.43	1.20	2.00
Peach Bottom 2	522	Jul-74	454	Dec-70	230	Dec-72	230	2.00	2.27	1.51	1.97	1.40	1.79
Peach Bottom 2	522	Jul-74	454	Mar-71	277	Mar-73	262	2.00	1.89	1.37	1.73	1.32	1.67
Sequoyah 1	984	Jul-81	504	Sep-75	324	Sep-77	231	2.00	3.04	1.74	2.18	1.48	2.91
Sequoyah 2	623	Jun-82	301	Mar-78	535	Mar-80	300	2.00	1.17	1.08	1.01	1.00	2.12
Beaver Valley 1	599	Oct-76	452	Sep-72	342	Oct-74	297	2.08	1.75	1.31	1.52	1.22	1.96
Browns Ferry 1	256	Aug-74	223	Sep-69	149	Oct-71	155	2.08	1.72	1.30	1.43	1.19	2.36
Browns Ferry 2	256	Mar-75	204	Sep-69	149	Oct-71	155	2.08	1.72	1.30	1.31	1.14	2.64
Browns Ferry 3	301	Mar-77	215	Sep-69	149	Oct-71	155	2.08	2.02	1.40	1.38	1.17	3.60
Browns Ferry 3	301	Mar-77	215	Sep-72	149	Oct-74	130	2.08	2.02	1.40	1.66	1.28	2.16
Prairie Isl 2	172	Dec-74	149	Sep-72	160	Oct-74	139	2.08	1.08	1.04	1.08	1.04	1.08
Cook 1	538	Aug-75	428	Sep-71	356	Oct-73	337	2.08	1.51	1.22	1.27	1.12	1.88
Farley 1	727	Dec-77	519	Mar-73	294	Apr-75	234	2.08	2.47	1.54	2.22	1.47	2.28
Farley 2	781	Jul-81	400	Mar-77	689	Apr-79	422	2.08	1.13	1.06	0.95	0.98	2.08
North Anna 1	782	Jun-78	520	Mar-73	407	Apr-75	324	2.08	1.92	1.37	1.61	1.26	2.52
Prairie Isl 1	233	Dec-73	221	Sep-70	148	Oct-72	148	2.08	1.58	1.24	1.49	1.21	1.56

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
Three Mile I. 1	398	Sep-74	346	Jun-70	184	Jul-72	184	2.08	2.16	1.45	1.88	1.35	2.04
Three Mile I. 1	398	Sep-74	346	Sep-70	197	Oct-72	197	2.08	2.02	1.40	1.76	1.31	1.92
Browns Ferry 2	256	Mar-75	204	Mar-71	149	Apr-73	141	2.09	1.72	1.30	1.44	1.19	1.92
Calvert Cliffs 2	335	Apr-77	239	Dec-71	168	Jan-74	146	2.09	2.00	1.39	1.64	1.27	2.56
Farley 2	781	Jul-81	400	Mar-78	635	Apr-80	356	2.09	1.23	1.10	1.12	1.06	1.60
North Anna 1	782	Jun-78	520	Dec-74	504	Jan-77	360	2.09	1.55	1.23	1.44	1.19	1.68
Sequoyah 1	984	Jul-81	504	Dec-74	324	Jan-77	231	2.09	3.04	1.70	2.18	1.45	3.15
Surry 2	150	May-73	142	Mar-70	138	Apr-72	138	2.09	1.09	1.04	1.03	1.01	1.52
Beaver Valley 1	599	Oct-76	452	Mar-73	340	May-75	270	2.17	1.76	1.30	1.67	1.27	1.66
North Anna 1	782	Jun-78	520	Sep-73	407	Nov-75	324	2.17	1.92	1.35	1.61	1.24	2.19
Oyster Creek 1	90	Dec-69	104	Sep-65		Nov-67		2.17					1.96
Palisades	147	Dec-71	153	Mar-68	89	May-70	97	2.17	1.65	1.26	1.57	1.23	1.73
Sequoyah 2	623	Jun-82	301	Mar-77	475	May-79	290	2.17	1.31	1.13	1.04	1.02	2.42
Susquehanna 1	1947	Jun-83	903	Mar-81	2276	May-83	1055	2.17	0.86	0.93	0.86	0.93	1.04
Maine Yankee	219	Dec-72	219	Mar-70	181	May-72	181	2.17	1.21	1.09	1.21	1.09	1.27
McGuire 1	906	Dec-81	464	Dec-76	384	Feb-79	235	2.17	2.36	1.49	1.97	1.37	2.31
North Anna 1	782	Jun-78	520	Mar-74	446	May-76	337	2.17	1.75	1.30	1.54	1.22	1.96
Oconee 3	160	Dec-74	139	Sep-71	137	Nov-73	130	2.17	1.17	1.07	1.07	1.03	1.50
Peach Bottom 2	522	Jul-74	454	Mar-70	230	May-72	230	2.17	2.27	1.46	1.97	1.37	2.00
Quad Cities 2	100	Mar-73	95	Mar-70		May-72		2.17					1.38
Sequoyah 1	984	Jul-81	504	Jun-74	313	Aug-76	236	2.17	3.15	1.70	2.13	1.42	3.27
Summer 1	1283	Jan-84	579	Mar-78	675	May-80	378	2.17	1.90	1.34	1.53	1.22	2.69
Three Mile I. 1	398	Sep-74	346	Sep-71	296	Nov-73	280	2.17	1.35	1.15	1.24	1.10	1.38
Three Mile I. 1	398	Sep-74	346	Mar-70	184	May-72	184	2.17	2.16	1.43	1.88	1.34	2.08
Salem 1	850	Jun-77	607	Dec-72	425	Mar-75	338	2.25	2.00	1.36	1.80	1.30	2.00
Surry 1	247	Dec-72	247	Dec-68	165	Mar-71	172	2.25	1.50	1.20	1.44	1.17	1.78
Arkansas 2	640	Mar-80	359	Dec-75	393	Mar-78	261	2.25	1.63	1.24	1.37	1.15	1.89
Brunswick 1	318	Mar-77	227	Sep-73	251	Dec-75	200	2.25	1.27	1.11	1.14	1.06	1.56
Brunswick 2	382	Nov-75	304	Dec-71	210	Mar-74	182	2.25	1.82	1.30	1.66	1.25	1.74
North Anna 1	782	Jun-78	520	Sep-72	360	Dec-74	313	2.25	2.17	1.41	1.66	1.25	2.56
Peach Bottom 2	522	Jul-74	454	Dec-69	218	Mar-72	218	2.25	2.40	1.48	2.08	1.39	2.04
Surry 2	150	May-73	142	Dec-69	138	Mar-72	138	2.25	1.09	1.04	1.03	1.01	1.52
Beaver Valley 1	599	Oct-76	452	Sep-71	286	Dec-73	270	2.25	2.09	1.39	1.67	1.26	2.26
Calvert Cliffs 2	335	Apr-77	239	Mar-72	168	Jun-74	146	2.25	2.00	1.36	1.64	1.25	2.26
Peach Bottom 3	220	Dec-74	191	Jun-72	316	Sep-74	275	2.25	0.70	0.85	0.70	0.85	1.11
Salem 1	850	Jun-77	607	Sep-74	678	Dec-76	512	2.25	1.25	1.11	1.19	1.08	1.22
St. Lucie 1	470	Dec-76	355	Mar-72	235	Jun-74	204	2.25	2.00	1.36	1.74	1.28	2.11
St. Lucie 1	470	Dec-76	355	Mar-73	318	Jun-75	253	2.25	1.48	1.19	1.40	1.16	1.67
Summer 1	1283	Jan-84	579	Sep-78	675	Dec-80	378	2.25	1.90	1.33	1.53	1.21	2.37
Three Mile I. 1	398	Sep-74	346	Jun-69	162	Sep-71	169	2.25	2.46	1.49	2.05	1.38	2.33
Arkansas 2	640	Mar-80	359	Mar-75	339	Jun-77	242	2.25	1.89	1.33	1.48	1.19	2.22
Farley 2	781	Jul-81	400	Jun-75	365	Sep-77	261	2.25	2.14	1.40	1.54	1.21	2.70
Fort Calhoun 1	174	Jun-74	151	Mar-70	125	Jun-72	125	2.25	1.39	1.16	1.21	1.09	1.89
Kewaunee	202	Jun-74	176	Mar-70	121	Jun-72	121	2.25	1.67	1.26	1.45	1.18	1.89
Sequoyah 1	984	Jul-81	504	Mar-74	313	Jun-76	236	2.25	3.15	1.66	2.13	1.40	3.26
Turkey Point 4	123	Sep-73	116	Mar-70	80	Jun-72	80	2.25	1.53	1.21	1.45	1.18	1.56
Farley 2	781	Jul-81	400	Dec-76	572	Apr-79	350	2.33	1.37	1.14	1.14	1.06	1.97
Quad Cities 2	100	Mar-73	95	Dec-68		Apr-71		2.33					1.82
Sequoyah 1	984	Jul-81	504	Dec-72	225	Apr-75	178	2.33	4.38	1.89	2.82	1.56	3.68
Beaver Valley 1	599	Oct-76	452	Jun-72	311	Oct-74	270	2.33	1.93	1.32	1.67	1.25	1.86
Calvert Cliffs 2	335	Apr-77	239	Sep-72	204	Jan-75	162	2.33	1.64	1.24	1.48	1.18	1.96

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
Cooper	246	Jul-74	214	Dec-70	207	Apr-73	196	2.33	1.19	1.08	1.09	1.04	1.54
Farley 2	781	Jul-81	400	Dec-77	662	Apr-80	371	2.33	1.18	1.07	1.08	1.03	1.54
Salem 1	850	Jun-77	607	Dec-70	237	Apr-73	224	2.33	3.59	1.73	2.71	1.53	2.79
Arkansas 2	640	Mar-80	359	Jun-75	339	Oct-77	242	2.34	1.89	1.31	1.48	1.18	2.03
Arkansas 2	640	Mar-80	359	Sep-75	369	Jan-78	245	2.34	1.73	1.27	1.46	1.18	1.93
Browns Ferry 2	256	Mar-75	204	Sep-70	149	Jan-73	141	2.34	1.72	1.26	1.44	1.17	1.92
Calvert Cliffs 1	429	May-75	341	Sep-70	170	Jan-73	161	2.34	2.52	1.49	2.12	1.38	2.00
Calvert Cliffs 2	335	Apr-77	239	Sep-74	256	Jan-77	183	2.34	1.31	1.12	1.31	1.12	1.11
Farley 2	781	Jul-81	400	Sep-74	363	Jan-77	259	2.34	2.15	1.39	1.54	1.20	2.92
Indian Point 3	570	Aug-76	431	Mar-71	256	Jul-73	242	2.34	2.23	1.41	1.78	1.28	2.34
Sequoyah 1	984	Jul-81	504	Sep-74	313	Jan-77	223	2.34	3.15	1.63	2.26	1.42	2.92
Susquehanna 1	1947	Jun-83	903	Sep-79	1607	Jan-82	777	2.34	1.21	1.09	1.16	1.07	1.60
Davis-Besse 1	558	Jul-78	371	Dec-72	349	May-75	277	2.41	1.60	1.21	1.34	1.13	2.31
St. Lucie 1	470	Dec-76	355	Dec-72	318	May-75	253	2.41	1.48	1.18	1.40	1.15	1.66
Prairie Isl 2	172	Dec-74	149	Dec-71	145	May-74	126	2.41	1.19	1.07	1.19	1.07	1.24
Three Mile I. 1	398	Sep-74	346	Dec-69	180	May-72	180	2.41	2.21	1.39	1.92	1.31	1.97
Davis-Besse 1	558	Jul-78	371	Sep-73	409	Feb-76	309	2.42	1.36	1.14	1.20	1.08	2.00
Sequoyah 1	984	Jul-81	504	Jun-72	213	Nov-74	185	2.42	4.63	1.88	2.73	1.51	3.76
Browns Ferry 2	256	Mar-75	204	Sep-67	124	Feb-70	136	2.42	2.06	1.35	1.50	1.18	3.10
Browns Ferry 3	301	Mar-77	215	Sep-71	149	Feb-74	130	2.42	2.02	1.34	1.66	1.23	2.27
Millstone 1	97	Mar-71	101	Mar-67		Aug-69		2.42					1.65
Nine Mile Point	162	Dec-69	187	Jun-66	88	Nov-68	107	2.42	1.84	1.29	1.75	1.26	1.45
Susquehanna 1	1947	Jun-83	903	Sep-78	1293	Feb-81	662	2.42	1.51	1.18	1.36	1.14	1.96
Cook 1	538	Aug-75	428	Sep-70	339	Mar-73	321	2.50	1.59	1.20	1.33	1.12	1.97
Peach Bottom 2	522	Jul-74	454	Sep-69	206	Mar-72	206	2.50	2.54	1.45	2.20	1.37	1.93
Quad Cities 1	100	Feb-73	95	Sep-67		Mar-70		2.50					2.17
Beaver Valley 1	599	Oct-76	452	Dec-71	286	Jun-74	249	2.50	2.09	1.34	1.82	1.27	1.93
Davis-Besse 1	558	Jul-78	371	Jun-72	304	Dec-74	264	2.50	1.84	1.27	1.40	1.15	2.43
Farley 1	727	Dec-77	519	Jun-73	294	Dec-75	234	2.50	2.47	1.44	2.22	1.38	1.80
Farley 2	781	Jul-81	400	Dec-74	363	Jun-77	259	2.50	2.15	1.36	1.54	1.19	2.63
North Anna 1	782	Jun-78	520	Dec-71	344	Jun-74	299	2.50	2.27	1.39	1.74	1.25	2.60
Sequoyah 1	984	Jul-81	504	Dec-73	225	Jun-76	170	2.50	4.38	1.81	2.97	1.55	3.03
Sequoyah 1	984	Jul-81	504	Jun-73	225	Dec-75	178	2.50	4.38	1.81	2.82	1.51	3.23
St. Lucie 1	470	Dec-76	355	Dec-71	218	Jun-74	189	2.50	2.16	1.36	1.87	1.29	2.00
Beaver Valley 1	599	Oct-76	452	Jun-71	219	Dec-73	207	2.50	2.73	1.49	2.18	1.37	2.13
Salem 1	850	Jun-77	607	Jun-71	237	Dec-73	224	2.50	3.59	1.67	2.71	1.49	2.40
Trojan	452	May-76	342	Mar-72	233	Sep-74	202	2.50	1.94	1.30	1.69	1.23	1.67
North Anna 2	532	Dec-80	298	Mar-75	301	Sep-77	215	2.51	1.77	1.26	1.39	1.14	2.30
Salem 2	820	Oct-81	420	Mar-74	496	Sep-76	375	2.51	1.65	1.22	1.12	1.05	3.03
Farley 2	781	Jul-81	400	Sep-76	499	Apr-79	305	2.58	1.57	1.19	1.31	1.11	1.87
North Anna 2	532	Dec-80	298	Dec-72	227	Jul-75	180	2.58	2.34	1.39	1.65	1.21	3.10
Trojan	452	May-76	342	Dec-72	284	Jul-75	226	2.58	1.59	1.20	1.51	1.17	1.32
Cook 2	444	Jul-78	295	Sep-75	437	Apr-78	291	2.58	1.02	1.01	1.02	1.01	1.10
Hatch 1	390	Dec-75	310	Sep-70	184	Apr-73	174	2.58	2.12	1.34	1.78	1.25	2.03
Millstone 2	418	Dec-75	332	Sep-71	252	Apr-74	219	2.58	1.66	1.22	1.52	1.18	1.65
Sequoyah 1	984	Jul-81	504	Dec-71	213	Jul-74	185	2.58	4.63	1.81	2.73	1.48	3.71
Beaver Valley 1	599	Oct-76	452	Mar-72	309	Oct-74	269	2.58	1.94	1.29	1.68	1.22	1.77
Browns Ferry 2	256	Mar-75	204	Mar-68	124	Oct-70	136	2.58	2.06	1.32	1.50	1.17	2.71
Browns Ferry 3	301	Mar-77	215	Mar-68	124	Oct-70	136	2.58	2.42	1.41	1.58	1.19	3.48
North Anna 2	532	Dec-80	298	Mar-73	227	Oct-75	180	2.58	2.34	1.39	1.65	1.21	3.00
Quad Cities 2	100	Mar-73	95	Jun-69		Jan-72		2.58					1.45

	Actuals		ACTUAL	Estimates			EST.	Est.	NOMINAL		REAL		
Unit Name	Cost	COD	COST 1972$	Date of Estimate	Total Cost	COD	COST 1972$	Years to COD	COST RATIO	MYOPIA FACTOR	COST RATIO	MYOPIA FACTOR	DURATION RATIO
Salem 1	850	Jun-77	607	Mar-72	336	Oct-74	292	2.58	2.53	1.43	2.08	1.33	2.03
Sequoyah 2	623	Jun-82	301	Jun-76	364	Jan-79	222	2.58	1.71	1.23	1.35	1.12	2.32
Farley 2	781	Jul-81	400	Jun-74	338	Jan-77	241	2.59	2.31	1.38	1.66	1.22	2.74
Fort Calhoun 1	174	Jun-74	151	Sep-68	92	May-71	96	2.66	1.89	1.27	1.58	1.19	2.16
Lasalle 1	1336	Jan-84	603	Sep-76	585	May-79	358	2.66	2.28	1.36	1.69	1.22	2.76
North Anna 2	532	Dec-80	298	Sep-73	227	May-76	172	2.66	2.34	1.38	1.74	1.23	2.72
Oconee 2	160	Sep-74	139	Sep-69	109	May-72	109	2.66	1.47	1.15	1.27	1.10	1.88
Sequoyah 2	623	Jun-82	301	Sep-75	324	May-78	215	2.66	1.92	1.28	1.40	1.13	2.53
Three Mile I. 1	398	Sep-74	346	Sep-69	162	May-72	162	2.66	2.46	1.40	2.14	1.33	1.88
Arkansas 2	640	Mar-80	359	Jun-74	318	Feb-77	227	2.67	2.01	1.30	1.58	1.19	2.15
North Anna 2	532	Dec-80	298	Mar-74	240	Nov-76	181	2.67	2.22	1.35	1.64	1.20	2.53
Arkansas 2	640	Mar-80	359	Sep-74	318	Jun-77	227	2.75	2.01	1.29	1.58	1.18	2.00
Beaver Valley 1	599	Oct-76	452	Sep-70	219	Jun-73	207	2.75	2.73	1.44	2.18	1.33	2.21
Lasalle 1	1336	Jan-84	603	Dec-76	585	Sep-79	358	2.75	2.28	1.35	1.69	1.21	2.58
North Anna 1	782	Jun-78	520	Sep-71	310	Jun-74	269	2.75	2.52	1.40	1.93	1.27	2.46
North Anna 1	782	Jun-78	520	Jun-71	308	Mar-74	268	2.75	2.54	1.40	1.94	1.27	2.55
Three Mile I. 1	398	Sep-74	346	Dec-68	150	Sep-71	156	2.75	2.66	1.43	2.22	1.34	2.09
Turkey Point 4	123	Sep-73	116	Sep-69	41	Jun-72	41	2.75	2.99	1.49	2.83	1.46	1.46
North Anna 1	782	Jun-78	520	Mar-72	344	Dec-74	299	2.75	2.27	1.35	1.74	1.22	2.27
North Anna 2	532	Dec-80	298	Dec-74	264	Sep-77	189	2.75	2.02	1.29	1.58	1.18	2.18
Salem 2	820	Oct-81	420	Dec-73	497	Sep-76	375	2.75	1.65	1.20	1.12	1.04	2.85
Salem 1	850	Jun-77	607	Mar-70	237	Dec-72	237	2.75	3.59	1.59	2.56	1.41	2.63
Indian Point 3	570	Aug-76	431	Sep-68	156	Jul-71	162	2.83	3.65	1.58	2.65	1.41	2.81
North Anna 2	532	Dec-80	298	Sep-72	208	Jul-75	165	2.83	2.56	1.39	1.80	1.23	2.92
Hatch 2	509	Sep-79	312	Jun-76	512	Apr-79	313	2.83	0.99	1.00	0.99	1.00	1.15
Indian Point 3	570	Aug-76	431	Sep-69	156	Jul-72	156	2.83	3.65	1.58	2.76	1.43	2.46
Indian Point 3	570	Aug-76	431	Sep-70	218	Jul-73	206	2.83	2.61	1.40	2.09	1.30	2.10
Oconee 3	160	Dec-74	139	Sep-70	109	Jul-73	103	2.83	1.47	1.15	1.35	1.11	1.50
Crystal River 3	366	Mar-77	261	Jun-69	148	Apr-72	148	2.83	2.47	1.38	1.77	1.22	2.73
Farley 2	781	Jul-81	400	Jun-77	689	Apr-80	386	2.83	1.13	1.05	1.04	1.01	1.44
McGuire 1	906	Dec-81	464	Jun-74	220	Apr-77	157	2.83	4.12	1.65	2.95	1.47	2.65
North Anna 2	532	Dec-80	298	Jun-73	227	Apr-76	172	2.83	2.34	1.35	1.74	1.22	2.65
Peach Bottom 3	220	Dec-74	191	Dec-70	221	Oct-73	209	2.83	0.99	1.00	0.91	0.97	1.41
Sequoyah 2	623	Jun-82	301	Jun-74	313	Apr-77	223	2.83	1.99	1.28	1.35	1.11	2.82
Browns Ferry 3	301	Mar-77	215	Mar-71	149	Jan-74	130	2.84	2.02	1.28	1.66	1.20	2.11
St. Lucie 1	470	Dec-76	355	Jun-72	269	May-75	214	2.91	1.75	1.21	1.66	1.19	1.55
St. Lucie 2	1430	Aug-83	663	Jun-80	1100	May-83	510	2.91	1.30	1.09	1.30	1.09	1.09
Summer 1	1283	Jan-84	579	Jun-76	493	May-79	302	2.91	2.60	1.39	1.92	1.25	2.60
Three Mile I. 2	715	Dec-78	476	Jun-75	630	May-78	419	2.92	1.14	1.04	1.14	1.04	1.19
Zion 2	290	Sep-74	252	Jun-70	213	May-73	201	2.92	1.36	1.11	1.25	1.08	1.46
Arkansas 2	640	Mar-80	359	Mar-74	273	Feb-77	195	2.92	2.34	1.34	1.84	1.23	2.05
Browns Ferry 2	256	Mar-75	204	Mar-67	117	Feb-70	128	2.92	2.18	1.31	1.59	1.17	2.74
Dresden 2	83	Jun-70	90	Mar-66		Feb-69		2.92					1.45
Susquehanna 1	1947	Jun-83	903	Mar-78	1195	Feb-81	613	2.92	1.63	1.18	1.47	1.14	1.80
For: 2 <= t < 3													
Number of Data Points:								175	167	167	167	167	175
Average:								2.40	2.02	1.32	1.64	1.22	2.13
Standard Deviation:								0.28	0.73	0.18	0.45	0.13	0.58

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
Brunswick 1	318	Mar-77	227	Dec-72	214	Dec-75	170	3.00	1.49	1.14	1.34	1.10	1.42
Peach Bottom 2	522	Jul-74	454	Mar-68	163	Mar-71	170	3.00	3.20	1.47	2.67	1.39	2.11
Sequoyah 2	623	Jun-82	301	Dec-72	225	Dec-75	178	3.00	2.78	1.41	1.69	1.19	3.17
Arkansas 2	640	Mar-80	359	Dec-73	273	Dec-76	206	3.00	2.34	1.33	1.74	1.20	2.08
Duane Arnold	202	Feb-75	161	Dec-70	148	Dec-73	140	3.00	1.36	1.11	1.15	1.05	1.39
Hatch 1	390	Dec-75	310	Jun-70	184	Jun-73	174	3.00	2.12	1.28	1.78	1.21	1.83
Indian Point 2	206	Aug-74	179	Jun-66		Jun-69		3.00					2.72
Peach Bottom 3	220	Dec-74	191	Mar-70	221	Mar-73	209	3.00	0.99	1.00	0.91	0.97	1.58
Sequoyah 2	623	Jun-82	301	Sep-74	313	Sep-77	223	3.00	1.99	1.26	1.35	1.11	2.58
St. Lucie 1	470	Dec-76	355	Jun-71	203	Jun-74	176	3.00	2.32	1.32	2.01	1.26	1.83
Sequoyah 2	623	Jun-82	301	Jun-72	213	Jul-75	169	3.08	2.93	1.42	1.78	1.21	3.25
Browns Ferry 1	256	Aug-74	223	Sep-67	124	Oct-70	136	3.08	2.06	1.26	1.64	1.17	2.24
Browns Ferry 3	301	Mar-77	215	Sep-70	149	Oct-73	141	3.08	2.02	1.26	1.52	1.15	2.11
Salem 1	850	Jun-77	607	Sep-71	308	Oct-74	268	3.08	2.76	1.39	2.27	1.30	1.87
Farley 2	781	Jul-81	400	Dec-73	329	Jan-77	235	3.09	2.37	1.32	1.70	1.19	2.46
McGuire 1	906	Dec-81	464	Dec-74	384	Jan-78	255	3.09	2.36	1.32	1.82	1.21	2.27
Peach Bottom 3	220	Dec-74	191	Mar-71	263	Apr-74	229	3.09	0.84	0.94	0.84	0.94	1.22
Salem 2	820	Oct-81	420	Mar-71	237	Apr-74	206	3.09	3.46	1.50	2.04	1.26	3.43
Sequoyah 1	984	Jul-81	504	Mar-71	213	Apr-74	185	3.09	4.63	1.64	2.73	1.38	3.35
Zion 1	276	Dec-73	261	Mar-69	205	Apr-72	205	3.09	1.35	1.10	1.27	1.08	1.54
Fort Calhoun 1	174	Jun-74	151	Mar-69	92	May-72	92	3.17	1.89	1.22	1.64	1.17	1.66
McGuire 1	906	Dec-81	464	Sep-73	220	Nov-76	166	3.17	4.12	1.56	2.79	1.38	2.60
Oconee 2	160	Sep-74	139	Mar-69	93	May-72	93	3.17	1.73	1.19	1.50	1.14	1.74
Sequoyah 2	623	Jun-82	301	Jun-73	225	Aug-76	170	3.17	2.78	1.38	1.78	1.20	2.84
Sequoyah 2	623	Jun-82	301	Dec-73	225	Feb-77	160	3.17	2.78	1.38	1.88	1.22	2.68
Brunswick 1	318	Mar-77	227	Dec-71	181	Mar-75	144	3.25	1.76	1.19	1.58	1.15	1.62
Brunswick 2	382	Nov-75	304	Dec-70	195	Mar-74	169	3.25	1.96	1.23	1.79	1.20	1.51
McGuire 1	906	Dec-81	464	Dec-72	220	Mar-76	166	3.25	4.12	1.55	2.79	1.37	2.77
Peach Bottom 3	220	Dec-74	191	Dec-69	203	Mar-73	192	3.25	1.08	1.02	1.00	1.00	1.54
Salem 2	820	Oct-81	420	Dec-72	425	Mar-76	321	3.25	1.93	1.22	1.31	1.09	2.72
Sequoyah 2	623	Jun-82	301	Dec-71	213	Mar-75	169	3.25	2.93	1.39	1.78	1.20	3.23
Surry 1	247	Dec-72	247	Dec-67	144	Mar-71	150	3.25	1.71	1.18	1.64	1.17	1.54
Surry 2	150	May-73	142	Dec-68	123	Mar-72	123	3.25	1.22	1.06	1.15	1.04	1.36
Arkansas 2	640	Mar-80	359	Sep-73	275	Dec-76	208	3.25	2.33	1.30	1.73	1.18	2.00
Lasalle 1	1336	Jan-84	603	Sep-75	498	Dec-78	331	3.25	2.68	1.35	1.82	1.20	2.56
Pilgrim 1	231	Dec-72	231	Jun-68	122	Sep-71	127	3.25	1.89	1.22	1.81	1.20	1.39
Cook 1	538	Aug-75	428	Jun-69	235	Sep-72	235	3.25	2.29	1.29	1.82	1.20	1.90
Cook 2	444	Jul-78	295	Jun-69	235	Sep-72	235	3.25	1.89	1.22	1.26	1.07	2.79
Ginna	83	Jun-70	91	Mar-66		Jun-69		3.25					1.31
Hatch 1	390	Dec-75	310	Mar-70	185	Jun-73	175	3.25	2.11	1.26	1.77	1.19	1.77
Kewaunee	202	Jun-74	176	Mar-69	109	Jun-72	109	3.25	1.85	1.21	1.61	1.16	1.61
Farley 2	781	Jul-81	400	Dec-75	477	Apr-79	292	3.33	1.64	1.16	1.37	1.10	1.68
Millstone 2	418	Dec-75	332	Dec-70	239	Apr-74	208	3.33	1.75	1.18	1.60	1.15	1.50
North Anna 2	532	Dec-80	298	Mar-72	198	Jul-75	157	3.33	2.69	1.35	1.89	1.21	2.63
Oyster Creek 1	90	Dec-69	104	Jun-64		Oct-67		3.33					1.65
Arkansas 2	640	Mar-80	359	Jun-73	275	Oct-76	208	3.33	2.33	1.29	1.73	1.18	2.02
Calvert Cliffs 2	335	Apr-77	239	Sep-70	128	Jan-74	111	3.33	2.62	1.33	2.15	1.26	1.97
McGuire 1	906	Dec-81	464	Sep-74	365	Jan-78	243	3.33	2.48	1.31	1.91	1.21	2.17
Salem 2	820	Oct-81	420	Mar-70	237	Jul-73	224	3.33	3.46	1.45	1.87	1.21	3.47
Summer 1	1283	Jan-84	579	Dec-76	635	May-80	356	3.41	2.02	1.23	1.63	1.15	2.07

	Actuals		ACTUAL	Estimates			EST.	Est.	NOMINAL		REAL		
Unit Name	Cost	COD	COST 1972$	Date of Estimate	Total Cost	COD	COST 1972$	Years to COD	COST RATIO	MYOPIA FACTOR	COST RATIO	MYOPIA FACTOR	DURATION RATIO
Three Mile I. 1	398	Sep-74	346	Dec-67	124	May-71	129	3.41	3.21	1.41	2.68	1.33	1.98
Cook 2	444	Jul-78	295	Sep-70	339	Mar-74	295	3.50	1.31	1.08	1.00	1.00	2.24
Peach Bottom 2	522	Jul-74	454	Sep-67	163	Mar-71	170	3.50	3.20	1.40	2.67	1.32	1.95
Peach Bottom 3	220	Dec-74	191	Sep-69	193	Mar-73	183	3.50	1.14	1.04	1.05	1.01	1.50
Quad Cities 2	100	Mar-73	95	Sep-67		Mar-71		3.50					1.57
Beaver Valley 1	599	Oct-76	452	Dec-69	192	Jun-73	182	3.50	3.12	1.38	2.49	1.30	1.95
Ginna	83	Jun-70	91	Dec-65		Jun-69		3.50					1.29
North Anna 2	532	Dec-80	298	Dec-71	198	Jun-75	157	3.50	2.69	1.33	1.89	1.20	2.57
St. Lucie 1	470	Dec-76	355	Dec-70	200	Jun-74	174	3.50	2.35	1.28	2.04	1.23	1.72
Arkansas 1	233	Dec-74	202	Jun-69	132	Dec-72	132	3.50	1.77	1.18	1.53	1.13	1.57
Salem 2	820	Oct-81	420	Jun-71	237	Dec-74	206	3.50	3.46	1.43	2.04	1.23	2.95
Trojan	452	May-76	342	Mar-71	228	Sep-74	198	3.50	1.98	1.22	1.72	1.17	1.48
Farley 1	727	Dec-77	519	Sep-71	259	Apr-75	206	3.58	2.81	1.33	2.52	1.29	1.75
Hatch 2	509	Sep-79	312	Sep-75	513	Apr-79	314	3.58	0.99	1.00	0.99	1.00	1.12
Hatch 2	509	Sep-79	312	Sep-74	513	Apr-78	341	3.58	0.99	1.00	0.91	0.98	1.40
Point Beach 1	74	Dec-70	81	Sep-66		Apr-70		3.58					1.19
Farley 2	781	Jul-81	400	Jun-73	268	Jan-77	191	3.59	2.91	1.35	2.09	1.23	2.25
Summer 1	1283	Jan-84	579	Jun-74	355	Jan-78	236	3.59	3.61	1.43	2.45	1.28	2.67
Fort Calhoun 1	174	Jun-74	151	Sep-67	70	May-71	73	3.66	2.49	1.28	2.07	1.22	1.84
Maine Yankee	219	Dec-72	219	Sep-68	131	May-72	131	3.66	1.67	1.15	1.67	1.15	1.16
Oconee 1	156	Jul-73	147	Sep-67	93	May-71	96	3.66	1.68	1.15	1.53	1.12	1.59
Prairie Isl 2	172	Dec-74	149	Sep-70	112	May-74	97	3.66	1.53	1.12	1.53	1.12	1.16
Salem 2	820	Oct-81	420	Sep-71	308	May-75	245	3.66	2.66	1.31	1.72	1.16	2.75
St. Lucie 1	470	Dec-76	355	Sep-69	123	May-73	116	3.66	3.82	1.44	3.05	1.36	1.98
Three Mile I. 2	715	Dec-78	476	Sep-71	345	May-75	274	3.66	2.07	1.22	1.73	1.16	1.97
Three Mile I. 2	715	Dec-78	476	Sep-70	285	May-74	248	3.66	2.51	1.29	1.92	1.20	2.24
Three Mile I. 2	715	Dec-78	476	Sep-74	580	May-78	386	3.66	1.23	1.06	1.23	1.06	1.15
Millstone 1	97	Mar-71	101	Dec-65		Aug-69		3.67					1.43
Susquehanna 1	1947	Jun-83	903	Mar-77	1097	Nov-80	615	3.67	1.77	1.17	1.47	1.11	1.70
Brunswick 1	318	Mar-77	227	Jun-71	182	Mar-75	145	3.75	1.75	1.16	1.57	1.13	1.53
North Anna 2	532	Dec-80	298	Sep-71	191	Jun-75	152	3.75	2.79	1.31	1.96	1.20	2.47
Oconee 3	160	Dec-74	139	Sep-69	109	Jun-73	103	3.75	1.46	1.11	1.35	1.08	1.40
Quad Cities 1	100	Feb-73	95	Jun-66		Mar-70		3.75					1.78
Three Mile I. 2	715	Dec-78	476	Aug-72	465	May-76	351	3.75	1.54	1.12	1.35	1.08	1.68
Arkansas 1	233	Dec-74	202	Mar-69	138	Dec-72	138	3.75	1.69	1.15	1.47	1.11	1.53
Indian Point 3	570	Aug-76	431	Sep-67	154	Jul-71	160	3.83	3.70	1.41	2.69	1.29	2.34
Nine Mile Point	162	Dec-69	187	Sep-64	68	Jul-68	82	3.83	2.39	1.25	2.27	1.24	1.37
Arkansas 2	640	Mar-80	359	Dec-71	200	Oct-75	159	3.83	3.20	1.35	2.26	1.24	2.15
Browns Ferry 1	256	Aug-74	223	Dec-66	117	Oct-70	128	3.83	2.19	1.23	1.74	1.15	2.00
Crystal River 3	366	Mar-77	261	Jun-68	113	Apr-72	113	3.83	3.24	1.36	2.31	1.24	2.28
Point Beach 1	74	Dec-70	81	Jun-66		Apr-70		3.83					1.17
Sequoyah 1	984	Jul-81	504	Jun-70	187	Apr-74	162	3.83	5.27	1.54	3.11	1.34	2.89
Sequoyah 2	623	Jun-82	301	Jun-70	187	Apr-74	162	3.83	3.34	1.37	1.86	1.18	3.13
Calvert Cliffs 1	429	May-75	341	Mar-69	124	Jan-73	117	3.84	3.46	1.38	2.91	1.32	1.61
Browns Ferry 1	256	Aug-74	223	Sep-66	117	Aug-70	128	3.92	2.19	1.22	1.74	1.15	2.02
Monticello	105	Jun-71	109	Jun-66		May-70		3.92					1.28
Oconee 1	156	Jul-73	147	Jun-67	86	May-71	89	3.92	1.81	1.16	1.65	1.14	1.55
Robinson 2	78	Mar-71	81	Jun-66		May-70		3.92					1.21
Salem 1	850	Jun-77	607	Jun-67	149	May-71	155	3.92	5.71	1.56	3.91	1.42	2.55
Three Mile I. 1	398	Sep-74	346	Jun-67	106	May-71	110	3.92	3.76	1.40	3.14	1.34	1.85
Three Mile I. 2	715	Dec-78	476	Jun-73	525	May-77	375	3.92	1.36	1.08	1.27	1.06	1.40

	Actuals		ACTUAL	Estimates			EST.	Est.	NOMINAL		REAL		
			COST	Date of	Total		COST	Years	COST	MYOPIA	COST	MYOPIA	DURATION
Unit Name	Cost	COD	1972$	Estimate	Cost	COD	1972$	to COD	RATIO	FACTOR	RATIO	FACTOR	RATIO
Susquehanna 1	1947	Jun-83	903	Dec-76	1032	Nov-80	578	3.92	1.89	1.18	1.56	1.12	1.66
Dresden 3	104	Nov-71	108	Mar-66		Feb-70		3.92					1.45
For: 3 <= t < 4													
Number of Data Points:								103	91	91	91	91	103
Average:								3.44	2.39	1.27	1.84	1.18	1.97
Standard Deviation:								0.30	0.93	0.14	0.56	0.10	0.59
Duane Arnold	202	Feb-75	161	Dec-69	138	Dec-73	130	4.00	1.46	1.10	1.23	1.05	1.29
Lasalle 1	1336	Jan-84	603	Dec-74	445	Dec-78	296	4.00	3.00	1.32	2.04	1.19	2.27
St. Lucie 1	470	Dec-76	355	Jun-69	123	Jun-73	116	4.00	3.82	1.40	3.05	1.32	1.88
Arkansas 2	640	Mar-80	359	Sep-72	230	Oct-76	174	4.08	2.78	1.28	2.06	1.19	1.84
Browns Ferry 2	256	Mar-75	204	Sep-66	117	Oct-70	128	4.08	2.18	1.21	1.59	1.12	2.08
Sequoyah 1	984	Jul-81	504	Sep-69	187	Oct-73	176	4.08	5.27	1.50	2.86	1.29	2.90
Sequoyah 2	623	Jun-82	301	Sep-69	187	Oct-73	176	4.08	3.34	1.34	1.71	1.14	3.12
Vermont Yankee	172	Nov-72	172	Sep-66	88	Oct-70	96	4.08	1.95	1.18	1.79	1.15	1.51
Cooper	246	Jul-74	214	Mar-68	127	Apr-72	127	4.08	1.94	1.18	1.69	1.14	1.55
Farley 2	781	Jul-81	400	Mar-73	268	Apr-77	191	4.08	2.91	1.30	2.09	1.20	2.04
Point Beach 2	71	Oct-72	71	Mar-67		Apr-71		4.08					1.37
McGuire 1	906	Dec-81	464	Sep-71	220	Nov-75	175	4.17	4.12	1.40	2.65	1.26	2.46
Salem 1	850	Jun-77	607	Mar-67	139	May-71	145	4.17	6.12	1.54	4.19	1.41	2.46
Susquehanna 1	1947	Jun-83	903	Sep-76	1032	Nov-80	578	4.17	1.89	1.16	1.56	1.11	1.62
Three Mile I. 1	398	Sep-74	346	Mar-67	100	May-71	104	4.17	3.98	1.39	3.32	1.33	1.80
Zion 2	290	Sep-74	252	Mar-69	194	May-73	183	4.17	1.49	1.10	1.37	1.08	1.32
North Anna 1	782	Jun-78	520	Dec-69	281	Mar-74	244	4.25	2.78	1.27	2.13	1.19	2.00
Peach Bottom 2	522	Jul-74	454	Dec-66	138	Mar-71	144	4.25	3.79	1.37	3.16	1.31	1.79
Surry 1	247	Dec-72	247	Dec-66	130	Mar-71	135	4.25	1.90	1.16	1.82	1.15	1.41
Davis-Besse 1	558	Jul-78	371	Sep-70	266	Dec-74	231	4.25	2.10	1.19	1.60	1.12	1.84
Salem 1	850	Jun-77	607	Sep-67	152	Dec-71	158	4.25	5.59	1.50	3.84	1.37	2.29
Salem 1	850	Jun-77	607	Dec-67	152	Mar-72	152	4.25	5.59	1.50	3.99	1.39	2.24
Sequoyah 2	623	Jun-82	301	Sep-70	187	Dec-74	162	4.25	3.34	1.33	1.86	1.16	2.76
Surry 2	150	May-73	142	Dec-67	112	Mar-72	112	4.25	1.34	1.07	1.27	1.06	1.27
Beaver Valley 1	599	Oct-76	452	Mar-69	189	Jun-73	179	4.25	3.17	1.31	2.53	1.24	1.78
Hatch 1	390	Dec-75	310	Mar-69	151	Jun-73	143	4.25	2.59	1.25	2.17	1.20	1.59
Oconee 3	160	Dec-74	139	Mar-69	93	Jun-73	88	4.25	1.73	1.14	1.59	1.11	1.35
Millstone 2	418	Dec-75	332	Dec-69	183	Apr-74	159	4.33	2.28	1.21	2.09	1.19	1.38
Arkansas 2	640	Mar-80	359	Jun-71	190	Oct-75	151	4.33	3.37	1.32	2.37	1.22	2.02
Cook 1	538	Aug-75	428	Dec-67	235	Apr-72	235	4.33	2.29	1.21	1.82	1.15	1.77
Cook 2	444	Jul-78	295	Dec-67	235	Apr-72	235	4.33	1.89	1.16	1.26	1.05	2.44
San Onofre 2	2502	Aug-83	1160	Jun-77	1320	Oct-81	676	4.33	1.90	1.16	1.72	1.13	1.42
Summer 1	1283	Jan-84	579	Sep-72	297	Jan-77	212	4.33	4.32	1.40	2.73	1.26	2.61
Pilgrim 1	231	Dec-72	231	Feb-67	105	Jul-71	109	4.41	2.20	1.20	2.11	1.18	1.32
Oconee 1	156	Jul-73	147	Dec-66	76	May-71	79	4.41	2.05	1.18	1.86	1.15	1.49
St. Lucie 2	1430	Aug-83	663	Dec-78	919	May-83	426	4.41	1.56	1.11	1.56	1.11	1.06
Summer 1	1283	Jan-84	579	Dec-74	355	May-79	217	4.41	3.61	1.34	2.67	1.25	2.06
Oconee 2	160	Sep-74	139	Dec-67	88	May-72	88	4.42	1.82	1.15	1.58	1.11	1.53
Prairie Isl 1	233	Dec-73	221	Dec-67	105	May-72	105	4.42	2.22	1.20	2.10	1.18	1.36
North Anna 2	532	Dec-80	298	Sep-70	184	Mar-75	146	4.50	2.89	1.27	2.04	1.17	2.28
Peach Bottom 3	220	Dec-74	191	Sep-68	145	Mar-73	137	4.50	1.52	1.10	1.39	1.08	1.39

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
Quad Cities 2	100	Mar-73	95	Sep-66		Mar-71		4.50					1.45
Duane Arnold	202	Feb-75	161	Jun-69	133	Dec-73	126	4.50	1.52	1.10	1.28	1.06	1.26
Kewaunee	202	Jun-74	176	Dec-67	85	Jun-72	85	4.50	2.38	1.21	2.07	1.18	1.44
Hatch 2	509	Sep-79	312	Sep-73	404	Apr-78	269	4.58	1.26	1.05	1.16	1.03	1.31
Cooper	246	Jul-74	214	Sep-67	133	Apr-72	133	4.58	1.85	1.14	1.61	1.11	1.49
Summer 1	1283	Jan-84	579	Jun-73	297	Jan-78	197	4.59	4.32	1.38	2.93	1.26	2.31
Oconee 1	156	Jul-73	147	Sep-66	78	May-71	82	4.66	1.99	1.16	1.80	1.13	1.47
Salem 2	820	Oct-81	420	Sep-74	496	May-79	304	4.66	1.65	1.11	1.38	1.07	1.52
St. Lucie 2	1430	Aug-83	663	Sep-78	845	May-83	392	4.66	1.69	1.12	1.69	1.12	1.05
Maine Yankee	219	Dec-72	219	Sep-67	100	May-72	100	4.67	2.19	1.18	2.19	1.18	1.13
Nine Mile Point	162	Dec-69	187	Mar-64	68	Nov-68	82	4.67	2.39	1.20	2.27	1.19	1.23
Susquehanna 1	1947	Jun-83	903	Mar-76	1047	Nov-80	587	4.67	1.86	1.14	1.54	1.10	1.55
Salem 1	850	Jun-77	607	Sep-66	139	May-71	145	4.70	6.12	1.47	4.19	1.36	2.29
Three Mile I. 2	715	Dec-78	476	Aug-69	214	May-74	186	4.75	3.34	1.29	2.56	1.22	1.96
Trojan	452	May-76	342	Dec-69	227	Sep-74	197	4.75	1.99	1.16	1.73	1.12	1.35
Arkansas 2	640	Mar-80	359	Dec-70	183	Oct-75	145	4.83	3.50	1.30	2.47	1.21	1.91
Farley 1	727	Dec-77	519	Jun-70	203	Apr-75	161	4.83	3.58	1.30	3.22	1.27	1.55
Sequoyah 2	623	Jun-82	301	Dec-68	161	Oct-73	152	4.83	3.87	1.32	1.98	1.15	2.79
Calvert Cliffs 1	429	May-75	341	Mar-68	125	Jan-73	118	4.84	3.43	1.29	2.89	1.24	1.48
Calvert Cliffs 2	335	Apr-77	239	Mar-69	105	Jan-74	91	4.84	3.19	1.27	2.62	1.22	1.67
Peach Bottom 3	220	Dec-74	191	Mar-68	145	Jan-73	137	4.84	1.52	1.09	1.39	1.07	1.40
Oconee 2	160	Sep-74	139	Jun-67	86	May-72	86	4.92	1.87	1.14	1.62	1.10	1.47
For: 4 <= t < 5													
Number of Data Points:								63	61	61	61	61	63
Average:								4.40	2.78	1.24	2.15	1.18	1.76
Standard Deviation:								0.26	1.21	0.12	0.74	0.09	0.48
Duane Arnold	202	Feb-75	161	Dec-68	107	Dec-73	101	5.00	1.89	1.14	1.59	1.10	1.23
Hatch 1	390	Dec-75	310	Jun-68	160	Jun-73	151	5.00	2.44	1.20	2.05	1.15	1.50
North Anna 1	782	Jun-78	520	Mar-69	185	Mar-74	161	5.00	4.23	1.33	3.23	1.26	1.85
Oconee 3	160	Dec-74	139	Jun-68	88	Jun-73	83	5.00	1.82	1.13	1.67	1.11	1.30
St. Lucie 2	1430	Aug-83	663	Dec-74	537	Dec-79	329	5.00	2.66	1.22	2.02	1.15	1.73
Arkansas 1	233	Dec-74	202	Dec-67	132	Dec-72	132	5.00	1.77	1.12	1.53	1.09	1.40
St. Lucie 2	1430	Aug-83	663	Dec-75	620	Dec-80	347	5.00	2.31	1.18	1.91	1.14	1.53
Sequoyah 1	984	Jul-81	504	Sep-68	161	Oct-73	152	5.08	6.11	1.43	3.31	1.27	2.52
Calvert Cliffs 1	429	May-75	341	Dec-67	123	Jan-73	116	5.09	3.49	1.28	2.93	1.24	1.46
Crystal River 3	366	Mar-77	261	Mar-67	110	Apr-72	110	5.09	3.33	1.27	2.38	1.19	1.97
Zion 1	276	Dec-73	261	Mar-67	164	Apr-72	164	5.09	1.68	1.11	1.59	1.10	1.33
Fitzpatrick	419	Jul-75	333	Mar-68	224	May-73	212	5.17	1.87	1.13	1.57	1.09	1.42
Lasalle 1	1336	Jan-84	603	Mar-73	407	May-78	271	5.17	3.28	1.26	2.23	1.17	2.10
McGuire 1	906	Dec-81	464	Sep-70	179	Nov-75	142	5.17	5.06	1.37	3.26	1.26	2.18
Prairie Isl 1	233	Dec-73	221	Mar-67	100	May-72	100	5.17	2.33	1.18	2.21	1.17	1.31
Brunswick 1	318	Mar-77	227	Dec-70	194	Mar-76	147	5.25	1.64	1.10	1.55	1.09	1.19
Davis-Besse 1	558	Jul-78	371	Sep-69	201	Dec-74	175	5.25	2.78	1.21	2.12	1.15	1.68
Lasalle 1	1336	Jan-84	603	Sep-72	407	Dec-77	291	5.25	3.28	1.25	2.08	1.15	2.16
Lasalle 1	1336	Jan-84	603	Sep-73	430	Dec-78	286	5.25	3.11	1.24	2.11	1.15	1.97
Salem 2	820	Oct-81	420	Dec-67	128	Mar-73	121	5.25	6.41	1.42	3.47	1.27	2.64
Surry 2	150	May-73	142	Dec-66	108	Mar-72	108	5.25	1.39	1.06	1.31	1.05	1.22

	Actuals		ACTUAL	Estimates			EST.	Est.	NOMINAL		REAL		
Unit Name	Cost	COD	COST 1972$	Date of Estimate	Total Cost	COD	COST 1972$	Years to COD	COST RATIO	MYOPIA FACTOR	COST RATIO	MYOPIA FACTOR	DURATION RATIO
Beaver Valley 1	599	Oct-76	452	Mar-68	150	Jun-73	142	5.25	3.99	1.30	3.19	1.25	1.64
San Onofre 2	2502	Aug-83	1160	Mar-74	655	Jun-79	401	5.25	3.82	1.29	2.89	1.22	1.79
St. Lucie 2	1430	Aug-83	663	Sep-75	537	Dec-80	301	5.25	2.66	1.21	2.20	1.16	1.51
Hatch 2	509	Sep-79	312	Dec-72	330	Apr-78	219	5.33	1.54	1.08	1.42	1.07	1.27
Millstone 2	418	Dec-75	332	Dec-68	179	Apr-74	156	5.33	2.34	1.17	2.14	1.15	1.31
Lasalle 1	1336	Jan-84	603	Jun-70	360	Oct-75	286	5.33	3.71	1.28	2.11	1.15	2.55
Lasalle 1	1336	Jan-84	603	Jun-73	407	Oct-78	271	5.33	3.28	1.25	2.23	1.16	1.98
San Onofre 2	2502	Aug-83	1160	Jun-76	1210	Oct-81	620	5.33	2.07	1.15	1.87	1.12	1.34
Peach Bottom 3	220	Dec-74	191	Sep-67	145	Jan-73	137	5.34	1.52	1.08	1.39	1.06	1.36
Rancho Seco	344	Apr-75	273	Dec-67	134	May-73	127	5.42	2.56	1.19	2.16	1.15	1.35
Duane Arnold	202	Feb-75	161	Jun-68	103	Dec-73	97	5.50	1.96	1.13	1.65	1.10	1.21
Oconee 3	160	Dec-74	139	Dec-67	93	Jun-73	88	5.50	1.73	1.10	1.59	1.09	1.27
St. Lucie 2	1430	Aug-83	663	Jun-74	360	Dec-79	220	5.50	3.97	1.29	3.01	1.22	1.67
Trojan	452	May-76	342	Mar-69	197	Sep-74	171	5.50	2.29	1.16	2.00	1.13	1.30
Farley 1	727	Dec-77	519	Sep-69	164	Apr-75	130	5.58	4.44	1.31	3.98	1.28	1.48
Beaver Valley 1	599	Oct-76	452	Dec-67	150	Jul-73	142	5.58	3.99	1.28	3.19	1.23	1.58
Farley 2	781	Jul-81	400	Sep-71	233	Apr-77	166	5.58	3.35	1.24	2.41	1.17	1.76
Calvert Cliffs 1	429	May-75	341	Jun-67	118	Jan-73	112	5.59	3.64	1.26	3.06	1.22	1.42
Susquehanna 1	1947	Jun-83	903	Sep-73	810	May-79	496	5.66	2.40	1.17	1.82	1.11	1.72
Lasalle 1	1336	Jan-84	603	Sep-71	360	May-77	257	5.66	3.71	1.26	2.35	1.16	2.18
Oconee 2	160	Sep-74	139	Sep-66	75	May-72	75	5.66	2.12	1.14	1.85	1.11	1.41
Salem 2	820	Oct-81	420	Sep-67	128	May-73	121	5.66	6.41	1.39	3.47	1.25	2.49
Trojan	452	May-76	342	Dec-68	196	Sep-74	170	5.75	2.31	1.16	2.01	1.13	1.29
St. Lucie 2	1430	Aug-83	663	Dec-72	360	Oct-78	239	5.83	3.97	1.27	2.77	1.19	1.83
Calvert Cliffs 2	335	Apr-77	239	Mar-68	106	Jan-74	92	5.84	3.16	1.22	2.60	1.18	1.56
Summer 1	1283	Jan-84	579	Mar-71	234	Jan-77	167	5.84	5.48	1.34	3.47	1.24	2.20
Hatch 2	509	Sep-79	312	Jun-70	189	Apr-76	143	5.88	2.69	1.18	2.18	1.14	1.57
St. Lucie 2	1430	Aug-83	663	Jun-77	850	May-83	394	5.91	1.68	1.09	1.68	1.09	1.04
Zion 2	290	Sep-74	252	Jun-67	153	May-73	145	5.92	1.90	1.11	1.74	1.10	1.23
Susquehanna 1	1947	Jun-83	903	Dec-74	945	Nov-80	530	5.92	2.06	1.13	1.70	1.09	1.44
Davis-Besse 1	558	Jul-78	371	Dec-68	180	Dec-74	156	6.00	3.10	1.21	2.37	1.15	1.60
Pilgrim 1	231	Dec-72	231	Jul-65	70	Jul-71	73	6.00	3.30	1.22	3.17	1.21	1.24
San Onofre 2	2502	Aug-83	1160	Jun-73	655	Jun-79	401	6.00	3.82	1.25	2.89	1.19	1.69
St. Lucie 2	1430	Aug-83	663	Dec-76	850	Dec-82	411	6.00	1.68	1.09	1.61	1.08	1.11
Susquehanna 1	1947	Jun-83	903	Jun-69	150	Jun-75	119	6.00	12.98	1.53	7.57	1.40	2.33
Lasalle 1	1336	Jan-84	603	Dec-71	360	Dec-77	257	6.00	3.71	1.24	2.35	1.15	2.01
Oconee 3	160	Dec-74	139	Jun-67	92	Jun-73	87	6.00	1.74	1.10	1.60	1.08	1.25
San Onofre 2	2502	Aug-83	1160	Jun-70	213	Jun-76	161	6.00	11.75	1.51	7.21	1.39	2.19
Millstone 2	418	Dec-75	332	Mar-68	146	Apr-74	127	6.08	2.86	1.19	2.62	1.17	1.27
San Onofre 2	2502	Aug-83	1160	Sep-75	1142	Oct-81	585	6.08	2.19	1.14	1.98	1.12	1.30
Calvert Cliffs 2	335	Apr-77	239	Dec-67	107	Jan-74	93	6.09	3.13	1.21	2.58	1.17	1.53
Peach Bottom 3	220	Dec-74	191	Dec-66	125	Jan-73	118	6.09	1.76	1.10	1.62	1.08	1.31
Susquehanna 1	1947	Jun-83	903	Sep-74	810	Nov-80	454	6.17	2.40	1.15	1.99	1.12	1.42
St. Lucie 2	1430	Aug-83	663	Sep-76	620	Dec-82	300	6.25	2.31	1.14	2.21	1.14	1.11
San Onofre 2	2502	Aug-83	1160	Mar-70	189	Jun-76	143	6.25	13.24	1.51	8.12	1.40	2.15
Millstone 2	418	Dec-75	332	Dec-67	150	Apr-74	130	6.33	2.79	1.18	2.55	1.16	1.26
San Onofre 2	2502	Aug-83	1160	Mar-75	1142	Jul-81	585	6.34	2.19	1.13	1.98	1.11	1.33
Susquehanna 1	1947	Jun-83	903	Dec-72	703	May-79	430	6.41	2.77	1.17	2.10	1.12	1.64
Prairie Isl 2	172	Dec-74	149	Dec-67	80	May-74	69	6.41	2.16	1.13	2.16	1.13	1.09
San Onofre 2	2502	Aug-83	1160	Dec-71	409	Jun-78	272	6.50	6.12	1.32	4.27	1.25	1.79
Farley 2	781	Jul-81	400	Sep-70	183	Apr-77	131	6.58	4.27	1.25	3.06	1.19	1.65

Unit Name	Actuals Cost	Actuals COD	ACTUAL COST 1972$	Estimates Date of Estimate	Estimates Total Cost	Estimates COD	EST. COST 1972$	Est. Years to COD	NOMINAL COST RATIO	NOMINAL MYOPIA FACTOR	REAL COST RATIO	REAL MYOPIA FACTOR	DURATION RATIO
San Onofre 2	2502	Aug-83	1160	Dec-74	893	Jul-81	458	6.58	2.80	1.17	2.54	1.15	1.32
Calvert Cliffs 2	335	Apr-77	239	Jun-67	105	Jan-74	91	6.59	3.19	1.19	2.62	1.16	1.49
San Onofre 2	2502	Aug-83	1160	Sep-71	363	Jun-78	241	6.75	6.89	1.33	4.81	1.26	1.77
Susquehanna 1	1947	Jun-83	903	Sep-69	150	Jun-76	113	6.75	12.98	1.46	7.97	1.36	2.04
St. Lucie 2	1430	Aug-83	663	Mar-73	360	Dec-79	220	6.75	3.97	1.23	3.01	1.18	1.54
St. Lucie 2	1430	Aug-83	663	Mar-74	360	Dec-80	202	6.75	3.97	1.23	3.29	1.19	1.39
Susquehanna 1	1947	Jun-83	903	Jun-71	373	Jun-78	248	7.00	5.22	1.27	3.64	1.20	1.71
Susquehanna 1	1947	Jun-83	903	Mar-72	645	May-79	394	7.16	3.02	1.17	2.29	1.12	1.57
Susquehanna 1	1947	Jun-83	903	Dec-71	526	May-79	322	7.41	3.70	1.19	2.80	1.15	1.55
Susquehanna 1	1947	Jun-83	903	Dec-70	250	Jun-78	166	7.50	7.79	1.31	5.43	1.25	1.67
For: 5 <= t													
Number of Data Points:								82	82	82	82	82	82
Average:								5.77	3.63	1.22	2.69	1.17	1.61
Standard Deviation:								0.61	2.46	0.10	1.38	0.07	0.37