(2)

AFFIDAVIT OF WELLS EDDLEMAN
Opposing Summary Disposition of Eddleman Contention 15-AA

My name is Wells Eddleman. I am an energy consultant and live at 718-A Iredell St., Durham NC 27705. A short statement of my qualifications is attached as Exhibit Q. (It's on "Facts in Dispute" back of p. 3 to save paper. WE.) I have repeatedly been recognized as an expert in energy systems and energy conservation before the NC Utilities Commission. I have twice presented capacity factor studies by Dr. Lavon Page and myself as an expert before that Commission.

The statements in the accompanying "Statement of Material Facts in Dispute on Eddleman Contention 15AA" are true to the best of my knowledge and belief at present. Most are verified also in the affidavit of Charles Komanoff and his accompanying letter and calculations, which are verified in his affidavit.

Komanoff and I (and others) agree that there is no way to be sure in advance what the capacity factor of a nuclear plant will be, whether for a year or over an operating lifetime. It may be 70%, or 40%, or (as in the case of TMI-2) under 1% on a 25 or 30-year lifetime basis. However, NRC Staff has a record of overestimating future performance of nuclear plants. In assigning benefits to something that hasn't happened yet (e.g. Harris 1 operation), the most reasonable procedure is to make conservative assumptions and calculations. The Staff's and Applicants' analysis of Harris CF is not sufficiently conservative, particularly for the reasons stated in "Statement of Material Facts in Dispute on Eddleman Contention 15AA" and/or noted in Komanoff's affidavit and supporting materials. Staff excludes from its statistics the nuclear plants shut down for long periods or indefinitely. A sample of the remaining plants is thus biased toward higher performance levels, since a shut-down plant has zero C.F. during the period it is shut down.

I am familiar with two NCUC cases in which CP&L was penalized by the NC Utilities Commission for mismanagement of the Brunswick plant, each involving an outage of more than 70 days attributed to

such mismanagement (Dockets E-2 sub 444 and E-2 sub 461). In the latter case, the outage was caused by failure to conduct NRC-required leak rate tests on the Brunswick plant containment for 4 years. NRC fined CP&L $600,000 for this failure.

Based on this and other evidence of CP&L's effect on performance at its Brunswick plant, including bad design, mismanagement, and failure to comply with regulations, I conclude that the greater CP&L's involvement in designing and building a nuclear plant, the more problems it has. This is surely true in comparing CP&L's Robinson 2 plant, a turnkey Westinghouse project, to Brunswick. The Robinson plant's performance is about average for a plant of its size, not statistically different from the size-adjusted average or norm by any reliable measure I've seen.

Brunswick, in contrast, is the worst-performing pair of BWRs in the nation; individually the units are worst and 2d worst in lifetime capacity factor. The Brunwsick plant is so far below the BWR norm that the capacity-factor-vs.-size arrangement for BWRS has a swayback shape with Brunswick the bottom of the swayback. Other studies, e.g. Komanoff's, have statistically found what I view as empirically true: Brunswick's low capacity factor cannot be explained by the factor of "salt" (i.e. brackish) water cooling. Brunswick does have a history of mismanagement that is more extensive than that of any other nuclear plant I am familiar with. It has had repeated and extensive (even overwhelming)problems while having a high rate of staff turnover and other management-related deficiencies.

In my view, non-statistical factors such as mismanagement, CP&L involvement in design, and poor operating practice by CP&L, explain most of the difference between Brunswick's actual CF and the norm or expected CF for a BWR unit of similar size (821 MWe DER).

No one, to my knowledge, has done an extensive comparison of the Harris design with other Westinghouse PWRs in operation or under construction which would be a valid basis for emstimating exactly the effects of design similarities or differences on Harris (vs. other plants') capacity factor. CP&L's Koppe affidavit does not address specific problems of the Harris design.

Nor has anyone validated that Harris is built as designed, as far as I know. The NRC construction audit of Harris may have been completed, but I have not seen the report of this audit or been able to check into it. NRC doesn't have the personnel or time to verify the plant's design as-built.

Therefore, it is reasonable to look at similar plants for indications of Harris' capacity factor. Westinghouse model D steam generators are already associated with operating problems. Too little operating experience has been had with the "fix" for these steam generators to be sure how well it works or what the steam generator performance will be over a long time.

CP&L identified Beaver Valley and North Anna 1 and 2 as plants similar to Harris, back in the early days of the Harris project. Beaver Valley is the "Brunswick of Wesgtinghouse PWRS" with a capacity factor of under 38% on a design-electrical-rating basis at 12-31-83. The North Anna units have performed better, but the 3 average under 55% C.F., with the longest-operating unit (XBeaver Valley 1) having the lowest capacity factor. This indicates to me that 55% is too high an estimate for Harris C.F. NRC's record of overestimating C.F. in licensing proceedings (both as I know it and upon information & belief), adds strength to this view on my part.

Finally, CP&L is even more involved in the Harris project than in Brunswick. The "CP&L effect" on Brunswick is substantial, a drop of something like 8 to 15% in capacity factor. The drop for Harris could well be greater, given CP&L's greater involvement.

STATE OF NORTH CAROLINA

COUNTY OF ORANGE

Today Wells Eddleman personally appeared before me and affirmed that the statements in his Affidavit Opposing Summary Disposition of Eddleman Contention 15-AA, and in his Response in opposition to Summary Disposition on 15-AA, are true and correct to the best of his present knowledge and belief.

16 April, 1984

Wells Eddleman

Wells Eddleman

Hilda V. Chappell, Notary
1424 Surry Court
Durham N.C. 27705
My commission expires 11-3-88

(2)

STATE of NEW YORK
COUNTY OF New York

AFFIDAVIT OF CHARLES KOMANOFF

Charles Komanoff, being duly affirmed, deposes and says:

1. I am principal of Komanoff Energy Associates, author of [illegible] Power Plant Cost Escalation and of numerous studies of nuclear power plant capacity factors. A statement of my credentials and experience is attached.

2. I ran certain statistics for Wells Eddleman of 718-A Iredell St., Durham, NC 27705, which are stated in my letter to Wells Eddleman of 718-A Iredell St Durham NC 27705, dated 3/12/84. These statistics are valid in my view.

3. The average capacity factor of all Westinghouse units is a highly inappropriate way to estimate capacity factor for a Westinghouse unit of approximately 900MWe, such as Shearon Harris. The statistical difference between Westinghouse units under 600 MWe and those larger units (over 600 MWe) is significant beyond the 99.9% confidence level. See item 8 of my letter to Eddleman, referred to above.

4. Carolina Power and Light Company identified Beaver Valley 1 and North Anna 1 and 2 as units similar to Harris 1 in its testimony in NC Utilities Commission docket E-2 sub 203 (seeking a Certificate of Public Convenience and Necessity to construct Harris), and that similarity is reflected in the NC Commission's Order awarding the certificate. CP&L discovery documents in my possession confirm that CP&L admits it is the source of this statement as to which units are similar to Harris.

4. In my opinion, Harris is most similar to units ordered at the same time, not to units completed at the same time. This would make Beaver Valley 1, North Anna 1 and 2, and perhaps V.C. Summer, the most similar plants to Harris. The average performance of Beaver Valley 1, and the two North Anna units to date, is under 55% capacity factor.

5. Performance of all PWRs of a similar size to Harris should include Three Mile Island 1 and 2, which have very small lifetime capacity factors. In any case, the universe of all similar sized PWRs is not an appropriate predictive grouping for Harris 1 because of differences in design, manufacturer, operators, and other differences. Nor is all PWRS an appropriate predictive group for Harris 1 performance, for the same reasons that all similar sized PWRs is not appropriate. Finally, the architect/engineer's experience on plants of all types and sizes is particularly inappropriate for predicting the performance of a plant built with the same architect/engineer.

6. The capacity factors of nuclear plants ~~coming on line~~ (C.K.) after 1979 (such as Harris) have actually been depressed relative to ~~those/ coming on line in~~ (C.K.) (C.K.) 1978 and earlier. My statistical studies show this depression is significant at the 99.8 to 99.9% confidence levels or above. Actual performance shows no basis for assuming improved performance by units such as Harris coming on line after 1979.

7. There is a statistically significant depression of capacity factor associated with the Brunswick plant operated by CP&L and built with much greater input and work by CP&L than was Robinson 2 (a turnkey plant). The two higher multiple-R's found for statistical analysis of this factor and others affecting BWR performance show respectively a loss of 9.2% significant at the 95% confidence level and a loss factor of 11.5% significant at the 99.5% confidence level. Brunswick is statistically different from all other BWRs (in capacity factor) at the 99.8%

confidence level.

8. The difference between the actual performance of Robinson unit 2 and the statistical norm for such a Westinghouse reactor is not statistically significant. It is about plus three percent. Robinson 2 will be out of service most of 1984 for steam generator replacement.

9. The depression of capacity factor associated with Brunswick is distinct from the lowering of capacity factor due to salt (or brackish) water cooling. See item 8 of my letter to Wells Eddleman.

10. One difference between Robinson 2 and Brunswick was CP&L's greater involvement with constructing Brunswick. I understand that CP&L's involvement in constructing Harris is even greater than its involvement with Brunswick.

11. The effect of Westinghouse model D steam generators on nuclear plant performance ~~has~~ [through 1983 appears to have (C.K.)] been to reduce performance. The evaluation of performance following various "fixes" of these types of steam generators must await the accumulation of some years of data on actual performance of plants on which such "fixes" have been performed.

12. Westinghouse 3-loop PWRS are associated with a reduction of 11.5 to 11.8% in capacity factor [relative to 2-loop plants (C.K.)], significant in my analysis beyond the 99.9% confidence level. Harris 1 is a 3-loop Westinghouse PWR.

13. If Robinson 2 achieved 100% CF for 2 months of 1984 and spent the rest of the year in its planned 10 month steam generator replacement outage, its lifetime capacity factor as of the end of 1984, ~~xxx~~ would likely fall by about 3½ percentage points, i.e. to at or below the present Westinghouse PWR norm as I calculate it.

14. There is no showing that CP&L management is NOT to blame for the lower capacity factor of the Brunswick plants. CP&L discovery documents in my possession show that the NC Utilities Commission has twice penalized CP&L for mismanagement in extended outages at the Brunswick plant, and that CP&L agrees that outages reduce capacity factor.

15. It is not reasonable in the light of the above information to assume that Harris 1 will have a lifetime capacity factor above 55 percent in commercial operation, throughout its expected operating lifetime. Historically, nuclear plants have not performed as well as either the owners, manufacturers or NRC Staff have predicted.

16. There is no reason known to me to assume that CP&L will do a~~k~~ better job of constructing, or of managing or operating Harris, than CP&L did at Brun~~xx~~swick.

Charles Komanoff
Charles Komanoff

3 April 1984

Filing of this affidavit without a notary's seal was approved by Judge Kelley, oral order of April 13, 1984. Komanoff has much difficulty getting to a notary. W.E.

KOMANOFF ENERGY ASSOCIATES

12 March 1984

Mr. Wells Edelman
718-A Uredell St
Durham, NC 27705

Dear Wells:

Pursuant to our telephone conversation yesterday, I ran certain statistics concerning the capacity factors of the Brunswick and Robinson nuclear units of Carolina Power & Light, of General Electric design units as a whole, and of Westinghouse design units as a whole.

I've attached print-outs of the results. This letter will summarize the results and the definitions underlying the calculations.

Komanoff Energy Associates calculates capacity factors based on the <u>original</u> "design electrical ratings" published for each unit when it was first listed in the NRC "Gray Book." Thus, CP&L units have design ratings of 821 MW for Brunswick and 707 MW for Robinson 2.

We exclude all small (less than 400 MW) units. We also exclude operation by each unit in its initial partial year of commercial operation, i.e., prior to the first New Years Day on which the unit was in commercial service.

Capacity factors are calculated through 1983.

The results of the calculations are as follows:

1. Brunswick 1 has a lifetime capacity factor of 44.2% for 6 years of operation. This is the 9th lowest lifetime capacity factor among U.S. nuclear units, and the 2nd lowest among GE-design units.

2. Brunswick 2 has a lifetime capacity factor of 42.3% for 8 years of operation. This is the 6th lowest lifetime capacity factor among U.S. nuclear units, and the lowest among GE-design units.

3. The two Brunswick units together have a lifetime capacity factor of 43.1% for 14 years of operation.

4. All U.S. GE-design nuclear units have an average lifetime capacity factor of 58.2% for 213 years of operation.

5. All U.S. GE-design nuclear units excluding Brunswick 1 and 2 have an average lifetime capacity factor of 59.2% for 199 years of opeartion.

6. The difference between the average capacity factor for Brunswick and the average for non-Brunswick GE-design units is 16.1%. This difference is statistically significant to the 99.8% confidence level, indicating that the capacity factor difference between Brunswick and other GE units is not the result of random factors.

7. Some of the difference between the performance of Brunswick and that of other GE units appears to be due to the deleterious effects of

saltwater cooling at Brunswick. However, multiple regression analysis of all GE performance to date indicates that, controlling for the difference between performance of GE salt-cooled units and GE non salt-cooled units, there is a "Brunswick factor" which implies about an 8 percentage point loss in performance, which is significant to about the 90% confidence level. Moreover, other regression formulations indicate that the Brunswick factor may be larger, implying about an 11.5 percentage point performance loss, which is significant to beyond the 99% confidence level.

8. A separate examination of the performance of U.S. Westinghouse-design nuclear units indicates that the average capacity factor of all such units of less than 600 MW capacity is 70.4% to date, for 97 years of operation, while the average capacity factor of Westinghouse units larger than 600 MW has been 55.2%, for 147 years of operation. The difference between the averages for the two groups, 15.3%, is significant beyond the 99.9% confidence level.

9. CP&L's Robinson 2 unit has a lifetime capacity factor of 63.2% for its 12 years of operation. It has out-performed the Westinghouse norm by an average of 3 percentage points per year. The norm is not an average of Westinghouse capacity factors, but rather a statistical construct based on causal factors, such as year of operation, unit size, unit age, etc., that have affected capacity factors of Westinghouse units to date. The 3 percentage point difference between Robinson 3 and the Westinghouse norm is not statistically significant.

The following definitions may be helpful to you in interpreting the variables used in the GE and Westinghouse performance regression equations:

BRUNSWIC = 1 for Brunswick 1 and 2

BFFIRE = 1 for Browns Ferry 1 and 2 in 1975 and 1976

YR7374 = 1 for operation during 1973-74

YR7475 = 1 for operation during 1974-75

YR8083 = 1 for operation during 1980-83

POSTTMI = 1 for operation after 1978

GESMALL = 1 for GE units less than 700 MW

SALT = 1 for saltwater-cooled units

SALTAGE = the variable SALT (above) times the unit's age

TOWER = 1 for units with cooling towers

POSTSG = 1 for a unit whose steam generator was replaced in a previous year

NEWSG = 1 for a unit undergoing steam generator replacement in that year

OLDER12 = 1 for any unit older than 12

SOL12 = 1 for a saltwater-cooled unit older than 12

WQUAKE = 1 for five individual Westinghouse unit-years in which capacity factor was significantly reduced due to shutdowns to resolve earthquake concerns

DUPE = 1 for a unit built alongside and soon after an identical unit

FOURLOOP = 1 for Westinghouse 4-loop plants, except Connecticut Yankee

TRILOOP = 1 for Westinghouse 3-loop plants

MATURE5 = Age minus 5, for units less than 5 years old, and equals 0 otherwise

Please feel free to circulate this letter, if you wish. Don't hesitate to call if any of the points here require further elucidation.

Sincerely,

Charles Komanoff

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DISPLAY? M,S,N     4.         5.         6.         7.       cells
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GE

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BREAKDOWN OF  CAPF
    ACROSS -  NUMBER   - NUMBER

M,S,N     4.         5.         6.         7.         8.        14.        17.

    47.952    58.076    59.793    44.235    42.315    62.208    56.667
   431.564   464.609   358.758   265.411   338.518   559.870   736.673
         9         8         6         6         8         9        13

M,S,N    18.        19.        22.        25.        26.        32.        34.

    56.506    50.727    58.914    54.147    56.969    62.482    72.778
   678.069   405.815   471.315   433.174   227.874   749.782   873.339
        12         8         8         8         4        12        12

M,S,N    35.        41.        43.        44.        45.        50.        51.

    58.743    55.352    60.068    60.093    57.923    60.719    57.476
   822.395   774.925   540.613   540.835   637.158   667.905   632.233
        14        14         9         9        11        11        11

M,S,N    67.          TOTAL

    70.514  :    58.153
   775.655  : 12386.490
        11  :       213


===PRINTOUT OFF===
/cinoyte
compute b


DISPLAY? ?

STATISTICS UNIVARIATE SEPARATE POOLED PAIRED T or ALL.
STATISTICS: Default statistics - T.
UNIVARIATE: N, mean, standard deviation, standard error.
SEPARATE and POOLED: Independent sample T tests.
PAIRED: Paired sample T test.
T: Separate variance or paired sample test as appropriate.

DISPLAY? t


GROUP 1: BRUNSWIC EQ 1.00
GROUP 2: BRUNSWIC NE 1.00


SEPARATE VARIANCE

                    DIFFERENCE
VARIABLE          MEAN    STD ERR      T         DF   PROB

CAPF           -16.071      4.237   -3.79        15   .002

DISPLAY?
 ^PrtSc=prnt  Alt- T=tran R=recv V=view D=dial E=echo M=mesg X=exit (Home)=Help

GROUP 1: BRUNSWIC EQ 1.00
GROUP 2: BRUNSWIC NE 1.00
```

SALT AGE

8 STEPS PERFORMED
DISPLAY? both

DEPENDENT: CAPF 8 VARIABLES IN. LAST IN: BRUNSWIC BFFIRE OLDER12
YR7475 GESMALL YR8083
SALT AGE

MULTIPLE R = .57245 R SQUARE = .32769 F = 12.42918
SIGNIF F = .00000

IN EQUATION

	VARIABLE	B	BETA	F	SIGF
*	BRUNSWIC	-8.36123	-.12901	2.838	.094
	BFFIRE	-41.12581	-.30175	26.591	.000
	OLDER12	-35.10565	-.33095	28.543	.000
	YR7475	-7.65593	-.15073	6.060	.015
	GESMALL	4.71858	.14296	3.723	.055
	YR8083	-7.95331	-.24384	9.193	.003
	SALT	-5.70418	-.15157	3.624	.058
	AGE	1.27335	.26110	9.144	.003
	(CONSTANT)	56.56359		635.728	.000

DISPLAY?
^PrtSc=prnt Alt- T=tran R=recv V=view D=dial E=echo M=mesg X=exit (Home)=Help

3 .5831 .3400 .3108 11.621 .000 -.0017 .917 OUT: SALT VINTAGE
UTIL
3 STEPS PERFORMED
DISPLAY? both

DEPENDENT: CAPF 9 VARIABLES IN. LAST OUT: SALT VINTAGE UTIL

MULTIPLE R = .58311 R SQUARE = .34002 F = 11.62057
SIGNIF F = .00000

IN EQUATION

	VARIABLE	B	BETA	F	SIGF
	BRUNSWIC	-9.21222	-.14214	4.582	.034
	BFFIRE	-42.46769	-.31160	27.958	.000
	OLDER12	-33.88527	-.31944	26.822	.000
	YR7475	-6.98058	-.13743	5.011	.026
*	GESMALL	3.42812	.10386	2.139	.145
	YR8083	-9.51894	-.29184	11.695	.001
	AGE	1.68374	.34525	13.837	.000
	TOWER	3.82760	.11647	2.858	.092
	SALTAGE	-.58244	-.11186	2.204	.139
	(CONSTANT)	53.30557		404.116	.000

DISPLAY? *
^PrtSc=prnt Alt- T=tran R=recv V=view D=dial E=echo M=mesg X=exit (Home)=Help

EQU? remove saltage

BK	MULTR	RSQ	ADJRSQ	F	SIGF	RSQCH	SIGCH	DEP:	CAPF
5	.5748	.3304	.3075	14.451	.000	-.0027	.368	OUT:	SALTAGE

1 STEPS PERFORMED
DISPLAY? both

DEPENDENT: CAPF 7 VARIABLES IN. LAST OUT: SALTAGE

MULTIPLE R = .57481 R SQUARE = .33041 F = 14.45092

SIGNIF F = .00000

IN EQUATION

VARIABLE	B	BETA	F	SIGF
BRUNSWIC	-11.48932	-.17728	7.896	.005
BFFIRE	-44.28510	-.32493	30.826	.000
OLDER12	-34.01965	-.32071	27.054	.000
* YR7475	-6.59498	-.12984	4.500	.035
YR8083	-10.56480	-.32391	15.758	.000
AGE	1.71313	.35127	15.995	.000
TOWER	5.09360	.15500	5.678	.018
(CONSTANT)	53.68926		412.691	.000

DISPLAY?

^PrtSc=prnt Alt- T=tran R=recv V=view D=dial E=echo M=mesg X=exit (Home)=Help

VARIABLE	GRP	N	MEAN	STD DEV	STD ERR	LABEL
CAPF	1	14	43.138	15.300	4.089	
	2	199	59.209	15.654	1.110	

W

DEPENDENT: CAPF 11 VARIABLES IN. LAST IN: POSTSG SOL12 WQUAKE NEWSG YR7374 DUPE FOURLOOP MATURES POSTTMI TRILOOP SALTAGE

MULTIPLE R = .72805 R SQUARE = .53005 F = 23.78852
SIGNIF F = .00000

IN EQUATION

VARIABLE	B	BETA	F	SIGF
* POSTSG	9.38793	.08511	2.561	.111
SOL12	-47.28585	-.32612	32.753	.000
WQUAKE	-31.52799	-.24260	27.830	.000
NEWSG	-27.67760	-.25094	25.649	.000
YR7374	-7.75978	-.11820	5.832	.017
DUPE	6.76703	.16001	11.854	.001
FOURLOOP	-15.44839	-.37951	45.865	.000
MATURES	2.19555	.17763	9.799	.002
POSTTMI	-5.36992	-.14534	6.884	.009
TRILOOP	-11.79779	-.29779	27.443	.000
SALTAGE	-.77761	-.14648	4.965	.027
(CONSTANT)	77.27311		1630.454	.000

DISPLAY?
^PrtSc=prnt Alt- T=tran R=recv V=view D=dial E=echo M=mesg X=exit (Home)=Help

2 .7245 .5249 .5045 25.739 .000 -.0052 .111 OUT: POSTSG
1 STEPS PERFORMED
DISPLAY? both

DEPENDENT: CAPF 10 VARIABLES IN. LAST OUT: POSTSG

MULTIPLE R = .72448 R SQUARE = .52487 F = 25.73874
SIGNIF F = .00000

IN EQUATION

VARIABLE	B	BETA	F	SIGF
SOL12	-50.92604	-.35124	40.838	.000
WQUAKE	-31.88012	-.24531	28.304	.000
NEWSG	29.78960	-.27009	31.342	.000
YR7374	-7.79396	-.11872	5.845	.016
DUPE	6.91996	.16362	12.343	.001
FOURLOOP	-15.83378	-.38897	48.400	.000
MATURES	2.13467	.17270	9.229	.003
POSTTMI	-4.81897	-.13043	5.668	.018
TRILOOP	-11.50547	-.29042	26.098	.000
* SALTAGE	-.53144	-.10011	2.859	.092
(CONSTANT)	76.79487		1639.589	.000

DISPLAY?
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VARIABLE	GRP	N	MEAN	STD DEV	STD ERR	LABEL
CAPF	1	97	70.438	16.798	1.706	
	2	147	55.178	16.965	1.399	

SEPARATE VARIANCE

VARIABLE	DIFFERENCE MEAN	STD ERR	T	DF	PROB
CAPF	15.259	2.206	6.92	207	.000

POOLED VARIANCE

VARIABLE	DIFFERENCE MEAN	STD ERR	T	DF	PROB
CAPF	15.259	2.211	6.90	242	.000

DISPLAY?
^PrtSc=prnt Alt- T=tran R=recv V=view D=dial E=echo M=mesg X=exit (Home)=Help

GROUP 1: TWOLOOP EQ 1.00
GROUP 2: TWOLOOP NE 1.00

DISPLAY? /sel mw eq 707
SELECTION OK
PROC? univ
VAR? wresid1 wresid2
NOTE - SELECTING ON $MW EQ 707.00
DISPLAY? stat

VARIABLE	N	MEAN	STD DEV	LABEL
WRESID1	12	3.054	13.209	WRESID1
WRESID2	12	2.965	13.359	WRESID2

TOTAL N = 12

2 50-400

CHARLES KOMANOFF has researched and written about the U.S. electric power industry since 1971, and the nuclear power industry since 1974. He has authored two previous books: *Power Plant Performance: Nuclear and Coal Capacity Factors and Economics* (Council on Economic Priorities, 1976) and *The Price of Power: Electric Utilities and the Environment* (CEP, 1972/MIT Press, 1974).

Komanoff has written widely on energy policy issues such as nuclear plant costs and reliability, pollution controls and costs for coal-fired plants, and the potential for improving the efficiency of energy use. His articles have appeared in *The New York Times, Newsday, The New York Review of Books, Bulletin of the Atomic Scientists, Journal of the Air Pollution Control Association*, and *Nuclear Safety* (forthcoming), among other publications. He is probably the most widely quoted critic in the United States of nuclear power's economic performance.

Komanoff has testified before numerous state regulatory agencies and has presented invited testimony to four Congressional committees. In 1980 he testified on the U.S. nuclear program before the Select Committee on Energy of the House of Commons, U.K.—the only witness from America unaffiliated with the nuclear industry.

Komanoff was energy projects director of the Council on Economic Priorities during 1975-76, and senior quantitative analyst for the New York City Environmental Protection Administration during 1972-74. He was graduated from Harvard College with honors in Applied Mathematics in 1968.

KEA Publications

Reprints of selected chapters of this book are available from Komanoff Energy Associates: Chapters 1 (Introduction) and 2 (Summary), together; Chapter 3 (Sources Of Nuclear Regulatory Requirements); Chapters 5 and 6 together (concerning future nuclear regulations); Chapter 7 (Regulatory And Design Changes At Coal-Fired Plants); Appendix 1 (Nuclear Data Base); and Appendix 2 (Coal Data Base).

These other KEA publications may also be of interest:

KEA-1 "Nuclear Plant Performance Update 2." Review of U.S. reactor capacity factors through 1977, primarily statistical. 114 pp., bound.

KEA-7 "Doing Without Nuclear Power," cover article from *The New York Review of Books*, 19 May 1979. Explains why considerations of economic and social costs make improved energy efficiency, rather than nuclear power or synthetic fuels, the bridge to a renewable-energy future.

KEA-13 "Power Propaganda." Critique of the Atomic Industrial Forum's nuclear and coal cost surveys, showing how AIF omitted the costliest nuclear plants and cheapest coal plants to make nuclear appear cheaper.

KEA-16 "U.S. Nuclear Plant Performance," from *Bulletin of the Atomic Scientists*, November 1980. Analysis of reactor capacity factors through mid-1980, including lifetime listings by reactor, vendor, and size class.

Earlier studies by Charles Komanoff, including *Power Plant Performance* (1976) and its first *Update* (1977), are available from the Council on Economic Priorities (84 Fifth Avenue, New York, NY 10011).