

Environmental Policy Institute

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REASONS FOR DELAY IN POWERPLANT LICENSING AND CONSTRUCTION: An initial review
of data available on powerplants brought on line from 1967 through 1976.

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REASONS FOR DELAY IN POWERPLANT LICENSING AND CONSTRUCTION

Summary: REASONS FOR DELAY surveys the readily available data and information on the reasons for delay in bringing new powerplants on line between 1967 and 1976.

The principal data source were reports of the Federal Power Commission published between March, 1973 and July, 1977. The FPC reports were based on questionnaires sent to utilities, and compiled on the basis of utility responses. As such, the data base is weak for two reasons: 1) the reasons for delay recorded are those perceived by the utilities, and thus may reflect certain biases, 2) the numbers compiled refer to the number of times a given reason was listed as a cause of delay, rather than the cause or the most important cause of delay. The data also fails to indicate the length of time involved in each delay.

Nonetheless, the numbers are revealing. When the ten year data is compiled according to the various sectors involved in powerplant construction, it issues the following results:

	<u>Number of Times Cited</u>
Vendor Related Problems	154
Labor Related Problems	142
Regulatory Problems	51
Utility Related Problems	38
Legal Challenges, Weather, Etc.	34

Additional studies of reasons for delay in nuclear powerplant construction conducted by the Atomic Energy Commission, the Nuclear Regulatory Commission, and the General Accounting Office are also reviewed, and clearly support the overall data of the FPC reports.

Federal Power Commission Data: 1967 - 1971

Since 1967 the Federal Power Commission (FPC) has undertaken a series of surveys and staff analyses regarding the causes of delays in new powerplant construction, based on utility questionnaires*. In May, 1972, an analysis of 129 fossil- and nuclear- powerplants over 300 MWe brought into service between 1967 and 1971 indicated that in each year, 58% to 85% of the large new units** scheduled for service had been delayed. As indicated in Table 1, the preponderance of these delays were attributed to labor strikes, shortages of construction labor, and problems associated with equipment failures and the faulty installation of major components:

	1967	1968	1969	1970	1971	TOTALS
<u>CAUSES OF DELAY</u>						
Labor strikes	5	6	8	10	11	40
Equipment failures	9	5	7	5	1	27
Labor shortages	6	5	6	4	1	22
Late deliveries	5	3	5	3	5	21
Reduced productivity	1	-	4	4	5	14
Regulatory problems	1	2	3	2	-	8
Planned deferments	2	-	-	-	-	2
Adverse weather	-	-	-	1	1	2
Design changes	-	-	-	1	-	1

TABLE 1. Causes of Delay: 1967 - 1971

* All FPC data is based on utility questionnaires, and therefore may reflect a bias toward some of the causes for delay (e.g. reduced labor productivity rather than reduced management productivity).

A closer analysis of the powerplants brought into commercial operation in 1971 indicated that the three nuclear powerplants brought on line in 1971 were more seriously effected than the 27 fossil-fired units (48,000 MWe/months of delay in comparison with 36,000 MWe/months delay); and, unlike the fossil-fired units, the nuclear powerplant were effected by environmental regulations. In comparison, labor-related problems accounted for delays in both nuclear and fossil-fired units, and were the major cause of delay in the fossil-fired units.

Atomic Energy Commission Analysis: 1973 Nuclear Powerplant Data

In July, 1971, the Calvert Cliffs' court decision requiring a "rather finely tuned and 'systematic' balancing analysis" under the National Environmental Policy Act, led to a serious interruption of the nuclear powerplant licensing process, and, coupled with both an upsurge in orders for new facilities as well as increased public concerns regarding the environmental impacts, was generally perceived to have created a regulatory morass in the nuclear licensing process.

In November, 1973, Commissioner William O. Doub of the Atomic Energy Commission commented on an FPC analysis of the reasons for delays in nuclear powerplants scheduled to come on-line during 1973. Commenting on the data (see Table 2, following page), which contradicted the prevailing attitudes regarding the causes of delay in nuclear powerplants, Mr. Doub observed:

We all know that statistics can be very tricky, but even doubling or tripling the regulatory-related delay figures, does not do much to close the gap (between construction and manufacturing related problems). 1/

** The term "large-units" is the term used by the FPC to designate units over 300 MWe

	1973	
	Units	Plant/Months
<hr/>		
CAUSES OF DELAY		
<hr/>		
Poor labor productivity	16	34
Late delivery of equipment	9	68
Regulatory changes	8	23
Labor strikes	5	18
Shortages of labor	5	18
Equipment failures	6	15
Rescheduling	1	12
Legal challenges	4	9
Adverse weather	1	9
Strikes of factory labor	4	5

TABLE 2. Causes of Delay in Nuclear Powerplants: 1973

In May, 1974, the Joint Committee on Atomic Energy continued hearings on "Nuclear Powerplant Siting and Licensing", at which time Commissioner Doub commented more extensively on the AEC analysis of this data and related licensing problems:

It is true that in recent years the licensing process has been on the critical path for a significant number of reactors, and reduction or elimination of licensing from the critical path are worth goals that should be and have been studied. I do not agree, however, that the licensing process caused unreasonable delays in those instances where it served to point out safety or environmental issues whose resolution required time. Rather, the causes of delay in such instances was the early state of development of nuclear power, and we all expect that this is a much diminished source of delay.

The causes of lengthy licensing reviews experienced in the past can be categorized as follows:

1. A sudden upsurge of legitimate environmental concerns in the late 1960's and 1970's, culminating in the Calvert Cliffs' decision.
2. A coincidental increase in constructive public interest in nuclear power, as evidenced by much increased public intervention.
3. An upsurge in orders placed for nuclear powerplants, due to increased power demands and improved economic competitiveness of nuclear power.
4. An increase in the number of technological problems identified as the size and complexity of nuclear powerplant increased.

All of these factors combined to produce a tremendous licensing backlog in 1970 and 1971... 2/

Federal Power Commission Data: 1973 - 1974

In 1973 and 1974 the FPC compiled additional data on the reasons for delay in nuclear and coal fired powerplants over 300 MWe, which was slightly more detailed than previous surveys, but similar in its findings. The most significant change is the increased importance of "changes in regulatory requirements", presumably as a result of the Calvert Cliffs' decision and the "backlog" mentioned by Commissioner Doub. Also of interest are the sudden number of delays resulting from legal challenges on environmental issues in 1974 (plants brought into operation in 1974): but the FPC data does not provide more specific information regarding the nature of the legal challenges or the particular powerplants involved. A summary of the data is contained in Table 3 (on the following page).

	1973	1974
<u>CAUSES OF DELAY</u>		
Changes in regulatory requirements	14	10
Poor productivity of labor	12	9
Late Delivery of major components	13	6
Shortage of construction labor	10	3
Environmental legal challanges	-	10
Construction labor strikes	9	-
Delays in local certification	3	4
Rescheduling associated facilities	6	1
Equipment failures	5	1
Manufacturer employee strikes	3	-
Miscellaneous legal challanges	-	2
Delays in state certification	-	1
Initial operating problems	1	-

TABLE 3. CAUSES OF DELAY: 1973 - 1974

Federal Power Commission Data: 1975 - 1977

Since 1974 the Federal Power Commission has surveyed utilities on the reasons for delays in new powerplant construction on a quarterly basis, and data is currently available through the fourth quarter of 1976. Table 4 summarizes the data as compiled by the FPC: January 1975 through June 1975; July 1975 through December 1975; and January 1976 through April 1976. Results from April 1976 through December 1976 were summarized by the FPC, but not tabularized.

CAUSES OF DELAY	1975		1976
	Jan/Jun	Jul/Dec	Jan/Mar
Late delivery of major equipment	21	14	--
Initial operation problems	10	10	--
Failure of major equipment	12	4	--
Rescheduling associated facilities	12	3	1
Fiscal problems	8	1	3
Unspecified reasons	9	2	1
Construction labor strikes	3	4	--
Shortages of construction labor	2	2	2
Poor productivity of labor	8	2	--
Faulty installations	3	2	--
Changes in regulatory requirements	3	2	--
Natural disasters	4	--	--
Delays in state certification	1	2	--
Delays in federal certification	--	2	--
Environmental challenges	--	2	--
Land-use challenges	--	2	--
Delays in local certification	--	1	--

TABLE 4. CAUSES OF DELAY: 1975 - 1976

In the summaries of survey findings published for plants brought on line during the third and fourth quarters of 1976, the results are similar to the findings above:

April - September, 1976: Of the reasons for delay the most frequently cited was 'equipment problems (late delivery, failures, faulty installations)-- it was cited 26 times. The second most frequently cited reason was 'labor troubles' (i.e., shortages of labor, poor productivity, etc.); it was cited six times. 'Prolonged procedures to obtain necessary certificates from different government agencies was cited four times, and 'legal challenges' also four times. 3/

October - December, 1976: Of the reasons for delay the most frequently cited was 'equipment problems' (late delivery, failures, faulty installation)-- it was cited 15 times. The second most frequently cited reason was regulatory delays (difficulties in obtaining necessary certificates or approvals from government agencies); it was cited eleven times; the third reason was changes in regulatory requirements-- ten times. Labor problems and financial difficulties were cited five times each. 4/

Federal Power Commission Data: Caveats

The data compiled by the Federal Power Commission has two serious limitations: first of all, it represents information compiled by the FPC based on surveys of the electric utility industry, and certain aspects of the data strongly suggest an accompanying bias. Secondly, the data is based on contributing causes, rather than on single, or most important causes, and therefore any number of "causes" may be cited for the delay of a single powerplant. For these reasons the data is approximate, and it is important to remember that it has not be subject to independent analysis.

Nuclear Regulatory Commission: Causes of Delay in Nuclear Powerplants

In May, 1977, the Nuclear Regulatory Commission (NRC) published findings as to the causes of delay in nuclear powerplants as a part of its study of "Improved Regulatory Effectiveness." 5/ Table 5 indicates the average time required from the docketing of environmental reports to the completion of the final environmental impact statements in nuclear reactors since Calvert Cliffs; and tends to substantiate Commissioner Doub's remarks regarding a temporary regulatory backlog created in 1970 and 1971 (see pp. 3,4).

Average Time from Docketing of Environmental Report to Completion of
Final Environmental Impact Statement (FES)

<u>Fiscal Year</u>	<u>Months</u>	<u>Number of Cases</u>
1970	22.8	6
1971	22.6	9
1972	13.3	3
1973	10.1	8
1974	12.3	4
1975	11.9	5
1976	14.1	5
1977	11.0	1

TABLE 5. NUCLEAR POWERPLANT ENVIRONMENTAL REVIEW TIMES

Witnesses for the Nuclear Regulatory Commission have testified to similar improvements in the licensing process which have gradually occurred over the past several years. In its Programmatic Information on standardized plant licensing the Atomic Energy Commission had stated:

In the past there has been no great incentive to standardize, since each new plant has tended to be larger than the last one ordered. This increase in reactor plant capacity has resulted in a need for review in increasing depth to maintain a consistent level of safety. The result has been a steady growth in the required licensing review time. 6/

But in June, 1975, witnesses for the NRC indicated that although the time required for combined safety and environmental reviews had backlogged to 31 months for cases docketed in 1970 (FY70), the time had already been reduced to 19 months, and was likely to be reduced to 14 months without further statutory changes. 7/ "As far as the issuance of operating licenses are concerned," they testified, "regulatory

process is not a critical path item." 8/

Report of the Comptroller General on Nuclear Powerplant Leadtimes

In March, 1977, the Comptroller General completed an analysis of existing and proposed nuclear licensing procedures, in which it found that utilities require "10 years or more" to plan, license, and construct nuclear powerplants, and from which it concluded that:

Even though some measures taken by the Commission are long term and have not been fully implemented, the prospects are not good for reducing future leadtimes for licensing and constructing nuclear powerplants. In fact, GAO believes that both the Commission and industry will have difficulty in maintaining the current timeframe of 10 years. 9/

The bulk of the time required for the process, the GAO study found, was required for construction, during which time,

...the utility completes detailed design work, construction, and pre-operation testing. Often, design changes occur at this time to (1) enhance methods of powerplant operation or maintenance, (2) incorporate better solutions to engineering problems, (3) reduce project costs, and (4) incorporate new or revised regulations or other safety requirements promulgated by NRC.

Other factors significantly affecting powerplant construction times include (1) project financing, (2) utility and construction contractor management abilities, (3) timely procurement and delivery of materials, (4) availability of labor skills, labor productivity and labor strikes, and (5) the weather. 10/

Conclusions

Based on the available data it is clear that the principal causes of delay in bringing new powerplants on line have been related to labor, and to the inability of the component manufactures to deliver high quality equipment on schedule. Although changes in regulatory requirements may have caused, or complicated other problems, they have not been a major cause of delay in new powerplants. Legal challenges, environmental reviews, and public participation in the existing process, simply have not been statistically significant.

	YEAR										
	67	68	69	70	71	72	73	74	75*	76	TOTALS
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CAUSES OF DELAY											TOTALS
<hr/>											
<u>Vendor Related Problems</u>											<u>154</u>
Late Delivery of Major Components	5	3	5	3	5	--	12	9	10	-	
Equipment Failures**	9	5	7	5	1	--	6	1	41	-	
Factory Strikes	-	-	-	-	-	--	3	-	-	-	
<u>Labor Related Problems</u>											<u>142</u>
Labor Strikes	5	6	8	10	11	--	9	-	7	-	
Reduced Productivity	1	-	4	4	5	--	12	9	10	-	
Shortages of Manpower	6	5	6	4	1	--	10	3	4	2	
<u>Regulatory Problems</u>											<u>51</u>
Changes in Regulatory Requirements	-	-	-	-	-	--	14	10	5	-	
Delays in Obtaining Permits	1	2	3	2	-	--	3	5	6	-	
<u>Utility Related Problems</u>											<u>38</u>
Changes in Plans	2	-	-	-	-	--	6	1	15	1	
Financial Problems	-	-	-	-	-	--	-	-	9	3	
Changes in Design	-	-	-	1	-	--	-	-	-	-	
<u>Miscellaneous Problems</u>											<u>34</u>
Legal Challenges	-	-	-	-	-	--	12	-	4	-	
Unspecified Reasons	-	-	-	-	-	--	-	-	11	1	
Adverse Weather	-	-	-	1	1	--	-	-	4	-	

TABLE 6. SUMMARY OF CAUSES OF DELAY: 1967 - 1976

* 1975 data combined; see table 4

** Equipment failures include faulty installations and initial operating problems

References and Bibliography

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- Table 2. "Meeting the Challenge To Nuclear Energy Head-On", Remarks by Commissioner William O. Doub, Atomic Energy Commission, as reprinted Appendix 8, Nuclear Powerplant Siting and Licensing, Hearings before the Joint Committee on Atomic Energy, 93rd Congress, Volume 11, p. 1147.
- Table 3. Federal Power Commission Reports No. 19050, March, 1973; 20194, May 1974.
- Table 4. Federal Power Commission Reports No. 21817, October, 1975; 22333, May, 1976; 22698, October, 1976.
- Table 5. Nuclear Regulatory Commission Preliminary Staff Report, Improving Regulatory Effectiveness in Federal/State Siting Actions, May 1977, NUREG-0195, p. 4-7.
- Table 6. Compiled from above data, Tables 1-5.

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- Note 1. William O. Doub, op. cit., JCAE, p. 1147.
2. William O. Doub, Nuclear Powerplant Siting and Licensing, Hearings before the Joint Committee on Atomic Energy, 93rd Congress, March 19, 1972, pp. 9,10.
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 5. Op. cit., Table 5 above.
 6. Programmatic Information on the Licensing of Standardized Nuclear Powerplants, U.S. Atomic Energy Commission, August, 1974
 7. Commissioner Marcus Rowden et. al. testimony before the Joint Committee on Atomic Energy, June 25, 1975.
 8. *ibid.*
 9. Report to the Congress by th Comptroller General of the United States: Reducing Nuclear Powerplant Leadtimes: Many Obstacles Remain, March, 1977, p. iii.
 10. *ibid*, p. 5.
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