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A STUDY OF NRC PROCEDURES FOR ASSESSING NEED FOR POWER
AND ALTERNATIVE ENERGY SOURCES IN FULFILLMENT OF THE
NEPA REQUIREMENTS FOR ENVIRONMENTAL IMPACT STATEMENTS

Submitted to Commissioner Peter Bradford, USNRC

by

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Summary

Since the 1971 Calvert Cliffs decision, the Commission has undergone the painful process of evolving clear guidelines for complying with the National Environmental Policy Act (NEPA). The Commission has struggled to devise procedures which will withstand legal challenges and yet will not prove so cumbersome as to unnecessarily delay the process of considering nuclear plant license applications. As the Commission has developed standards for NEPA compliance, two of the most contentious and oft-litigated issues have been the adequacy of staff estimates of need for power (hereafter NFP) and of the availability of alternative energy sources (AES) which might eliminate the need for a new power reactor.

Today the NFP and AES issues remain among the most controversial raised in the pre-Construction Permit phase of NRC licensing. With growth in demand for electricity slowing, the cost of nuclear spiralling and the cost of many alternative sources becoming more competitive, these issues promise to become still more controversial in the future. Thus, the importance to the Commission of having in place adequate procedures for assessing NFP and AES can only increase.

The process by which the NRC addresses the NFP and AES issues will be examined in the following report. This report is based upon five weeks of research and numerous interviews with members of the NRC staff, representatives of the nuclear industry and the environmental lobbies, personnel at the national labs, Congressional staff aides, members of state regulatory commissions and employees of other relevant Federal agencies, including DOE and CEQ.

The point of departure for this investigation has been the basic question: "Do current NRC practices provide for adequate assessment of

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NFP and fair consideration of AES?" The conclusion of this report is that they do not. The major deficiencies of current NRC practices which are identified and discussed in this report include the following:

- 1) Controversial, expensive and legally-binding Commission estimates on the NFP question have been proved wrong time and again. Using rough figures, it can be concluded that approximately 55% of the Commission's NFP findings have been rejected by the subsequent deferral or cancellation of a reactor by utilities which have cited absence of demand as their major reason for delay. As the lead governmental agency charged with making such estimates in compliance with NEPA, the NRC has assumed primary responsibility in this area and has devised elaborate methods for assessing needs. But even though NFP forecasting is a difficult and probabilistic science, 55% would seem an intolerably high frequency of error for a low-risk agency such as the NRC.
- 2) The Commission has consistently failed to perform full cost-benefit analyses for reasonable alternatives as required by NEPA. Alternatives other than coal are routinely dismissed with boilerplate language in environmental impact statements. Commission estimates always favor nuclear over coal and a NEP determination is always made affirmatively. NRC environmental statements display a clear bias in favor of central station facilities and a mix of potentially more cost-effective (and environmentally benign) technologies is never adequately assessed. With the costs of nuclear continuing to rise, there is no evidence that such assumptions are being systematically reexamined.
- 3) The uniformly low opinion--both within and outside the Commission--of NRC staff work in the NEP and AES is contributing to the evident discomfort of the staff with their NEPA obligations. The inability of the NRC to develop in-house expertise in these areas some eight years after Calvert Cliffs has been a key factor in the growth of confusion and controversy around the NFP and AES components of environmental statements. ELD, EPB and ORNL have all been dissatisfied with the practice of contracting with Oak Ridge for NEP and AES work. The recent decision by NRR to shift the bulk of this work to the Argonne lab hardly seems a satisfactory long-term solution.
- 4) New efforts by states in the NFP and AES areas--spurred in large part by dissatisfaction with the NRC product--are leading to more duplication of regulatory effort. Several states are producing--at much less expense than the NRC--what are proving to be far more accurate assessments of demand and alternatives. Such embarrassments have served to call into question the credibility, if not the relevance of NRC work in these areas.

- 5) ~~The inconsistent treatment of the NFP and AES issues by NRC licensing boards has added to the appearance of bias and incompetence within the NRC NEPA-review process. Various boards have made suggestions to the effect that NFP "should be left to the utility's management". Boards have refused to accept arguments which are predicated upon future government action (i.e. conservation and solar incentives) where they might imperil nuclear plant applications, but have done just the opposite where government action is needed to keep a nuclear project alive (financial qualifications in Seabrook). They have similarly rejected 'theoretical' arguments on the availability of alternatives while endorsing 'theoretical' arguments where they favor a plant license (i.e. NFP, availability of waste disposal technology). In the absence of some specific directions from the Commission regarding NEPA requirements for fairly assessing and analyzing alternatives, the practices of many licensing boards have appeared so capricious as to invite litigation--and thus further delay of the licensing process.~~

The extent and implications of these basic problems are explored more fully in the following report, which concludes with a discussion of options open to the Commission for attempting to remedy the present situation.

The Commission's Mandate and the ESRP

The Commission's obligation to assess the NFP and AES issues grows directly from the extension of NEPA requirements to Commission licensing actions in the Calvert Cliffs decision. Since 1971, the Commission has been guided principally by the CEQ guidelines for NEPA compliance by Federal agencies. The most recent revision of these CEQ guidelines, dated November 29, 1978, identifies consideration of alternatives to a proposed Federal action (such as licensing a nuclear reactor) as "the heart of the environmental impact statement". As stated in S. 1502.14, of the CEQ regs., the environmental impact statement (EIS):

should present the environmental impacts of the proposal and alternatives in comparative form, thus sharply defining the basic issues and providing a clear basis for choice among options by the decisionmaker and the public. In this section, agencies shall (a) Rigorously explore and objectively evaluate all alternatives which were eliminated from detailed study, briefly discussing the reasons for their having been eliminated, (b) Devote substantial treatment to each alternative considered including the proposed action so that reviewers may evaluate their comparative merits, (and) (c) Include reasonable alternatives not within the jurisdiction of the lead agency. (emphasis added)

Fully consistent with these CEQ guidelines are the provisions of 10 CFR 51.23 in the Commission's rules which state:

The draft environmental impact statement will include a preliminary cost-benefit analysis which considers and balances the environmental and other effects of the facility and the alternatives available for reducing or avoiding adverse environmental and other effects, as well as the environmental and economic benefits of the facility. The cost-benefit analysis will, to the fullest extent practicable, quantify the various factors considered. (emphasis added)

In an attempt to guarantee conformity with the CEQ guidelines, NRR has recently drafted and circulated for comment a detailed Environmental Standard Review Plan (ESRP) to guide the staff in its compilation of an EIS.* Sections 8 and 9 of the ESRP deal with the NFP and AES issues respectively and offer the reviewer a compendium of issues to be addressed. For instance, Section 8.2.2-5 states:

the reviewer will consider the following factors as they contribute to electricity demand growth:

- 1) The extent to which technological breakthroughs, government legislation and subsidies, and large conservation investments may provide greater conservation savings than have been experienced in the past.
- 2) The extent to which energy sources (e.g., synthetic natural gas) or energy conversion systems (e.g., solar space heating) currently under development may reasonably be expected to compete with the use of electricity. The reviewer will consult with the reviewer of ES Section 9.1, Alternative Energy Sources and Systems, to complete this portion of the review.
- 3) The possibility that long-term savings may not be particularly significant.
- 4) The possibility that energy conservation would result in increased use of electric power.

Section 9 of the ESRP provides guidelines for more detailed evaluation of alternative energy sources. It states that usually "no additional review will be required" to weigh conservation as an energy source since the reviewers for Section 8, "in the process of analyzing and evaluating the need for the plant, will make a determination that conservation is or is not a practical alternative to the proposed plant". (emphasis added) Criteria for identification of a "competitive alter-

*(Note that the 'Final' version of the ESRP is undergoing further revision, though I am not aware of any suggestions for reform of sections discussed herein.)

native" state that an energy source must (1) "be developed, proven and available to the applicant"; (2) "provide generating capacity equivalent to the capacity established by (NRC staff in Section 8); and (3) "be available within the time frame determined for the proposed project". It must also be determined that "Federal, State or local regulations do not prohibit or restrict the applicant's use of the energy source" (ESRP Section 9.1.2-4). (It is noteworthy that the criteria for alternatives could not be satisfied by commercial nuclear reactors currently in use, as there is no technology for permanent waste disposal which is "developed, proven and available to applicant" or which is guaranteed to "be available within the timeframe determined for the proposed project".)

It is clear both from the ESRP and from current standard practices of the Commission staff that the principal alternative--the only alternative--to nuclear is expected to be coal (oil and natural gas are eliminated for reasons of "national energy policy"). Elaborate methods for comparison of nuclear and coal costs have been devised, relying principally on the much-touted CONCEPT model developed at Oak Ridge. While there is a marked absence of cost-benefit data in the treatment environmental statements give to other alternatives and in their endorsement of the 'substitution' argument for nuclear plants; the case against coal is argued in great detail.

Another peculiarity of NRC practice which is carried forward in the proposed ESRP is the way the NRC treats an alternative energy strategy (i.e. a combination of solar, hydro, geothermal, cogeneration

or conservation). Alternative energy sources which, taken together, might provide an energy mix of greater megawattage than a new reactor are summarily dismissed on a individual basis. Endorsement of such practices can be noted in the criteria for conservation emphasized in excerpts from Section 9 above. More examples can be found under Section 9.1.2-A-1, entitled "Noncompetitive Energy Sources", which concludes: "[W]ithin the timeframe of the need for power, neither solar nor wind alternatives will be available". The ESRP rejects geothermal energy in similar blanket fashion and cogeneration is not mentioned as a potential source of power. Clearly the burden of proof is on the intervenor to get the NRC to give such sources anything more than pro forma treatment. As a result, intervenors are virtually obligated to perform an alternative EIS for all of a mix of technologies, a task most always beyond their limited means--if they are to receive serious consideration from licensing boards. One veteran ELD lawyer described the dilemma facing proponents of non-nuclear alternatives as follows:

I wouldn't want to face licensing boards to convince them of the viability of future technologies. The Boards are generally older guys who feel comfortable with nuclear and not too comfortable with the future. They've seen a lot of pie-in-the-sky technologies come and go. If you want to see a classic display of scientific know-nothingness, look at the Board decision, they completely disavow any potential from solar, wind, you name it.

The same lawyer outlined the best strategy for defending nuclear against alternatives proposed in such cases:

You've got to subtly--shift the burden of proof on the intervenor and make it stick. Force him to make a demonstration that all these alternatives are going to work. Play to the Board and show how long you've been sitting there without the intervenor making a good faith showing.

Weighed against these apparent deficiencies of the ESRP, the draft plan displays at least some sensitivity to specific NEPA requirements. The summary evaluation Section 9.1.3-11 states that "(f)or those alternatives determined to be environmentally preferable, the reviewer will ensure that economic cost data are available in sufficient detail to enable the reviewer to conduct cost-benefit analyses and comparisons with the proposed project." One is left with the conclusion, however, that this statement applies only to nuclear power: coal is the only other energy source for which the staff conducts any type of cost-benefit analysis and the staff position is that nuclear is highly superior to coal in environmental terms.

It is far from clear that detailed cost-benefit analyses by NRC staff of various proposed alternative paths (as for example in Palo Verde 4 & 5) would result in environmental statements which oppose investments in nuclear. Most likely, they would not, particularly in view of the source of such analyses. But the point here is simply that NRC environmental statements are not meeting the obligations of the law. As the Supreme Court wrote in recent Vermont Yankee and Aeschilman cases: "the concept of alternatives is an evolving one, requiring the agency to explore more or fewer alternatives as they become better known and understood." With nuclear costs soaring, the costs of many alternatives are becoming more and more competitive. In the absence of any genuine comparison of nuclear with alternatives beyond coal, it is extremely difficult for the NRC to justify its conclusion that nuclear is always the best alternative. Furthermore, since the NRC is the lead government agency charged with NEPA compliance in nuclear plant licensing,

these very basic questions of cost-effectiveness, need and environmental beneficence are going unanswered whenever states accept the notion of Federal preemption. Thus is the public lulled by assurances that hard questions are being asked and honest answers are being produced, while in reality the NEPA mandate is simply not being fulfilled by the agency responsible.

NRC Procedures For Compiling Environmental Statements

When and if a finalized ESRP becomes standard operating practice, it will be superimposed upon a preexisting process for producing environmental statements developed by the NRC. In fact, the ESRP will do little to change this process, but rather will provide some more specific guidelines for what EIS' should include. The process of developing such guidelines has frustrated EPM's, as the only thing they feel that they can count on is that the environmental statements will become longer still. As one EPM told me:

Anytime anyone raises a new question, they add another volume to the DES (Draft Environmental Statement). People think longer reports are essential in order to forestall new questions. Their length increases as lawyers from ELD pressure us to defend against the last attack. And I've never seen a proposal for reform that doesn't increase the length of reports.

Another EPM with whom I spoke had a similar complaint:

Firebreathing young lawyers (from ELD) are always after us to make the need for power determination more and more elaborate . . . there is a process of escalation at work. The more elaborate the statements become, the more areas there are for intervenors to make new contentions and delay.

Perhaps the most surprising thing about current NRC practices is how little of the draft and final environmental statements (DES and FES) originate from in-house. This is especially true in the NFP and AES

areas. For several years after Calvert Cliffs, the Commission looked to the FPC for data, expert witnesses and legal counsel on the NFP and AES issues. But since 1974, the bulk of this work has been done first at ORNL and, more recently, at Argonne.

In recent years, NFP and AES components of the environmental statements have been put together at ORNL, using the utility's environmental report as a point of departure. A good deal of back and forth always takes place between the lab and the Bethesda staff. Modifications may be accomplished over the phone or face to face at the labs in order to avoid FOIA requests. This process can become somewhat protracted as Bethesda refines the data from the utilities and the labs. For instance, Bethesda staffers often 'waffle' the NFP data to make the case more defensible before the licensing boards (as for example when a utility comes in saying "We need 2,130 MWe before July 6, 1987 or we'll have rolling brownouts", and the staff 'loosens' the estimates to say power is needed 1987-1989.) EPM's, whose responsibility it is to oversee compilation of the entire EIS, are often in conflict with the ELD case lawyers at this stage, as many lawyers want to work directly with the labs. The phenomenon was described by another ELD lawyer as follows:

ELD concerns form a different pattern than EPB or the labs . . . we are very case-specific. We are interested in winning the case at hand so I want to make certain that my evidence is the best and will beat the other guy . . . We regularly have to go around EPB and work directly with the labs, with the individual who put the data directly in the hopper. You want to get out of the process something you can use.

Not in compliance with NEPA

Ultimately it is the EPM, the ELD case lawyer and their staff witnesses (most always from the labs) who will have to defend the FES

before the licensing boards and it is this fact which sparks much of the criticism of the labs. None of the individuals from EPB and ELD with whom I spoke failed to criticize the lab's work in the NFP area, which one EPM identified as "the soft underbelly of the Commission". An ELD lawyer declared that:

"we've done an appalling job on the need and alternatives questions. I personally don't think our NFP estimates are worth the paper they are written on . . . they just can't stand scrutiny at all." ((

In another discussion, this time with the staff of the Cost-Benefit Analysis Division, an individual who had previously been somewhat defensive of the Commission's work in this area then suggested that duplication of effort on NFP and AES issues "has been beneficial-- because the state of the (forecasting) art is so poor." Another ELD lawyer who blasted the quality of the labs' work argued that the problem was attributable to the fact that "they usually don't take anything but applicant information. You have to sit down with them and say 'How'd you get these figures, throwing darts?'. . . You really have to walk them through it sometimes."

The job of providing some type of "quality assurance" for the data put together at the labs falls to the NRC's Cost-Benefit Analysis Division in Bethesda. But very little of the original work is done there. As one EPM noted, "the NRC has little expertise in the areas of need and cost--we are not like an FPC and do not have such capabilities." Another Project Manager attributed Bethesda's dissatisfaction with the ORNL work to the lab's practice of "recycling people. They take an engineer and tell him he's going to be a need forecaster", (as a result), "the quality of their work has started to fall apart". An ELD case lawyer made a similar observation:

They take people from where work is falling off or take the new guys in as a sort of rite of initiation . . . they wouldn't have credentials (in the need and cost areas) but they'd bootstrap them, run them through one case, and if they made it through (without being challenged by intervenors), then they'd have their credentials as 'expert witnesses'.

With the precipitous drop in the number of CP applications coming to the NRC, the workload at the labs has fallen off considerably. (From a high of almost four per month in the early 70's, estimates for future workload have plunged to not more than two new CP applications per year, and maybe none for several years into the 1980's.) With ORNL doing less work for the Commission, the NRC's ability to pressure the lab to provide the most useful type of data (and more qualified personnel) has been reduced. It is generally acknowledged among Bethesda staff that in recent years, ORNL has been less and less responsive to NRC needs, particularly as the amount of work the lab is doing for DOE increases. There are also indications from lab personnel that they have grown increasingly uncomfortable with the constant pressure from ELD and EPB to be more politically sensitive in interpreting their data, to provide as the ELD lawyer put it, "something you can use in defending against inevitable attacks by intervenors on the Commission's NFP and AES assessments. As a result, ORNL told NRC last year that they wanted to phase out the EIS work they have done for the Commission, and this request was acceded to by NRR last winter. As one EPM explained: "ORNL wanted out. They weren't enamored of working for us . . . After all, they are an arm of DOE (the provisions of the Energy Reorganization Act of 1974 notwithstanding)." Unfortunately, as one NRC budget officer noted, switching labs is no solution, for "Argonne's no better than Oak Ridge in many respects."

The current plan is to have ORNL complete staff work on those CP and OL environmental statements still in the works or subject to defense before licensing boards. But in the future, most of the work will be done at Argonne, with the demand and cost analyses being 'sub-contracted' to ORNL for CONCEPT runs and use of the SLED (State Level of Electricity Demand) and regional forecasting models. Thus, the CONCEPT base will remain the 'boilerplate' data for all cost comparisons with nuclear. It is noteworthy in this respect that the model has come in for considerable criticism from DOE forecasters who argue that it fails to reflect probable mid and long-term costs, such as those required by safety improvements (R3, TMI lessons, etc.) Furthermore, DOE personnel suggest the ORNL model inadequately disaggregates data to show great differences in cost between regions. (For example, application of national figures to New England will be skewed by inadequate allowance for high labor, parts, transportation and weather-delay costs. They will also produce an unnaturally low figure when averaged with the cheaper plants self-constructed by TVA and Duke Power without a bevy of outside consultants or union labor.) A DOE analyst suggested to me that ORNL "just has not gone all ten yards to bring their model around. It's a useful tool, but they've only gone six yards." He also noted that CONCEPT's estimated costs for nuclear construction, operational and maintenance are soaring nevertheless.

Before discussing the costs of the NFP and AES estimates, a few miscellaneous points regarding the EIS process should be noted. First, despite the great deal of controversy and staff debate, compilation

of EIS' do not intersect the NRC's "critical path" because the parallel safety reviews inevitably take longer (an average of roughly one vs. two years according to several sources). Of course, successful attacks upon deficiencies in the FES before licensing boards can delay issuance of LWA's and CP's.

Second, it should be noted how early in the process utilities begin working with the NRC staff--often several years before submission of an ER. One EPM attributes this phenomenon to the fact that "the licensing process has been a moving target . . . utilities have been unable to rely on printed guidelines as they simply lag too far behind what the staff wants or expects from the utility." As a result of this phenomenon, there is at least the appearance of collusion between staff and the utility. The NRC works with the utility for several years before taking its first public position in issuing a DES. Inevitably, as the staff takes over responsibility for defending the FES, the NRC at least appears to adopt a position of advocacy for the utility as their positions are emerged. An EPM describes this process of unifying utility and NRC staff positions as follows:

It is an easy matter to bluff or blackmail a utility. If we offer them the three alternatives of facing staff opposition in the form of a negative report, withdrawing the application or changing something, they'll always just change it. In that sense the intervenors have a real gripe--because applications are never rejected; it never comes to that and it makes the intervenors mad as hell.

A third point which bears mentioning is the enormously demoralizing impact upon the staff of going through the entire process leading up to issuance of a FES--and sometimes even through defense of the

statement before the boards and issuance of a CP--only to have the application withdrawn by the utility because of an absence of need for power. I was struck by the fact that the three model NFP and AES components in impact statements to which staff referred me this June were all for reactors which have since been scrapped. The effect of such shattered expectations cannot be pinpointed, though it apparently has led more to cynicism than to caution in compiling NFP and AES cost assessments. It is also a problem which promises to worsen as the few new CP-applications expected continue to diminish in number. It is not inconceivable that there will be strong temptation to the staff to justify new plants in EIS' if only to keep more meaningful, exciting work before them.

A final general point on the topic of staff interplay in compiling EIS' relates to the tensions among the labs, ELD and EPB. It is unfortunate that each of the three main branches involved in compiling and defending the NFP and AES components of the EIS' have such a rocky working relationship. Almost every person I spoke to in one of these branches went out of his/her way to criticize the quality of the work done by the other two. The most bitter comments were made by EPM's in discussing "the elaborate, cover-your-ass exercise" which ELD pressures EPB and the labs to go through in justifying NFP and AES findings. One EPM even suggested that "it seems the more environmentalist, off-the-wall a guy is, the more he advances (in ELD) . . . There is a cumulative effect and the whole process (of analyzing NFP and AES) becomes incredibly burdensome." In their defense, ELD lawyers complain of the shoddy job

done by EPB and the labs on the contentious issues such as NFP and AES.

One lawyer explained this as follows:

it was always a hurry-up thing (with EPB). There was pressure to meet the bluebook schedule, crank out a statement, then supplement it with written testimony if intervenors raised issues. ELD has wanted to pull on the bit, saying "Let's do it right the first time".

Cost of NFP and AES Analyses: NRC and State Efforts

In order to get some rough figures of just how much the Commission expends to reach individual findings on the need and energy alternatives question, I spoke with a number of relevant personnel in Bethesda. The following ballpark data should provide some basis for comparison with work done by other bodies, including state agencies and intervenors, and might serve to suggest some areas for reorienting priorities.

The total cost for lab work (Argonne or ORNL) on an individual environmental statement (including DES and FES) ran \$277,000 in FY 1979. This figure is expected to approach \$350,000 for FY 1980. Between 1/4 to 1/3 of this work is directly related to NFP/AES assessment, with this proportion on the increase due to the growing prominence of these issues in current licensing proceedings. So, roughly \$100,000 is paid to the lead lab for NFP/AES work.

In addition, even when Argonne takes over completely, from \$5,000 to \$20,000 will be paid to ORNL for CONCEPT and SLED runs, program support and expert witnesses as needed.

In addition, the NRC staff estimates that total pre-CP work in Bethesda on environmental statements which are not exhaustively contested runs approximately \$120,000, with approximately \$45,000 going

to Cost-Benefit Analysis Division. (Figures are broken down into man-months required using a GS 13/.5 salary of \$32,000 X 1.44 management overhead factor + 26% for retirement, insurance and workman's compensation or about \$57,000/man year for Bethesda staff work--just about exactly what it costs at Argonne. Man months estimates are as follows-- Cost-Benefit Analysis/9.3, Env. Specilsts. Branch/6.8, Hydrology/4.1, Geoscience/.5, Argonne/62.)

Adding the figures we get a grand total of approximately \$157,500 for the Commission's staff work of NFP/AES issues for each pre-CP proceeding. This figure is increasing rapidly, and does not reflect the higher costs of back-up work on highly contested applications, the cost of ELD work with staff witnesses on these issues, nor, of course, the expenses of hearings and appeals on these issues including licensing board and appeal board salaries. The figure is reached through the following computations:

Argonne work--28.6% of \$350,000	=	\$100,000	
ORNL support--medium figure	=	12,500	
Cost-Benefit Analysis	=	45,000	
		<u>\$157,500</u>	for NFP/AES assessment per environmental statement

The Cost-Benefit Analysis Division in Bethesda employs ten professional staff (including two half-time administrators) and usually five secretarial assistants with a personnel budget of around \$500,000/year.

Their FY 1979 Budget also had a total of \$741,000 for Research and Program Support, including \$181,000 paid to ORNL for NFP-related work and \$35,000 paid to ORNL for work on coal capital costs as part of CONCEPT updating. (A total of \$355,000 has recently been earmarked for an analysis of "the socio-economic impacts of TMI".) An example of some of the studies funded in FY 78 was \$75,000 for analysis of the impact of

ments was funded to the tune of \$57,000. The head of the Cost-Benefit division notes that they did not use all their research funds in FY 78 and "turned some back".

With the number of new CP applications dropping virtually to zero, it is not clear that such expenditures will be necessary in the near future, though of course CP's remain in the pipeline and there will still be pre-OL environmental reviews to perform. Nevertheless it is noteworthy to compare NRC expenditures on NFP/AES to those of states and intervenors. If you take the staff figure for generic work in Cost-Benefit of approximately \$1.241 million for research and personnel, divide it by 4--for the number of pending environmental statements completed in a recent average year--you get another \$300,000 per NFP/AES assessment to add to the \$157,500 figure, or \$457,500 per assessment. By contrast a state like New York has reached binding decision (which differ from the NRC and may well prove far more accurate) on these questions for less than \$100,000, according to a member of their PSC. Wisconsin figures run somewhat higher than New York's due to state laws requiring issuance of generic demand forecasts every two years. Similarly, the costs in California are higher than New York's because of a large retinue of generic demand and supply forecasters on the state payroll, and requirements for issuance of biannual demand forecasts.

Another interesting comparison with the NRC expenses can be found in the cost to the Environmental Defense Fund of developing and deploying a model for analyzing demand and costs of alternatives in a given service region. The total cost of devising this elaborate model--which has already been used in state licensing and rate-making proceedings in

California and Arkansas--was around \$80,000. The cost of applying it to a new service region and computing system alternatives is estimated at between \$20,000 and \$35,000, depending on the number of utilities involved.

A brief word should be added here regarding the perspective individual states have on the NFP and AES issues. Pursuant to a number of "little NEPA" laws, many states are beginning to perform reviews-- particularly regarding siting and need--which are highly duplicative of NRC efforts. California, Wisconsin and New York have the most advanced of such programs. Other states with rigorous procedures for analyzing siting and need issues include Oregon, Arkansas, Maryland and Minnesota, to name only those frequently cited. While for the purposes of the National Environmental Policy Act, the NRC currently remains the lead governmental agency responsible for fulfilling procedural and substantive requirements, states clearly have rights on rate-setting and land use issues. The NRC has begun holding joint hearings with a few states including Maryland and New York, but in both of these cases, the joint hearings were broken off; the state bodies concluded there was no need for power, in stark contrast to the NRC position. As a result there has been, as one New York official noted "no fair test of the joint hearing process thus far." (This is notably similar to the remark made by at least two EPM's to the effect that they had never had a 'standard' or 'normal' licensing case in the eight years since Calvert Cliffs.)

The possibility of NRC and state proceeding reaching divergent conclusions raises an interesting problem. Even if it is clear that a

state is not going to approve a plant, the NRC currently continues the licensing process until notified by the utility of a deferral or cancellation. This fact only increases the temptation to state officials to follow the path one Wisconsin official told me his agency takes-- "simply to ignore what the NRC does". Of course, the questions of explicit state vetoes and NRC delegation of NEPA reviews to qualified states are addressed in the now-dormant Nuclear Siting and Licensing Act. But there seems to be great potential for Commission initiative here, completely independent of further Congressional action. Standards for delegation of NEPA-reviews can be set and facilitation of more joint proceedings to reduce delay in the interim can be accomplished. Here the Commission can take 'defensive' measures to guard against the strong possibility that duplication of State and Federal efforts might cause regulatory delays to increase in the future.

NRC Record in Forecasting NFP

The most damning criticism of current NRC methods for assessing NFP can be found in an examination of their product: time and again utilities have cancelled reactors because of an absence of demand after the NRC has produced and vigorously defended its determination that the plant was needed within a given timeframe. This is not to ignore the fact that NFP forecasting is a difficult and probabilistic science. Nor is it to suggest that the cost of being late with a plant is the same as the cost of bringing it on line before it is needed. It is simply to point out that the NRC estimates have been too consistently and spectacularly wrong to lend them much use or credibility.

The problem with NRC handling of the need question is from the outset one of attitude. Very few of the people charged with compiling and reviewing EIS's believe the NRC has any business performing such assessments, the requirements of NEPA notwithstanding. "These are business decision," one EPM complained. "We have no right--and should have no responsibility--to make such decisions." Any number of licensing boards have expressed similar sentiments, which I heard repeatedly from other Bethesda staff. But the fact is that the need and alternatives questions are central to the whole licensing process. As the lead governmental agency for nuclear licensing, the NRC cannot wish this responsibility away.

Other problems include the difficulty of dissembling habitually 'conservative' utility data, long-lead times and deep-rooted institutional confidence in 'historical' (i.e. >5%) growth rates. An EPM expanded on these difficulties:

licensing now exceeds the ability to plan. You can't make reliable forecasts beyond ten years, and it now takes fourteen to plan, license and build a plant. . . Need for Power determinations are so very sensitive to attack because of these lead times. Estimates are constantly being updated--right up to the day you go into a hearing. You know you're always going to need the power, the question is when. . . You get any two economists to forecast need for power and you'll get two different sets of conclusions. There is just no way to get firm agreement. But we have to agree. We're in the regulatory business and, what is it, \$12 million a month that delays at a plant like Seabrook cost?

The best way to deal with such dilemmas, another EPM suggested, is to reject the excessive caution which he feels is built into current practices. Need and alternative assessments in this analysis should be treated like bank loans by the coordinating EPM:

They should be just above the optimum risk level. If I was a bank manager and had a loan officer who never lost a loan, I'd fire him because he's never taking a risk and is clearly too conservative. We should operate just above the margin and not include (in the

Viewed from another perspective, such a prescription promises to make the NRC record in this area worse, not better. Working with Commission data, one can conclude that roughly 55% of the plants for which the NRC has made at least a preliminary finding--and in many cases an elaborately-defended final determination--of need, have subsequently been subject to long-term deferrals or cancellations because of an absence of anticipated demand.

It is extremely difficult to get a hard figure for the NRC failure rate in determining need for power; though I suspect that it is considerably higher than 55%. I am using this as a rough figure simply to give the staff the benefit of considerable doubt. Ideally what one needs is a ratio of preliminary (or final) staff determinations of need versus the number of plants deferred for more than a year or cancelled altogether because of an absence of need. OMPA simply does not have such data. Going back to the establishment of the NRC, data on deferrals and cancellations has been kept in a number of different ways, so one can interpret it only with some difficulty.

For example, data for the NRC's first year provided by OMPA is really data for 7/1/74 through 4/30/76. It shows that of 201 units on order, under CP review or under construction, 23 were cancelled (no reasons cited) and 140 were delayed for greater than twelve months.

Of 140 plants under CP review or with CP's--and thus affirmative NFP determinations from NRC staff--108 were delayed for greater than twelve months due to an absence of NFP or closely related reasons.* (This does not include cancelled reactors, for which status is not given.) This works out to an error frequency of 78%.

But 1974-1976 was an unusually rough period, due to the crushing impact of OPEC upon electricity demand, so more recent figures may be more accurate. Figures for FY 1977 from the NRC Brown Book show that of 66 reactors with CP's or under active CP review which experienced slippage during this period, 30 of the delays greater than one year were attributable to an absence of NFP or closely related reasons. Data for the total number of reactors with CP's or under active review at this time are not available. The slippage rate for 1974-76 above was greater than 90%--only 18 of 201 planned reactors didn't slip. But let's assume for FY 75 it dropped to 75%, and that there were therefore 22 reactors

* In different years, the NRC aggregated reasons for delay using different methods. "Need for Power", "Schedule Slippage", "Financial" and "Demand for Electricity" have been used interchangeably. I have accepted such tabulations in most cases and have counted among the non-NFP delays those for which no reasons is given, thereby improving somewhat the number of reactors for which staff has been 'right' on NFP. The one place in which I have increased NFP-delays is in the case of certain California, Wisconsin, Massachusetts and New York reactors where the NRC has attributed delay to "State Regulatory Delay" or some such, when in fact this delay has been directly attributable to the fact that these states have rejected NRC NFP determinations and the reactors have subsequently been cancelled on this basis. It is noteworthy in the context of the recent NSLA debate that the bulk of non-NFP delays have been related to problems with construction, parts deliveries, labor, weather and seismic questions, but rarely regulatory delay per se.

which experienced no slippage during this period. So we compute our error frequency by dividing 30 by $(66+22=88)$. This works out to an error frequency of 34%. (Note again that some of the 66% for which the NRC was 'right' during this annual period, slipped in later years, thus worsening the error frequency. So 66% 'right' is a very generous figure.)

For FY 78, the figures are 30 of 57 slips of greater than a year were attributable to an absence of NFP or closely related reasons. Again, let's generously assume that 25% of reactors under CP review or with CP's reported zero months slippage this year, thus dividing 30 by $(57+25\% \text{ of } 57)$ or 71. This works out to an error frequency of 42%.

For the first ten and one-half months of FY 1979, the figures are 30 of 47 slips of greater than twelve months attributable to NFP. (Note that 9 of 11 slips for reactors announced or on order were NFP cancellations. The other two were a one year deferral on NFP grounds.) Again figuring a 75% slippage rate of at least one month, we can compute error frequency by dividing 30 by $(47+25\% \text{ of } 47)$ or 59. This works out to an error frequency of 51%.

So our rough calculations give us error frequencies of 78%, 34%, 42% and 51%. Adding the figures for reactors and NFP slips we get 358/198 or a total of 55% error frequency in the NRC determination of NFP.

I have tried to stress the 'softness' of this number. The perfectly calculated figure could be as low as 30% or as high as 90% depending on your reactor slippage ratio, when you assume staff has prepared to defend NFP, where you define NFP as the reason for slippage or whether you break out reactors which don't slip twelve months in one

year, but do the next. Regardless of these factors, it should be clear that the error frequency is intolerably high. The NRC has never refused a plant on NFP grounds. As the lead agency for conducting NEPA reviews, it has failed in meeting its obligation to ask the hard questions about NFP and AES which might provide consumers with more economical and environmentally benign energy sources. While providing the illusion of regulation in these areas, the NRC has cost everyone a lot of money and anguish as unjustifiable reactor projects have started and stopped like so many yo-yo's going up and down, soaking up capital desperately needed for other energy investments all the while.

Of course, responsibility for such failures extends beyond the NRC labs and the staff to other branches of the Federal government, state PUC's and the utilities. For instance, many utilities have never adjusted to the post-1973 world of reduced growth in energy demand. They proceed blindly assuming a return to "normal" growth rates of 7-8% in demand and they stare passively, at their ten year demand forecasts failing to realize that they have the power to change such estimates--to help reduce demand, to conserve and to promote technologies with shorter lead times which bear the promise of reduced costs.

But the NRC staff has all too willingly accepted such a view. Ostensibly quoting the NRC Chairman, one EPM told me "Our job is to license a plant or not to license a plant". Such an outlook seemingly ignores NEPA responsibilities, which like it or not, the Commission must bear. A great deal of the blame tolerance of such a narrow perspective

must fall to the NRC's licensing boards, whose performance in addressing the NFP and AES issues is extremely poor.

Treatment of NFP and AES by the Licensing Boards

One experienced ELD lawyer confessed that "Need For Power is a losing argument for the opposing side". And indeed the record shows that licensing boards have always toiled deliberately to come up with the new defenses for their inevitable conclusions that "Yes, the nuclear plant is needed" and "No, alternatives are not available." What emerges from a thorough review of the licensing and appeal boards' record on these issues is the conclusion that the boards will go to any length to put the need and alternative issues--with which they are clearly uncomfortable--safely behind them. A detailed study of this record has been put together for the ABA-ALI Course of Study by Bill Potter (see ABA-ALI study materials, September 28-30, 1978), so I shall not attempt to review the entire record here. But some basic patterns should be noted.

Absent clear direction from the Commission, boards have pulled any number of arguments out of the air to rebut intervenors critiques of staff NFP and AES assessments. One Appeal Board even chastised a Licensing Board (Nine Mile Point) on this point, noting that it had unfairly "changed theories in midstream". Boards seem to put forward any of a number of arguments in approving licenses, beginning with an express reluctance to fully explore the NFP and cost-benefit issues

at all (Midland, 1972--Cost-benefit analysis becomes "practically a foregone conclusion" once "need" is determined; Nine Mile Point, 1973-- "the value of electricity (which is genuinely needed) is, in a real sense, 'priceless'", Seabrook, 1976--"determinations of the need for power and need for the plant can be viewed as matters which should be left to the utility's management, which must exercise its business judgment").

When pressed vigorously on the need issue, boards have loosened requirements on NFP error margins or rejected the value of econometrics (upon which Bethesda and ORNL rely!) For example, see the Nine Mile Point 1975 Appeal Board's opinion faulting econometrics because they "must simplify reality" and are "misleading if their underlying assumptions are erroneous". The same Board required use of 1960-1971 historical growth rates to reflect "basic long term trends" and held that there was no "statistically meaningful distinction between 1979 and 1981", thus defending a two-year margin of error. As one successful ELD lawyer noted:

even when the intervenor makes a strong case showing reduced or zero growth, licensing use a record showing past ('historical') growth trends to anticipate new demand in the future, as in the case. And with the 'priceless argument', once you have any need whatsoever, you've rigged the discussion.

The record is indeed full of attempts by Boards to refer back to 'historical' or 'normal' growth trends as a basis for justifying need. The issue thus becomes, in the words of the Nine Mile Point board, "not whether (the utility) will need additional capacity but when".

when". (See also, the 1974 Perry 1 and 2 Board, which agrees with the applicant that conditions will return to 'normal' in 1975 and that other deferrals make timely plant construction all the more imperative.)

Another favorite second line of defense for boards is the substitution theory (see for example Nine Mile Point, 1975 and Seabrook, 1976-8). In contrast to the nuclear vs. coal case--where detailed cost-benefit analysis (CONCEPT) is used--boards employ the argument that investment in a \$1.5-2 billion nuclear plant can be justified to replace oil and natural gas without any statistical justification whatsoever. (Query: if boards can make such arguments simply by citing "National Energy Policy", how do they deal with Presidential statements that nuclear power should be used "only as a last resort"?) EPM's bemoan the fact that utilities fail to use the substitution argument more prominently, a fact they attribute to utilities' "addiction to the notion of 'historical growth". One analyst in the cost-benefit division noted that utilities "have decided that what we want is higher reserve margins and are hooked on telling us what they think we want to hear, instead of trying to present a coherent case on the merits."

As noted in the discussion at page 7 above, the burden of analyzing and demonstrating the cost-effectiveness of most alternatives--NEPA requirements notwithstanding--is on intervenors. There is little evidence that boards comprehend their responsibility, detailed in Calvert Cliffs, to make an affirmative effort to build a complete record, whether or not issues are explored in detail is the staffs' FES. Especially pernicious is the double standard so many boards seem to

apply on the question of theory vs. demonstrable, proven fact. While boards embrace theoretical estimates of NFP and theoretical solutions to waste disposal, they consistently dismiss effects of energy conservation as "inconclusive" and "speculative", reject alternative energy technologies as "unproven". Boards generally require of intervenors impossible demonstrations that power absolutely won't be needed and that a mix of alternatives definitely will be adopted and deployed by utilities. In a similar fashion, boards permit plants to proceed contingent upon government actions (i.e. state approval of CWIP, PUC acquiescence in rate increases and waste disposal demonstrations) but reject alternatives because they may require some government action (conservation and solar incentives, facilitation of cogeneration, assistance for more hydroelectric and geothermal). As the 1976 Seabrook Board put it: "We have no power to assure that alternative sources will indeed be made available." But rejection of viable alternatives on this basis flies in the face of CEQ NEPA-compliance regs. which state clearly that the NRC must "include reasonable alternatives not within the jurisdiction of the lead agency" in identifying options which might prove environmentally preferable.

This last point poses a central dilemma for the NRC. The Commission is not a "super-DOE" or FERC or FPC. In the wake of the 1974 Energy Reorganization Act, it is not designed to be an energy policymaking agency per se. And yet every time it licenses a power reactor it is assuming the obligation as the lead Federal agency

of certifying that the enormous capital investment is needed and that there are no more promising alternatives available: it is making a policy decision. The NRC does not have the authority to direct utilities to restructure rates, to devise strategies for more incremental increases in electrical generating capacity or to assist consumers in taking conservation measures. In fact, such laws as the National Energy Act have expressly limited the power even of state PUC's to take such measures (§216 prohibitions on utilities providing conservation loans or insulation services.) But the obligation of the Commission is quite clear: it has only to identify more promising alternatives in order to reject a questionable nuclear plant application. It need not guarantee that these alternatives are implemented; that is the responsibility of other state and Federal bodies, and of the utilities themselves.

Conclusion and Discussion of Options

This report is unrelenting in its criticism of current NRC practices in the NFP and AES assessment areas. I believe such criticism is clearly justified by the record. And yet anyone who spends some time looking into these issues cannot remain unsympathetic to the difficulties of assessing need where such long lead times are involved, to the danger of being overly optimistic in considering the potential of more benign energy sources which have yet to fully mature, or to the frustration of staff analysts required to defend volume upon volume of reports in elaborate detail. These problems are genuine, though I believe not insurmountable. A number of options are open to the Commission to begin improving current practices. These include the following:

1. Issuance of a clear statement of NRC policy on such matters as tolerable margins of error in NFP forecasting, explicit requirements for full cost-benefit analysis of all viable alternatives and evaluation of a 'mix' of alternatives, circumscription of the acceptability of the 'substitution' argument, and general clarification of NEPA requirements to guide the staff, the labs and the licensing boards. This should be accompanied by a commitment to fully review the 'final' ESRP to make it consistent with these directives.
2. Reorienting of budget priorities, primarily to develop an in-house capability to perform NFP and AES components of EIS'. This should include a commitment to fund research into use of alternative models, such as those devised by the Environmental Defense Fund. Cost-Benefit Analysis Division should be directed to begin spending money 'proving' how expensive and dangerous coal is or how costly NRC safety regulations are and begin spending more funds on consideration of the cost-competitiveness of other alternatives such as solar and conservation. For example, they should be instructed to examine such recent research as the EDF models and the Harvard Business School study and report to the Commission on the integrity of the data used therein to conclude that conservation and solar can cost-effectively reduce nuclear demand with currently available technology.

3. Initiation of a Commission rulemaking proceeding to consider alternative views on how NFP and AES questions should be addressed in future EIS' and licensing actions. Such a proceeding is especially important to provide spokespersons for the nuclear industry and environmental groups with a forum for their deeply-held generic concerns on these questions, concerns which can never be adequately or appropriately addressed in individual licensing cases. Among topics for consideration in such a proceeding should be Commission exercise of discretionary authority to provide intervenor funding where necessary to ensure effective and timely presentation of contentions on issues such as NFP and AES. }
4. Initiation of a Commission rulemaking proceeding to establish guidelines and standards for delegation of NEPA reviews to states with qualified programs.
5. Identification to the Congress of Commission concerns and new budgetary priorities relevant to these issues. If appropriate, this should include address to the National Energy Act prohibitions (§216) as they relate to Commission criteria for identifying need and alternatives. Certainly, this communication should include an identification of Commission concerns in initiating the rulemaking proceedings outlined above.

I believe these initiatives would constitute an important first step towards restoring Commission credibility in the field of NEPA reviews and NFP/AES assessments. It may be that the Commission and the Congress will conclude that this work cannot be done fairly and effectively within a Commission still suffused with a sense of the inevitability and desirability of nuclear technology. In such a case, a combination of CEQ, EPA and/or individual states might be legislatively required to assume full responsibility for NEPA reviews of NRC licensing. However, I find it far more desirable for the Commission to begin assuming the full burden on its own, with full cooperation with qualified states. Eight years after Calvert Cliffs it would seem none too soon for the Commission to embark on such a course.