Licensing of Nuclear Power Plants

Reforming the Patchwork Process

Marcus A. Rowden

IN THE UNITED STATES it now takes ten or more years to bring a nuclear power plant from the planning stage to commercial operation—nearly twice what it took a decade ago. Not only is this unacceptable from the standpoint of rational energy planning, but it imposes enormous costs, ultimately borne by consumers. Federal and state approval requirements duplicate each other needlessly and sometimes are contradictory. For the utility seeking to build a nuclear power plant, the process is inconsistent, unpredictable, and characterized by a zeal for procedure that too often overwhelms substance. For the public participant, the opportunities for involvement come far too late, well after heavy commitments have already been made by the utility. Moreover, the process fails to meet what may be the most critical challenge: to *balance* the needs of energy and the environment.

Successive federal regulatory commissions and successive presidents have been advocating reform of this process for the past half dozen years. The problem has been the difficulty of marshalling sufficient political will to get legislative action. Interest has lagged for several reasons, including a downturn in new plant applications of all kinds since 1973, a shift in focus to other nuclear issues, and a general disposition to "muddle through." Now, however, projected energy needs and an accumulation of grievances in government and the private sector have created a political climate in which change seems possible. The Carter administration's national energy goals, which place heavy reliance for the next twenty-five years on the timely availability of more light-water reactors (the type of nuclear generating facility now operating in the United States), cannot be realized without significant licensing reform. The states also desire reform, because they see federal decision making on land use, power needs, and related matters as checkmating or, at best, duplicating traditional and legitimate state functions. Finally, events surrounding the proposed nuclear power plant at Seabrook, New Hampshire—where a process of "regulatory shuttlecock" between federal agencies halted construction for more than half a year after the facility had been authorized—have brought the need for reform to public attention. There, in full display, was a situation that the Nuclear Regulatory Commission (NRC) has called "a paradigm of fragmented and uncoordinated government decision-making on energy matters . . . a system strangling itself and the economy in red tape." In short, the time is ripe for reform.

Marcus A. Rowden, former chairman of the Nuclear Regulatory Commission (1976–77), is a visiting fellow of the American Enterprise Institute for Public Policy Research and a partner in the law firm of Fried, Frank, Harris, Shriver & Kampelman, Washington, D.C.

The Licensing Process and Its Problems

The basic federal statute for the licensing of nuclear power plants has remained essentially unchanged since it was developed more than twenty years ago. The Atomic Energy Act of 1954 and its several subsequent amendments generally provide for a two-stage federal li-

censing process, administered now by the Nuclear Regulatory Commission. First, the utility must obtain a construction permit authorizing it to build a facility at a particular site. Second, before loading fuel, it must obtain an operating license. The construction permit is based on the preliminary design of the plant and the suitability of the proposed site, while the operating license is based on the final plant design and the adequacy of actual construction. Even in the absence of any controversy, a formal adjudicatory hearing must be held before the construction permit is issued, and an opportunity for another such hearing must be offered before the operating license is issued.

Principal matters to be determined in lengthy application reviews by the NRC staff and in the ensuing hearings involve questions of radiological health and safety and of environmental protection.[1] The Atomic Energy Act established preemptive federal authority in the area of radiological health and safety. Authority in the area of environmental protection, on the other hand, which stems from the National Environmental Policy Act of 1969, is a shared federal-state responsibility.

Not surprisingly, the very "stability" of the nuclear licensing framework, virtually unchanged since the 1950s, has now become a major cause of instability. In the past dozen years nuclear power has progressed from a developmental technology to a mature industry that provides a significant portion, 10 percent, of the nation's electrical energy. Government and industry approaches to the design and location (or "siting") of a nuclear power facility have changed as technology has advanced and as needs have altered, but there have been no accommodating adjustments in the organic licensing law. Also, nuclear power plants (like many other large industrial facilities) are now subject to an extensive network of federal and state approval requirements that are largely a product of the environmental tide of the late 1960s and early 1970s. During its environmental reviews, for example, the NRC must coordinate with nearly a dozen other federal agencies having specific statutory authority bearing on the licensing action. Like Topsy, the system that has come about over the years—far from being the product of integrated planning—"just growed." It is burdened by multiple, unconnected requirements and lacks a coordinated approach for considering energy and environmental needs.

In charting the means for streamlining nuclear licensing, one is best advised to keep firmly moored to reality. The planning, designing, locating, and constructing of a large nuclear power plant is and will remain complex, costly, and time-consuming. Moreover, given the nature of our federal system and the many diverse interests involved, there are practical political constraints on the type and degree of change that can be effected. Nevertheless, if one shuns the search for miracle cures, a number of solid improvements can be achieved without compromising public health and safety or sound environmental values. While some elements of our energy future are not wholly amenable to this country's control, if there are to be energy shortages, higher costs, or dependency on foreign energy sources, they should not result from slow, wasteful, and outmoded regulatory performance. We must seek to accomplish four broad objectives.

(1) Federal licensing machinery, now outdated, must be matched to the country's planning and decision-making needs. Developments in industry and government provide the occasion and the tools for productive change.

It is disquieting, but nonetheless true, that large numbers of government agencies have the uncoordinated power to say "no" to a proposed electric generating facility (whether nuclear or fossil), but no single body can give a definitive "yes."

(2) The responsibilities of the relevant regulatory agencies, both state and federal, must be unscrambled. It is disquieting, but nonetheless true, that large numbers of government agencies have the uncoordinated power to say "no" to a proposed electric generating facility (whether nuclear or fossil), but no single body can give a definitive "yes."

[1] The NRC also reviews the physical security (safeguards) of the proposed facility and its nuclear fuel. In addition, a parallel pre-licensing antitrust review is conducted by the NRC in conjunction with the Department of Justice.

(3) More effective and better timed opportunities for public participation must be incorporated in the licensing process. It must be recognized, however, that public participation carries with it a price, both in the time and the uncertainty it adds to decision making.

(4) Finally, procedures for the licensing of nuclear facilities must not be isolated from the mainstream of national energy policies. Whatever siting and licensing system ultimately emerges should be related to the process by which the country's energy policies are being shaped.

What elements, then, should be the focus for practical reform? There are three: when decisions are made, who makes them, and how they are made.

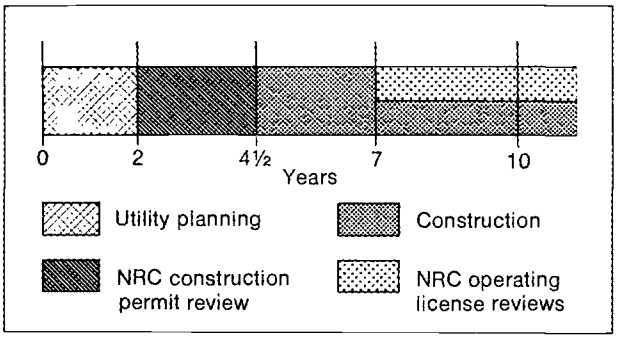
Matching the Process to Planning and Decision-Making Needs

A principal vice of the present system is the lateness of the time at which the primary federal regulatory body, the NRC, decides whether *it* will accept or reject a facility's site and design. The so-called nuclear plant cycle begins with utility planning for a "site-specific" facility, which takes perhaps two years. This is followed by license application and pre-construction reviews, which can last as long as three years. Then construction, along with operating permit reviews, consumes six years or more (see Figure 1).

This sequence made sense when the reactor licensing process was fashioned in the 1950s, and it made sense well into the 1960s (when the time consumed in regulatory reviews and construction was about half of what it is now).[2] But it no longer makes sense. The custom designs (that is, "facility-specific" designs) of the earlier era are giving way to standardized designs that can be pre-reviewed in depth for later use at a variety of sites. At the same time, the process of site selection and approval has grown far more complex and contentious and, of course, longer. A nuclear facility applicant is compelled to make a substantial commitment of resources (and energy planning margins) to a particular site and design well before receiving any firm regulatory approval of either (see Figure 2). This not only adds to worries about what the agency will decide (the question of "predictability"), but it also means that administrative delay or significant modification in design or site becomes progressively more costly as the process unfolds.

Figure 1

THE NUCLEAR POWER PLANT CYCLE



Source: General Accounting Office, "Reducing Nuclear Power Plant Leadtimes: Many Obstacles Remain—A Report to the Congress," EMD-77-15, March 2, 1977.

Review and approval of site and design—and the attendant public involvement—should precede, not follow, the submission of an application to build a specific power plant.

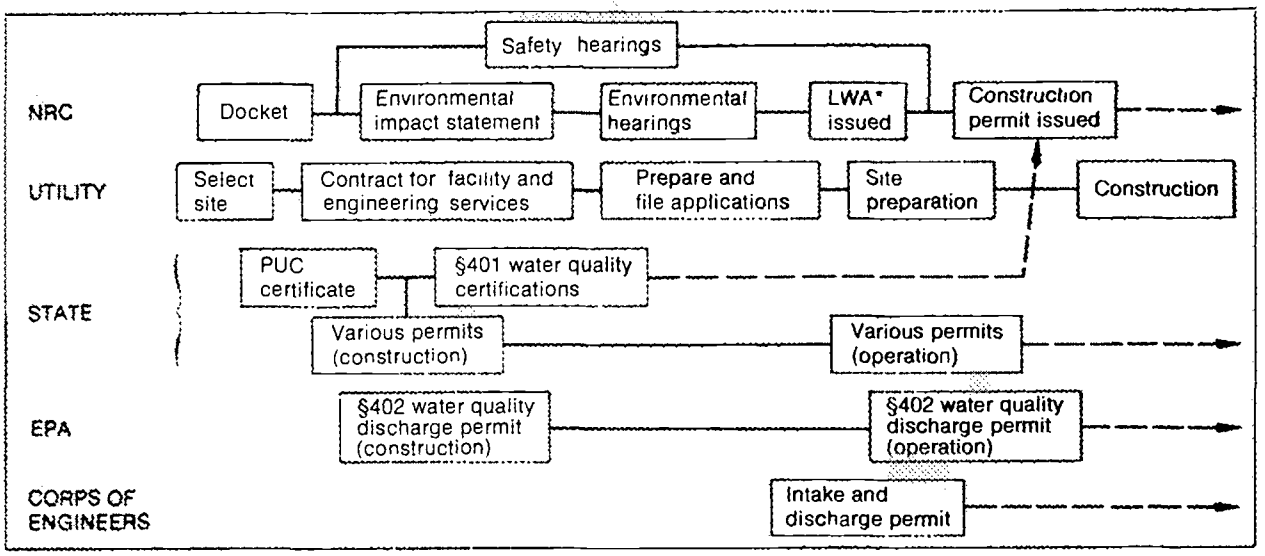
Delay costs alone are formidable. According to NRC estimates, costs for delay in starting construction average over $9 million per month, and those for delay in starting operation average between $8.5 and $13 million per month. Thus, the final step before the authorization of either construction or operation—the public hearing—finds the proponents of a nuclear facility least amenable to change and the opponents with the greatest incentive to use delay to realize their aims.

Review and approval of site and design—and the attendant public involvement—should *precede*, not follow, the submission of an application to build a specific power plant. Here the necessary reforms are really in the nature of unfinished business. Each of the last three

[2] The average elapsed time between a utility's award of a nuclear reactor contract and commercial operation grew from 72 months in the period 1962–65 to 135 months in 1974. (ERDA, *U.S. Central Station Nuclear Electric Generating Units: Significant Milestones*, January 1, 1977.)

Figure 2

PATHS FOR NUCLEAR PLANT LICENSING: SAFETY AND ENVIRONMENTAL REVIEWS



*Limited work authorization.

Source: U.S. Nuclear Regulatory Commission, Office of State Programs, *Improving Regulatory Effectiveness in Federal/State Siting Actions*, NUREG-0195, May 1977.

Congresses has had before it proposals to establish a licensing framework that would permit review and binding regulatory approval of standardized reactor designs and potential plant sites, several years before a utility would be seeking authority to build a "site-specific" facility. In effect, a utility would "bank" approved designs and sites for later use.

The idea is a natural outgrowth of recent developments. During the past five years, industry and the Nuclear Regulatory Commission have made major progress in standardizing design,[3] and in 1977 the commission established procedures for early review of site-suitability questions. Under existing law, however, the NRC cannot approve a site until a power plant application has been filed and can give such approval only to a utility applicant (as contrasted, for example, to a state agency that might be established to "bank" future sites). Moreover, the law does not provide adequate incentives (procedural rewards) to induce the major commitment of resources needed to make design and site "banks" broadly workable.

A change in the law to sanction and reward pre-application design and site approvals would yield substantial and widely shared benefits. It would significantly aid utility planning, giving needed predictability to the process, and would also enable state or regional agencies to bank sites for long-range planning purposes. It would place public participation at a point in the nuclear plant cycle when, as a practical matter, that participation can be most effective. It would measurably shorten the costliest parts of the nuclear plant cycle, by reducing the time now spent in site-specific planning and by allowing the NRC's pre-construction reviews, hearings, and approvals of design and site to occur before, rather than after, the filing of a specific plant application. When fully implemented, moreover, such a regime would severely confine, if not eliminate, the anomalous operating license hearing—a public proceeding that takes place after a billion dollar plant has been built.

The proposed framework would also yield significant collateral benefits. While pre-approval would not sanction a site for anything other than a nuclear power reactor, the fact that the site had undergone thorough environmental review would be of obvious value if a utility later wanted to place a fossil-fuel power plant there. And the wider use of stand-

[3] Nearly a dozen industry-proposed standard designs have already been reviewed by the NRC for construction permit use, and applications for more than two dozen nuclear plants incorporating these designs have been submitted by utilities.

ardized designs would produce both greater safety and improved efficiency of design and construction.

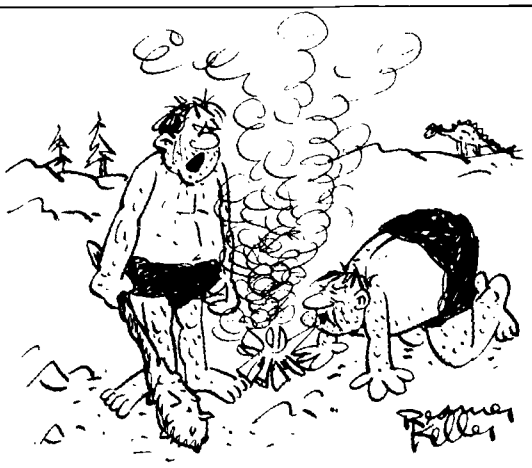
Such changes in the process are long overdue.

Unscrambling Regulatory Responsibilities

Although it is the most visible of the nuclear licensing bodies, the Nuclear Regulatory Commission is by no means the only one. There is, in fact, an urgent need for straightening out the present maze of state and federal facility requirements.

As we have noted, the 1954 Atomic Energy Act charged the AEC (and therefore now the NRC) with responsibility for radiological health and safety. Additional matters relevant to authorizing electric generating facilities were to be the province of other federal and state bodies. While the Atomic Energy Act remains unaltered in these respects, there have been basic changes elsewhere. Under the National Environmental Policy Act of 1969 and subsequent court decisions, the NRC may not allow a utility to begin plant construction until the commission has considered alternative sites and fuels, assessed energy needs, and determined that the benefits of the proposed new energy supply will exceed the environmental, social, and other costs. Parts of this review duplicate or conflict with the efforts of state agencies charged with making a "need for power" determination. Moreover, the states are increasingly undertaking their own comprehensive environmental reviews, akin to those performed under the National Environmental Policy Act. Many states believe that overlapping federal authority in this area is at odds with traditional federal-state divisions of responsibility as well as with the view that the state is better suited than the federal government to decide questions affecting its local environment. While there may be differing opinions on whether these questions are better handled by the federal government or the states, the demands of orderly government and sound energy planning argue forcefully against dual responsibility.

The problems of federal-state coordination are mirrored at the federal level where a profusion of agencies is involved in one or more aspects of facility approval. The Environmental Protection Agency, the Council on Environmental Quality, the Department of the Interior, Department of Commerce, Department of Agriculture, and the Corps of Engineers (to name only the most prominent) all have decision-making or advisory functions that directly affect the nuclear licensing process. And, at least in policy matters, the new Department of Energy will be a signal addition to this group.



"It has economic potential, all right, but what about the environmental impact?"

The Seabrook nuclear project graphically portrays the vulnerability of the existing system. Among the forty-three separate licenses, permits, and approvals sought by the applicant,[4] two—the NRC construction permit and the EPA water discharge permit—were to lead to a lengthy and costly procedural stalemate. The NRC construction permits for the twin Seabrook units were issued in July 1976, after three years of staff review and public hearings on safety and environmental issues. The permits were based, among other things, upon an initial EPA approval (the previous year) of a particular way of discharging the cooling water. In November 1976, following substantial site excavation and construction, the EPA regional administrator vacated that approval, causing the NRC licenses to be suspended and construction to be halted. There ensued a turbulent year of appeals—within EPA, within NRC, and to the courts—while the project (includ-

[4] This number is not atypically high. Another utility has projected the required number of approvals in its case at ninety-one (*The Energy Daily*, December 7, 1977).

ing some $200 million of the licensee's investment) remained in limbo. Although the EPA administrator ultimately reversed the regional ruling, unresolved issues are still being sorted out in the two agencies' administrative processes and in the courts.

As the Seabrook experience should teach us, mechanisms must be devised that, at a minimum, will make it possible to coordinate the actions of various agencies. Remedial aims should be straightforward: to sensibly allocate state and federal responsibilities and to limit reviews to those required for ensuring safety and a balance between energy and environmental needs. The manner of implementing those aims should be equally straightforward: to eliminate duplication and, at the federal level, to make a considered choice between consolidation and coordination.

(1) *Eliminating duplication.* This should begin with recognition of the primary role of the states in deciding environmental (and social) issues involving questions of whether, where, and when a nuclear plant is to be constructed. There should be no redundant environmental reviews by the NRC or any other federal agency where individual states are functionally competent (and prepared) to do the job. The states would provide the overall environmental assessment, with two restrictions. First, in projecting the radiological impact of the proposed facility, states would have to follow NRC standards and impact determinations.[5] Second, state environmental review would suffice for federal purposes only when conducted in accordance with criteria established by the appropriate federal agency (presumably either the NRC or the Department of Energy). One criterion might be a requirement for "one-stop" state handling of questions on power needs, land use, and water quality—not only for the sake of efficiency, but the better to balance the inevitable trade-offs between energy and environmental needs. Provision for timely public participation should also be an important criterion.

A determination of environmental acceptability and of the need for power *by a state qualified to make the determination* would be required for the issuance of a federal permit. Where a state did not qualify or did not choose to make such a review, *authority would be vested in the primary federal agency*—the NRC.

(2) *Coordination versus consolidation.* On the federal level, the choice is between consolidating functions or coordinating them. Consolidation (for example, in the NRC, the Department of Energy, or some new energy regulatory agency with an omnibus charter) has its proponents and a supporting array of policy arguments. However, the practical hurdles to be cleared make it a longer-term prospect—one to be addressed after the new Department of Energy has digested the matters so recently put on its plate. It is a course of action, nonetheless, that deserves thoughtful examination as a means of improving regulatory efficiency and dealing with the fundamental problem of fitting nuclear planning and decision-making into overall national energy policy.

Coordination of federal review responsibilities can be more readily accomplished, and there are immediately practicable proposals to be considered. One proposal is to empower a designated body to establish guidelines for—and oversee—such responsibilities rather than to leave the matter to ad hoc interagency understandings, as is done now. An NRC staff study of May 1977 (*Improving Regulatory Effectiveness in Federal/State Siting Actions*) recommends a congressionally established interagency council to coordinate federal siting policy, with subgroups to coordinate the handling of specific applications. One subgroup would receive schedules for agency action from its members and would set a time for accomplishing the reviews and necessary authorizations. There is precedent for the latter step. For example, the Department of Energy Organization Act (P.L. 95-91) authorizes the secretary to set "reasonable time limits" for action by the Federal Energy Regulatory Commission in certain FERC proceedings (section 503d).

A more comprehensive approach has been suggested in congressional consideration of proposed legislation on nuclear export licensing (the Nuclear Nonproliferation Act of 1977, S. 897). The committee report accom-

[5] My strong preference for maintaining a preemptive NRC responsibility for radiological health and safety is grounded on pragmatic considerations: functional competence and the advisability of not fragmenting responsibilities for standards-setting and decision. The recent amendment to the Clean Air Act (P.L. 95-95), giving EPA and the states new authority in this area, is a significant step in the wrong direction.

panying the bill (Senate Report No. 95-467) outlined an amendment that would direct the relevant agencies—including the NRC—to establish procedures to give

> explicit direction on handling of applications, express deadlines for each step of the process with specifically stated officials responsible for meeting such deadlines at each step, a central inter-agency coordinating authority to monitor the processing of applications, [and] a predetermined procedure for expeditious handling of intra-agency and inter-agency disagreements and appeals to higher authorities.

It also provides that applicants "should be advised of all the information required for the entire process for every agency's needs and such information should be required at the beginning of the process in a single filing. . . ." Some of these measures, it might be observed, could be implemented without waiting for legislation.

Admittedly, what is suggested here would be first steps only, but they would have value. Moreover, one can hardly deliver sermons to the states on their disjointed approval requirements without setting the federal house in order. The Seabrook impasse was, after all, a federal affair.

Rethinking the Time and Manner of Public Involvement

A hallmark of the federal process for licensing nuclear power plants has been the pre-license hearing. Conceived originally as a mechanism for public education as much as for resolving disputes, it has become a forum that generates conflict and pleases neither side.

As noted, both the construction permit hearing and the operating license hearing are poorly timed. The first comes after sizable resource and planning commitments have been made and the second after a billion dollar plant has actually been built. As a result, the stakes are exceedingly high in each case—which tends to skew the attitudes of participants, if not the hearing results themselves. Moreover, the hearing's adversary procedures, shaped in the image and traditions of the court room, are dubious means for determining "technical truth." They are even less satisfactory for resolving the social issues that are increasingly in contention. Finally they contribute to unnecessary delay. It is thus particularly disturbing that the hearing has largely become, and is perceived as, the principal if not the sole means of public participation in the plant approval process.

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This situation has led to proposals ranging, at the extremes, from abolition of the hearing to the encouragement of wider participation by paying the expenses of participants. The former is politically unacceptable and too readily rejects the value of timely public participation, especially in siting determinations. The latter raises fundamental social and practical questions on which there are sharply disputed opinions;[6] moreover, it rests heavily on the arguable thesis that participation by the public should continue to be carried out within the framework of the present adversary proceeding.

The problem of the lateness of the preconstruction hearing would be overcome by early site and design decisions—and the operating license hearing could be either eliminated entirely or confined to significant new technical data that might undermine the earlier safety approval. Beyond that, it seems clear to me that a butting of lawyers' heads is not the best manner of examining issues that turn less on factual questions than on differences in technical judgments or social values. Time and resources could be saved and emotions more often subordinated to reason, on both sides, if these procedures were better suited to the problems they are supposed to resolve. What is needed is a less formal licensing hearing, more like a

[6] For one treatment of those questions and differing answers (including those of the author), see "Financial Assistance to Participants in [Nuclear Regulatory] Commission Proceedings—Statement of Considerations Terminating Rulemaking," 41 F.R. 50829 (November 18, 1976).

legislative inquiry and less like a trial in a court of law.

A recent report sponsored by the Senate Committee on Governmental Affairs ("Delay in the Regulatory Process," *Study on Federal Regulation*, volume 4, July 1977) lends support to this conclusion. Finding that the trial-type procedure is a principal cause of excessive delay in regulatory agency processes and is not well suited to certain kinds of cases (including those involving technical decisions), the authors recommend a modified procedure for such cases. The basic hearing should be legislative in nature with no cross-examination; and "only when necessary to resolve particular factual issues . . . essential to the outcome of the proceeding" should cross-examination be allowed in a follow-on adjudicative phase.

It would be fanciful of course to suppose that, by itself, better timed and planned public participation would avoid the contention that permeates the nuclear issue. But there is no good reason for employing processes that breed or exacerbate dispute or that turn decision-making on technical issues into a procedural contest.

Relating the Process to National Energy Policies

Logic, experience, and need tell us that nuclear decision-making is not an end in itself but simply one part of the fabric of national energy planning. The present licensing process, however, is inordinately insular. Past legislative proposals for nuclear licensing reform have advocated modest remedial steps, such as authorizing the NRC to encourage or compel advance planning and notice of proposed nuclear sites and facilities with appropriate opportunity for public discussion. This planning would necessarily encompass all types of plants—fossil as well as nuclear. Though these steps are limited in scope and focus only on the NRC's charter, they would be constructive and could serve as a precursor to broader-based and longer-range improvements.

The federal-state siting study referred to above makes a number of far more ambitious recommendations. The authors' aim is a drastically revised process that would consider nuclear and other generating sources together, with accompanying institutional changes in mechanisms for federal, regional, and state planning and decision-making. Whatever the merits of their specific recommendations, the problem is real: we need a less fragmented system for planning and authorizing electric generating capacity. To devise a system that will be effective and politically feasible will require determination and skill. Here, clearly, the lead should be taken by the new Department of Energy, in view of the enormous stakes involved and the nature of that agency's statutory charter.

Licensing Reform in Perspective

The existing licensing regime is, in the words of President Carter's National Energy Plan, "unsatisfactory to all participants: industry, intervenors and the federal government." The President has coupled that assessment with a commitment to effective licensing reform. But formulation of the Carter administration's legislative proposal (incomplete as this issue of *Regulation* goes to press) has evoked sharply conflicting views within the executive branch, the NRC, and the affected private sector. Illustratively, the *New York Times* called one set of proposals "A Slapdash Approach to Nuclear Plants" (August 29, 1977), while the *Wall Street Journal* headlined its story "White House Guts Earlier Plans to Speed U.S. Approval of Nuclear Power Plants" (August 24, 1977).

The drafts being circulated include provisions for early site review, for considering environmental questions separately from safety and design questions, and for procedural changes to accommodate pre-approval of standard designs. Measures to deal with the federal-state review process are also in most versions. Later versions, unfortunately, retain—and, in some instances, extend—the trial-type hearing prior to any significant licensing action and provide for the funding of intervenors.

The legislation ultimately recommended by the Carter administration will face sharp disagreement on specific points. But there should be substantial support for these fundamental reforms: a more predictable process for site and facility decision-making, with a purposeful balance between energy and environmental needs; a much earlier opportunity for public participation in a less adversary set-

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ting; and a leaner, effectively coordinated framework of federal and state requirements.

Achievable change should not be undermined by unrealistic expectations of reform. No streamlining of the process can wholly remove the potential for uncertainty and delay stemming from the fact that proposals for nuclear generating facilities necessarily require rigorous review. It should also be remembered

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that, while public participation is desirable, it is only one aspect of a broader process and entails social costs that must be weighed in determining when, how, and within what limits it should be accommodated. Finally, there should be no illusion that reform of the licensing process can be a substitute for effectively fitting the use and control of nuclear power into a comprehensive energy policy.

But no amount of realism will excuse failure to overhaul a licensing process so wastefully out of step with national needs. Without excessive disruption, that process can be made more cost-effective and socially responsive. ■

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