Winter 1972

The Legal and Regulatory Framework for Thermal Discharge from Nuclear Power Plants

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THE LEGAL AND REGULATORY FRAMEWORK FOR THERMAL DISCHARGE FROM NUCLEAR POWER PLANTS

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I. Recognition of the Problem

As the rate of electricity generation increases, and as more nuclear power plants—in contrast to fossil fuel and hydro-electric facilities—are built to meet power needs, the use of cooling water and its subsequent discharge in heated states into the environment is expected to rise to massive levels. Estimates of future cooling water use vary and are subject to technical and economic developments, but by 1990, between 640 and 850 billion gallons per day are expected to be required. This range of water use can be roughly equated to one-half to three fourths of the average daily run-off of fresh water in the United States.[1] Alternatively, it has been estimated that "50% of the nation's water will be affected by the year 2000 if once-through cooling continues."[2]

Discharge of heated water by the once-through process creates local thermal problems for the receiving lakes, rivers and coastal waters. Alternatively, the use of cooling towers or ponds brings about the loss of effluent heat to the air, but it has been said that "local thermal air pollution is and will continue to be of little concern because of natural convection in the atmosphere."[3] However, the aggregated impact of thermal air pollution on specific metropolitan areas and ultimately on the global environment, may become an environmental problem, over time.[4]

Thermal water pollution, although an immediate local scale problem, eventually could lead to major regional and even international impacts, particularly in the coastal zone.[5] Thermal air pollution, except for immediate synergistic effects of heat and moisture with local climatological and air quality conditions which

may result in fog and inversions, represents a long term environmental management problem. Energy generation efficiencies, energy storage programs, and thermal storage (e.g. for heating homes) offer possibilities for partial technical solutions to these problems.[6]

The Atomic Energy Commission (AEC) and other federal agencies are at work on thermal prediction models, technological advances in plant design, studies of effects on aquatic life, and site selection criteria.[7] Hopefully, such "learning" will be economically feasible to implement in keeping with ecological necessities. The utilities and the AEC regard the availability of cooling water and discharge facilities as a major element of site selection,[8] along with applicable state (and federal) quality standards for the discharge-receiving waters[9] and the economics of cooling storage units.

Despite such considerations, thermal effluents have had direct and obvious impacts on aquatic life and associated recreation and commerce. Eighteen major fish kills were reported in the period from August 1962 to June 1969 as a result of power plant thermal effluents.[10] In addition, ecological impacts have been reported from other aspects of cooling processes: the impaling of fish on screens of cooling water intake equipment;[11] and the death of fish species that had migrated into waters heated by plant effluents, only to suffer thermal shock when generating and heat discharge facilities were temporarily shut down.[12]

Economic and social impacts may also accompany discharges of thermal air and water effluents: recreation, fishing, tourism, aesthetics and property values are all vulnerable. Fog, icing, and other weather modifications are expected to arise in certain thermal discharge areas,[13] and will enlarge these economic and social effects.

In addition to causing such effects of an ecological, social or economic nature, the discharge of thermal effluents manifests a demand for natural resources—air and water—which are also subject to a wide variety of demands for competing uses such as recreation, shell-fishing, and water supply for urbanization. State and federal decision-makers are now beginning to grapple with this more complex problem of resource management: how to develop the organizational and methodological approaches which will enable rational choices between such demands for limited natural resources.

Because of such effects and resource demands, citizens' groups, environmentalists and others have raised thermal water pollution as a major issue in a number of power plant siting controversies.[14]

As a result, a legal and regulatory framework is now evolving for power-plant decision-making, particularly as it relates to thermal pollution. The balance of this article will develop: (1) a "model" for organizing information from diverse social, technical and legal sectors, to enable power plant decision-makers to assess issues before siting and construction; and (2) an outline of the evolving legal and regulatory framework for thermal water pollution.[15]

II. Developing a Conceptual Approach

Hearings by numerous state and federal agencies, extensive intervention in agency proceedings, and litigation now accompany the construction and operation permit phases of the nuclear power program. Thermal and other project effects are inadequately perceived or dealt with; citizens' groups responding to a variety of self-interests and public interests are bringing new forces to bear on political officials and project decision-makers. The siting, design and implementation of nuclear power plant projects must therefore be based on a full understanding of the dynamic social environment in which such projects will be enacted. To develop this understanding and to be capable of organizing diverse technical, social, economic, political and legal information, a new conceptual model for project management is called for. What follows is a general description of such a model.

A. Inputs and Outputs

Each project undergoes several stages of development. These stages include a site selection and design phase, a construction phase, a pilot program or testing phase, and finally an on-going or operational phase.

Various inputs or resources are needed to carry out each phase of the project. These inputs will vary in type and level with each phase, with irreversible commitments of natural resources normally made at the construction phase. Inputs or resources include funds, manpower, water, land, and facilities and materials for construction, all of which are subject to demands of competing programs and social objectives. However, systematic analysis may reveal that some demands may not be in competition, and that appropriate design for each project may bring about a harmonization of resource use. For example, the thermal discharge of coolant waters may be a resource to mariculture and recreational pro-

grams; plant excavation and the construction of breakwaters may enable the development of recreational facilities and boating, or the better dispersion of pollutants discharged into coastal waters.

Project outputs will also vary. Admittedly difficult to assess, thermal pollution and other project outputs may cause economic and social dislocations for coastal communities or fishing and recreational programs. Thermal effluent containing toxic chemicals to retard corrosion of cooling equipment or radioactive materials may bring about health impacts and subtle, long-term ecological and physical changes in the regional environment. Numerous studies are now being done on such effects at prototype projects, and should be fully consulted by project management. Of course, many of the effects are subject to regulation by water pollution control authorities and public health, conservation and navigation officials at the present time. Project design should also include programs to monitor and assess effects concurrently with each stage of the project, to enable redesign to ameliorate effects and avoid potential legal difficulties. At this point, we can depict the beginnings of a conceptual model for nuclear power plant project management as indicated in Figure 1.

Resources (A) needed for commitment to a project (B) are determined and potential environmental, social, health and economic effects (C) of both a direct and indirect nature, to result from the thermal discharge and other aspects of the project, are considered at the outset.

B. Decision-Makers and Institutional Requirements

The implementation of each project will depend on a wide variety of decision-makers in both public and private sectors, and

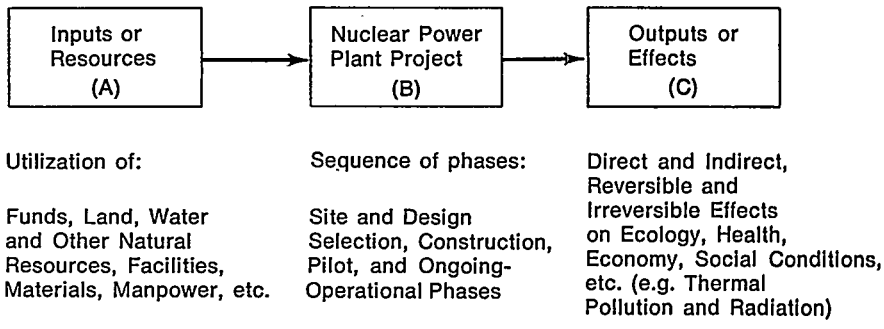

Figure 1
Inputs and Outputs of Power Plant Project.

at varying jurisdictional levels—local, state, federal and some regional. These decision-makers function as controls on any project essentially in two ways: (1) *by controlling inputs of resources:* e.g., public agencies and other public sources of funds and manpower, the sources of private funds and manpower, land use and coastal region authorities, governors and state legislatures whose enactments may be essential to the availability of resources; and (2) *by controlling the detrimental effects or outputs:* e.g., the courts by means of preliminary or permanent injunctions; regulation and enforcement by agencies such as EPA and state pollution control counterparts, the Corps of Engineers and public health agencies; project managers, insurance and private sector interests who may be able to redesign the project to abate or ameliorate effects.

This general discussion of decision-makers can, of course, be developed in detail for any specific power plant project.

Decisions are made in either case largely on the basis of information on the availability of resources (A) to be used, the technical and economic feasibility of the project (B) itself, and information on potential project effects (C). These informational inputs to decision-making are sought and used to enable selection between competing demands for natural resources by some decision-makers (e.g. the legislature or coastal authorities); and to determine control, authorization and regulation of the project by other decision-makers (e.g. the regulatory agencies and courts).

Each decision-maker seeks and uses specific information in accordance with his "institutional framework." The term "institutional framework" is a loose one to encompass an aggregation of governmental policies, common law and legislation, economic policies, management strictures and other institutionalized values and policies which must be considered by decision-makers.

Therefore the general model can now be extended as indicated in Figure 2.

Decision-makers (D) exercise control over inputs (A) and outputs (C); and are influenced by information on resources (A), project feasibility (B), effects (C) and institutional framework requirements (E).

A specific project proposed for Massachusetts Bay, for example, could be depicted along the lines of this general model; and the model made highly specific as to decision-makers and their institutional requirements. In other words, the full array of public and private sector decision-makers expected to be involved in project development and implementation can be determined as to institu-

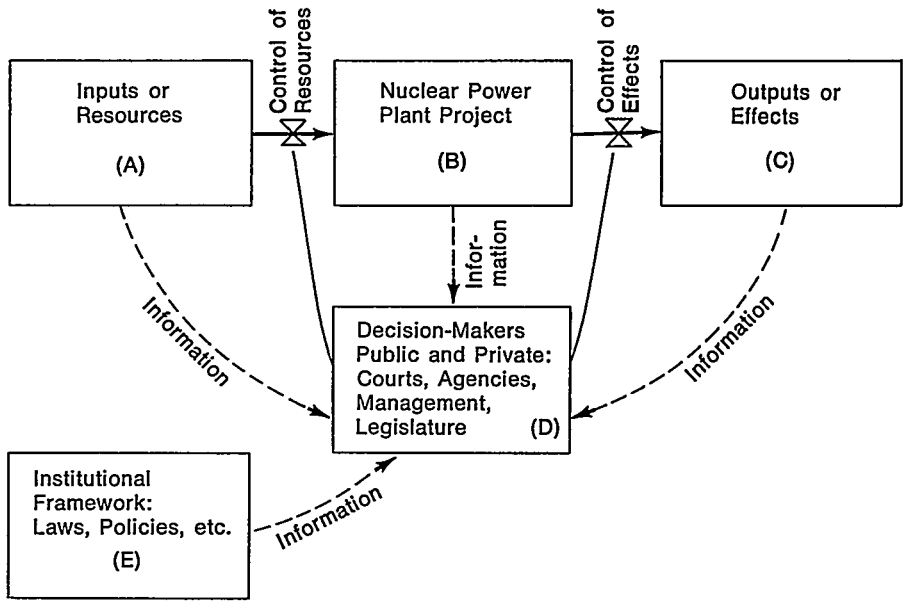

Figure 2
Power Plant Decision-Making.

tional settings, interrelationships, and their procedural and substantive criteria and functions.

C. Public Response to Projects

Finally full attention of project management must be paid to the forces of citizen reaction to effects and resource uses which are perceived to be detrimental to self-interests or larger concepts of public interest. Citizens responding to environmental threats and the disparagement of community quality of life are an important force in ensuring the accountability of decision-makers to the full spectrum of social interests and amenities. The courts and legislatures have recognized the benefits of this mode of accountability, and accordingly have enhanced citizen access to project information and access to decision-makers in the courts, agency hearings and other forums. This important public role has been effectively performed by the Sierra Club and other national organizations, resulting in better environmental decisions and project design.

Major legislation and judicial decisions which have enhanced the roles of citizens' groups will be discussed shortly. However, we can now complete the model by depicting this emerging influence on decision-making as indicated in Figure 3.

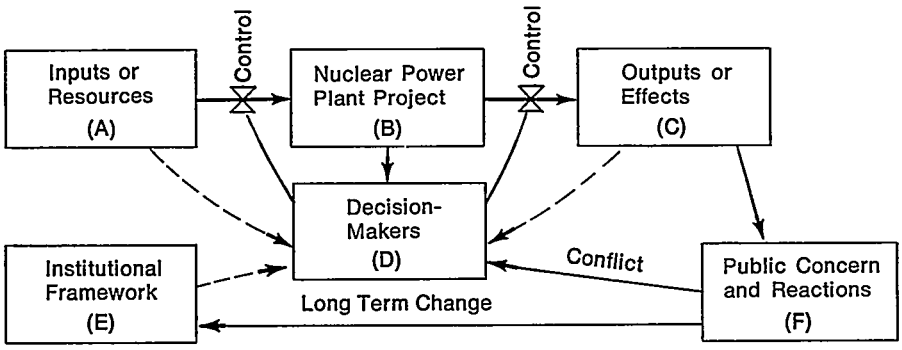

Figure 3
Citizen Participation in Decision-Making.

Detrimental project effects (C) or resources uses (A) perceived by citizens (F) are translated into a variety of new pressures on decision-makers (arrow F-D). Over time, aggregated citizen responses may provide the basis for new legislation, management policy or court decisions and may therefore subsequently be integrated into the institutional framework (E) for decision-making.

One obvious point for sound project design and management can be made on the basis of the model. Project management seeks information for decision-making from all sectors ((A), (B), (C), and (E)), except for information from the citizen sector (F). Citizen sector inputs or influences are manifested largely in adversarial processes (arrow F-D) in the courts or agency hearings. These are costly, time consuming and inefficient modes for management acquisition of information from citizens—especially costly when projects are underway but consistently halted because of litigation or other forms of intervention.[16] It is clear that sound management will enhance the availability of project information to the public (arrow C-F) and elicit citizen opinion beyond the minimal legal requirements to be discussed subsequently. By transforming adversarial patterns into dialogue, and even into "negotiation in good faith among interested parties," citizen inputs can become an integral and constructive aspect of decision-making.[17]

The model presented can be used for the useful organization of information on technical, socio-economic and legal aspects of a nuclear power plant project; for the siting and management of the project; and for the enhancement of communication about the project to interested parties.[18]

The subsequent discussion will explore some specific legal and

regulatory aspects of thermal water pollution and can be keyed to the model (Figure 3).

III. Common Law

The common law or Anglo-American legal tradition, derived from the aggregation of court cases dealing with specific social issues, is of limited interest and utility to our development of the environmental control framework for thermal water pollution.

Briefly, four common law concepts are available to private parties alleging individual injury from thermal water pollution; in rare cases, such concepts are available to groups represented by public officials alleging public injury (e.g., public nuisance). These concepts are: (a) trespass; (b) negligence; (c) nuisance; and (d) property rights in water. Trespass can be defined as the unauthorized physical invasion of private property, for which compensation and injunction are available as remedies. Therefore, the invasion of heated water onto one's land or into one's water supply is presumably actionable. There is no evidence of court decisions which have invoked trespass doctrines for the abatement of thermal water pollution or compensation for its invasion, although there are numerous cases which have dealt with the unauthorized invasion of phenols and other chemical pollutants.

Negligence is, for summary purposes, the failure to act in a reasonable, state-of-the-art manner which results in harm. For example, careless design, construction, maintenance or operation of cooling facilities which results in the leakage or dispersal of thermal effluents to the detriment of adjoining landowners is presumably actionable. Once again, however, there is no evidence of decisions in which courts have invoked negligence for the abatement of thermal water pollution or compensation for its injurious effects; however, there are numerous cases which have dealt with the negligent maintenance or operation of waste water storage or disposal facilities such as sumps for the storage of chemical wastes.

Nuisance and the riparian rights version of private property rights in water both call for the same elements of proof—"namely, defendant's unreasonable interference with plaintiff's right to make beneficial use of (his) water."[19] It appears that in only a few American cases—involving the deleterious effects of heated water discharges by industrial firms into bodies of water used by private parties in accordance with their property rights to make ice—have

courts invoked the common law concepts of nuisance and riparian rights to ameliorate the effects and have enjoined the thermal polluter or provided compensation for damages to the injured party.[20]

There seem to be no other potentially important bases for action on thermal pollution at common law, and the paucity of cases to date is generally acknowledged.[21] In addition, structural and procedural limitations prevent the courts from functioning as effective controls on environmental hazards such as thermal pollution. The courts await the fortuitous arrival of cases (Figure 3, arrow F-D) and do not initiate action; the courts are normally called on to solve problems (Figure 3, item C) after the problem source (Figure 3, item B) is fully developed—i.e. the social and economic commitment has been made and the power plant has been built; the courts restrict litigation (Figure 3, arrow F-D) in accordance with a variety of procedural doctrines such as the statute of limitations, and generally cannot grapple with long-term pernicious hazards (Figure 3, item C).[22] Finally, the courts cannot really grapple with the issues of resource management (Figure 3, item A). Here, executive and legislative branches of government, or corporate management, have cognizance, and are generally subject to judicial review on procedural grounds, but not on the substantive bases for decisions.

As a result of the substantive limitations of the common law, and the structural and procedural limitations of the judicial system, the major burden of pollution control—including thermal pollution—has been placed on the federal and state legislatures and agencies. Discussion of these institutions and their developing roles for the environmental control of thermal pollution will dominate the balance of this article, along with the one important judicial function—review of administrative decision-making.

IV. Pollution Control Legislation and Regulation

Responsibility for thermal water pollution has slowly devolved upon the AEC as a result of new perceptions of effects and new pressures from public officials and citizens on decision-makers and legislators.

A. The Early AEC Position

In the 1968 Report of the Energy Policy Staff of the Office of Science and Technology, Considerations Affecting Steam

POWER PLANT SITE SELECTION, the responsibility of the Atomic Energy Commission for thermal effects was stated as follows:

> The AEC has no present jurisdiction over the thermal effects caused by the siting of nuclear plants. However, each applicant for a construction permit is urged to:
>
> (i) Cooperate with the Fish and Wildlife Service, the Federal Water Pollution Control Administration, the State Fish and Game Boards and other interested agencies in developing plans for ecological surveys;
>
> (ii) Construct, operate and maintain such fish protective facilities over the water intake structures as needed to prevent significant damage to fishery resources; and
>
> (iii) Make such modifications in project structures and operations as may be found necessary as a result of ecological surveys.
>
> When selecting a site for a reactor facility, a utility must satisfy its particular state that it can comply with these regulations during the operation of the facility.[23]

This position of peripheral responsibility was derived from a synthesis of diverse legislation, regulations and executive orders. For example, the controlling legislation—the Atomic Energy Commission Act of 1954—essentially confined AEC environmental responsibilities to radiological health and safety pertaining to the special hazards associated with the operation of nuclear facilities. However, the Water Pollution Control Act and its amendments through the 1965 Water Quality Control Act required the state establishment of water quality standards and implementation programs.[24] Subsequent criteria approved under the program contained temperature requirements which were operational in 45 states by 1968; and the Secretary of the Interior, then responsible for implementation of the water quality program, articulated an antidegradation policy in 1968. Additionally, Executive Order 11288 was issued requiring federal activities to meet applicable water quality criteria and otherwise review agency programs to contribute to the national water pollution control effort.[25]

The existence of numerous other programs relating (1) to waters used for thermal discharge purposes (e.g. those of the Corps of Engineers relating to dredging and construction in navigable inland and coastal waters) and (2) to fish and wildlife conservation (e.g. those of the Department of the Interior and state agencies concerned with fish and wildlife) made it incumbent upon the AEC to adopt the cooperative stance on thermal water pollution

described in the Energy Policy Staff Report.[26] Nevertheless, the primary mission of the AEC to both promote and regulate nuclear power, the regulatory focus on radiation, and the two-step licensing procedure for construction and operating authorizations resulted in inadequate concern for thermal effects of licensed facilities.

State officials and citizens' groups became concerned over this failure to fully confront the thermal pollution issue. One result was *New Hampshire v. AEC*,[27] in which the state of New Hampshire sought judicial review of the AEC's granting of a provisional construction permit to the Vermont Yankee Nuclear Power Corporation for a nuclear power reactor at Vernon, Vermont. As the court noted:

> The narrow but important issue is whether the Commission erred in refusing to consider, as outside its regulatory jurisdiction, evidence of possible thermal pollution of the Connecticut River. . .

After reviewing the legislation, including the 1954 Atomic Energy Act, the court determined that "Congress . . . had in mind only the special hazards of radioactivity . . ."; that the "Commission had been consistent in confining itself to these hazards . . ."; and that Executive Order 11288 encompassed ". . . only installations owned by and operated for the government, rather than those subject to the government's regulatory powers. . ." The court thereupon concluded that ". . . the licensing board and the Commission properly refused to consider the proferred evidence of thermal effects . . ." and affirmed the issuance of the construction permit as well as the position of the AEC on thermal pollution enunciated in the Energy Policy Staff Report.

B. Water Pollution Control Program Developments

The legislative response to the court's unwillingness to close what the court had described as ". . . a serious gap between the dangers of modern technology and the protections (then) afforded by law . . ." was the 1970 amendment[28] to the Federal Water Pollution Control Act.[29] This amendment, in part, provided that:

> Any applicant for a federal license or permit to conduct activity including . . . the construction or operation of facilities, which may result in any discharge into the navigable waters of the United States, shall provide the licensing or permitting agency a certification from the State in which the discharge originates or will originate . . . that

> there is reasonable assurance . . . that such activity will be conducted in a manner which will not violate applicable water quality standards.[30]

As a result, before a construction license could be provided by the AEC, the relevant state water pollution agency would either have to (1) certify that the potential AEC licensee could be expected to meet water quality standards and criteria—including those related to temperature—or (2) fail to act within a reasonable time. State certification for construction license purposes also sufficed for subsequent operating license purposes; but the state could discontinue its earlier certification before the issuance of an operating license if ". . . there is no longer reasonable assurance that there will be compliance with applicable . . . standards . . . ," and thereby suspend the AEC licensing process.[31]

The AEC subsequently acknowledged responsibility for thermal effects and other non-radiological environmental effects in licensing nuclear facilities,[32] in part due to the 1970 Amendment, in part due to the National Environmental Policy Act and its judicial interpretations, to be discussed subsequently in this article.

Defects in this system of water pollution control as it related to thermal pollution have been succintly reviewed by Tarlock, Tippy and Francis in their extensive review of power plant siting.

> . . . even today, there is sharp debate over the (temperature criteria and) standards to be applied. The Environmental Protection Agency has avoided the establishment of a firm thermal standards policy. Instead, they have preferred to negotiate agreements with utilities . . . that cooling towers will be constructed. . . The drafting and enforcement of thermal quality standards (by the states) present several serious problems . . . because of the variations in both surface and flow characteristics of bodies of water, thermal criteria must be individually established for each site and must be coordinated for large reaches of a stream or estuary. . . Furthermore, . . . standards are especially vulnerable to judicial attack on the grounds that they are unreasonable. Courts have required a showing that probable injury to a beneficial use will result . . . and absent such a showing, have found that the discharge does not constitute pollution because the injury is speculative. . . Finally . . . regulation is complicated because states do not have adequate technical information to assess a proposed discharge. . .[33]

The National Technical Advisory Committee on Water Quality

Standards originally appointed by the Secretary of the Interior, subsequently published reports recommending criteria in five general areas of water use. These criteria provided general guidelines for state use, and constituted an attempt at remedying some of the technical problems attending state efforts to grapple with thermal pollution.[34]

Enforcement procedures against all types of polluters under the 1970 federal water pollution control program proved cumbersome, and involved extensive periods of notice, conferences, and occasionally, litigation. Most procedures against thermal polluters were resolved at the conference stage by agreement on *ad hoc* pollution control programs by the interested public and private sector parties. However, payments for harmful effects of heated water discharges were required by states in several cases—e.g., in Ohio and New York.[35]

The cumbersome nature of the 1970 Water Pollution Control program, its meagre results, and its inhibitions on aggressive federal leadership brought about several proposals for new legislation, which led to the 1972 Federal Water Pollution Control Act. A major feature of the new law, to be discussed subsequently, is its integration of the Water Pollution Control program with the dissimilar Refuse Act Permit Program of the Rivers and Harbors Act of 1899.

C. Refuse Act

The Rivers and Harbors Act was passed in 1899[36] to provide the Corps of Engineers with authority over activities which would result in impacts on the navigability of inland and coastal waters. But through a series of remarkable decisions by federal courts in the 1960's and early 1970's, the "Refuse Act" section was interpreted so as to provide the Corps of Engineers with authority to deny virtually all industrial discharges into navigable waters, irrespective of any effects on navigation. Citizens vigorously sought application of the Act in light of its judicial extensions, and federal attorneys stopped many industrial polluters through use of the Act in the courts.

In light of the judicial extension of the Act, some 40,000 industrial plants were considered to be in violation because of ongoing discharge practices in mid-1972. EPA and the Corps, after some initial difficulties in administering the new form of the Act,

set out to review the newly-determined "violators" with the intention to stop blatant cases, but to allow permits to others—the majority—so that these lesser polluters would fall within the gradual abatement program of the 1970 Federal Water Pollution Control Act.

However, in the 1971 case of *Kalur v. Resor*[37] a federal court determined that the issuance of such permits fell within the scope of the National Environmental Policy Act and called for the development of individual *a priori* impact assessments (to be discussed in the next section). The staggering work load that would be entailed in the development of thousands of impact assessments brought a temporary halt to the intended mass permit program, and provided one more incentive for the passage of the new Federal Water Pollution Control Act of 1972, since it was clear that only new legislation could reconcile the problems of abating water pollution under two disparate programs.

As far as heated water discharges are concerned, no cases under the Refuse Act brought about judicial extension of the Act to thermal pollution. The federal government did contend that heated water constituted refuse, and initiated litigation against the Florida Power and Light Company, because of thermal discharges into Biscayne Bay from the company's Turkey Point Plant. The case was settled by a consent decree, precluding judicial definition of thermal effluents as refuse. But as has been noted, the presiding judge had not questioned the government's contention and had denied the defendants' motion to dismiss, prior to the consent decree formulation.[38] The use of chemicals in the cooling process, and their discharge along with heated effluent also rendered thermal effluents particularly vulnerable to further judicial applications of the Refuse Act.[39]

D. 1972 Water Pollution Control Amendments

The difficulties of establishing a viable federal-state program for the control of water pollution led, in late 1972, to Congressional enactment of a new federal program which has substantially changed the earlier approaches. The 1972 amendments (P.L. 92–500) are lengthy and complex and await judicial and agency interpretation. Some of the major provisions which apply to the discharge of heated effluent follow:

(*Sec. 101*): A national goal that the discharge of pollutants into

navigable waters be eliminated by 1985. An interim national goal that, wherever attainable, water quality sufficient for the protection and propagation of fish, shellfish and wildlife be achieved by 1 July 1983. Both goals are keyed, however, to the availability and feasibility of treatment technologies.

(*Sec. 102*): A ban on the release of storage water to dilute pollution, as a substitute for adequate treatment of wastes at the source.

(*Sec. 301b*): The requirement that effluent limits for point sources be based on the "best practicable control technology currently available" by 1 July 1977, and on the "best available technology economically achievable" by 1 July 1983. Therefore, national effluent criteria will be established for different classes of point sources, and periodically reviewed in light of changing technological and economic conditions, by the EPA. Additionally, more stringent criteria must be applied if necessary to protect fish, shellfish and wildlife, to allow recreation, and to meet the pre-existing state water quality standards.

(*Sec. 306(b)(1)(A)*): The list of industries to be regulated by EPA, in terms of such effluent criteria includes "steam electric powerplants"; (306(d)) provides that point sources, constructed after the effective date of the law and in conformance with applicable performance standards, shall not be subject to more stringent limitations for a 10 year period running from the completion of construction or during the period of depreciation of such facility as defined by the Internal Revenue Code, whichever period ends first. Subsequent violations of limitations are unlawful, according to (306(e)).

(*Sec. 316*): The thermal discharge criteria imposed may, on an *ad hoc* basis, be changed by EPA following the introduction of evidence by the operator of a power plant that less stringent limits will be sufficient to "assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wild life . . ." in the waters receiving the discharges. The "best technology available" criterion shall apply to the location, design, construction and capacity of cooling water intake structures.

(*Sec. 401 through 405*): The permit program previously implemented under the Refuse Act is modified and integrated into the new program to be administered by EPA. (Sec. 401(a)(3)(4) and (7) apply to the electric utility industry, in particular.)

Other sections provide for state permit programs, citizens suits, and federal monitoring and enforcement.

The Environmental Protection Agency has since taken a number of implementing actions, by issuing the following:

Notice of Interstate and Intrastate Standards Subject to Agency Review,[40] to review the pre-existing state water quality standards.

Proposed Guidelines and Forms for Acquisition of Information from Owners and Operators of Point Sources[41] for the National Pollutant Discharge Elimination System to acquire information on pollutant discharges from municipal, agricultural, manufacturing and other commercial sources. The forms also constitute applications for permits to be subsequently acted upon by EPA or states whose permit programs have been approved by EPA. EPA has admitted that its haste in awarding permits is premature in the sense that no national effluent criteria presently exist, but has asserted that immediate action on permits is justified, in some cases by the existence of "effluent guidances" previously developed, and in other cases to launch the new program and meet subsequent deadlines of the law.

State Program Elements Necessary for Participation in the National Pollutant Discharge Elimination System[42] to provide criteria for EPA evaluation of state permit programs which upon approval, result in state exercise of permit authority.

Proposed Rule Making for National Pollutant Discharge Elimination System[43] to provide criteria for EPA review of applications for discharge permits.

These rapid new developments will be implemented and tested in the future, and have increased the complexity—but hopefully also the effectiveness—of coping with thermal and other discharges. Despite EPA's promises of rigorous enforcement, however, considerable skepticism has greeted its hasty issuance of permits without the prior development of technical criteria, particularly since the subsequent establishment of such criteria will be unenforceable against permit-holders during the five year duration of the typical permit.

Superimposed on these legislative and administrative activities has been the enormous influence of the National Environmental Policy Act. The following section discusses the Act and some judicial applications relevant to the control of thermal water pollution from nuclear power plants.

V. National Environmental Policy Act (NEPA)[44]

NEPA became federal law on 1 January 1970 and has since surpassed all expectations in its effects on decision-making in the federal agencies, and to some extent, in state programs and the private sector.

The Act includes a declaration of national policy for (a) rehabilitating environmental damage, and (b) planning and managing future federal activities in environmentally responsible terms. But NEPA also includes a relatively unique legislative provision—an "action-forcing" section which requires federal agencies to develop new resources, methods and criteria for decision-making and to articulate applications of this new decision-making process, in full, for public use.

The provision of new information under NEPA to the public has brought about new bases for litigation by citizens' groups, vigorous judicial review of agency decisions, and significantly extensive interpretation of the scope of NEPA requirements.[45]

A. Impact Assessment Procedures and Program Decision-Making

Section 102 of the National Environmental Policy Act requires federal agency assessments of environmental impacts before "major actions" are to be taken. These actions include, for example, the AEC approval of a construction license to a utility, and the granting of permits by the Corps of Engineers to dredge, construct or discharge industrial wastes in navigable waters. The assessment responsibility is broadly stated—NEPA calls for systematic and interdisciplinary approaches to decision-making which will integrate quantifiable technical and economic considerations along with unquantifiable environmental amenities; and each *a priori* assessment must be developed to treat five issues:

(1) potential environmental impacts;
(2) unavoidable adverse impacts;
(3) irreversible adverse impacts;
(4) short-term considerations vs. long-term resource use considerations; and
(5) alternatives to the proposed action.

Draft and final impact assessments are made available to the public and other governmental officials for review,[46] under pro-

cedural guidelines established by the Council on Environmental Quality. Although NEPA does not provide a veto power to any official even if the project assessed poses real environmental hazards, the Act does provide new information to the public by exposing the extent to which environmental effects are being considered by the agency. Any glaring deficiencies in the statement scope and substantive content will, on the basis of experience since January 1970, result in citizen group intervention in agency processes, political pressures and litigation. Many agency projects proposed and assessed have been delayed, and in some cases, projects have been abandoned. Others have proceeded, but only after redesign to ameliorate those environmental impacts which have generated controversy.

Most of these agency projects involve applications of existing technology for road-building, dredging, housing construction, etc.; but a few involve the further development of new technology—e.g. the air cushion vehicle, the liquid metal fast breeder reactor, cloud seeding experiments, offshore exploration programs for mineral resources.

Although NEPA does not require consideration of social or economic impacts *per se,* these are inevitably integral to the assessment of most environmental impacts. Although NEPA does not impose assessment and exposure processes on industry, the private sector or state agencies, whenever a utility or other non-federal organization is the applicant or intended beneficiary of federal agency "major action," its proposal is handled by the federal agency in the NEPA process. There have been suggestions that NEPA be extended directly to the private sector, but as yet, these have not been seriously considered. However, variants of the Act have been adopted by several states—e.g. Washington, California, and Massachusetts—and others are expected to follow,[47] extending the habits of *a priori* assessment and exposure of decision-making processes to a wide variety of state agencies.

B. Judicial Developments—Calvert Cliffs

The courts have carried the impact of NEPA on decision-making even further. In *Calvert Cliffs Coordinating Committee v. AEC,*[48] the court reviewed AEC implementation of NEPA—specifically AEC regulations to the effect that:

(1) Although environmental factors must be considered by the

> Agency's . . . staff under the rules, such factors need not be considered by the hearing board . . . unless affirmatively raised by outside parties or staff members . . .
> (3) Moreover, the hearing board is prohibited from conducting an independent evaluation and balancing of certain environmental factors if other responsible agencies have already certified that their own environmental standards are satisfied by the proposed federal action. . . .[49]

The court's highly-critical response to rule (1) noted that:

> . . . the Commission's crabbed interpretation of NEPA makes a mockery of the Act. . . What possible purpose could there be in requiring the "detailed statement" (of environmental impacts) to be before hearing boards if the boards are free to ignore entirely the contents of the statement? NEPA was meant to do more than regulate the flow of papers in the federal bureaucracy . . . (NEPA) must . . . be read to indicate a congressional intent that environmental factors as compiled in the "detailed statement" be considered through agency review processes. . . In uncontested hearings, the board . . . must at least examine the statement carefully to determine whether the review . . . by the Commission's regulatory staff has been adequate. And it must independently consider the final balance among conflicting factors. . . .

The response to rule (3) was also highly critical, and has since resulted in considerable confusion as to the extent agencies such as the AEC should go in reducing emissions, with respect to the air and water pollution standards and criteria established by other federal and state agencies.

> We believe the Commission's rule is in fundamental conflict with (NEPA) . . . NEPA mandates a case-by-case balancing judgment . . . In each individual case, the particular economic and technical benefits of planned action must be assessed and then weighed against the environmental costs . . . to ensure that . . . the optimally beneficial action is finally taken.
>
> Certification by another agency that its own environmental standards are satisfied involves an entirely different kind of judgment. Such agencies (e.g. EPA), without overall responsibility for the particular federal action in question, attend only to one aspect . . . (and) do not attempt to weigh . . . damage against opposing benefits. Thus the balancing analysis remains to be done . . . The only agency in a position to make such a judgment is the agency with overall responsibility for the proposed federal action.

The court used the water pollution control program to illustrate:

> Obedience to water quality certifications under WQIA (Water Quality Improvement Act) is not mutually exclusive with NEPA procedures . . . Water quality certifications essentially establish a minimum condition for the granting of a license. But they need not end the matter. The Commission can then go on and perform the very different operation of balancing the overall benefits and costs of a particular proposed project, and consider alterations above and beyond the applicable water quality standards which would further reduce the environmental damage . . .

In short, the court imposed on federal agencies, the burden of striking the best environmental bargain possible, for each project, within the framework of standards and criteria provided by pollution control programs of other agencies. ". . . NEPA mandates a rather finely tuned and systematic balancing analysis in each instance," as the court succinctly put it. The AEC decided not to appeal this decision; and it now appears that NEPA and *Calvert Cliffs,* together with amendments to the federal water pollution control program, have made a shambles of the doctrine of AEC non-responsibility for thermal water pollution as it had been earlier articulated in *New Hampshire v. AEC* (1969) and the Energy Policy Staff Report (1968). However, it should be noted that the 1972 Water Pollution Control amendments (section 511 (c)(2)) have made the permit conditions and effluent criteria, to be established by EPA, the strictest that a federal agency may impose, thereby limiting the full influence of the *Calvert Cliffs* decision.

So the model (Figure 3) presented earlier can be further developed by adding in the growing practice of environmental-social assessment of effects (C) by federal decision-makers at the point where inputs or resources are to be committed to certain types of projects and some technological developments (line A-B). Concomitantly, the flow of information on effects to citizens has been enhanced (line C-F). The results are controversial for a number of reasons. NEPA has fostered a multitude of conflicts between interest groups and agencies resulting in extensive program delays. But it is clear that NEPA is forcing wiser environmental practices.

A number of legislative proposals were introduced in 1972 to limit the impact of NEPA on the nuclear power program. These

include direct amendments to NEPA, amendments to other laws which would effectively limit NEPA, and new legislation which would explicitly exempt certain programs from compliance with NEPA. For example:

—H.R. 13752 which would amend NEPA by allowing the AEC to issue operating licenses without filing a final impact statement;
—H.R. 14137 which would amend NEPA to allow the President at his discretion to declare an emergency (e.g. power shortage) and suspend NEPA compliance on a specific project basis, without hearings to determine if an emergency exists in fact;
—H.R. 14065 to amend AEC Act provisions for interim operating licenses so that NEPA can be avoided to some extent; and
—H.R. 5277, a Power Plant Siting Bill, which would set up a procedure for long range planning and state certification of power generating facilities, specifically eliminating the need to file NEPA impact assessments.[50]

Evidently, a backlash of sorts is taking place. It would be unfortunate if the benefits of NEPA-enlightened decision-making are to be sacrificed for short term agency expediencies and narrow mission orientations. Some evidence that this is already occurring is provided by the recent *Interim Policy Statement on Implementation, Federal Water Pollution Control Act Amendments of 1972* of the AEC[51] and by the concurrent *Memorandum of Understanding Regarding Implementation of Certain Complementary Responsibilities* of the AEC and EPA.[52] The important contents of these determinations constitute a major limitation on the application of NEPA to AEC activities.

VI. Other Legal Developments

A wide variety of environmental bills, laws and judicial decisions seem now to flow constantly from federal and state legislatures and courts. Few confront or explicitly refer to thermal water pollution, but deal instead with land and water use, resource management, decision-making as between competing demands for specific resource areas, and access of citizens to decision-makers either in agency hearings or processes of judicial review.

Many of these legislative and judicial enactments will nevertheless effect site selection of power plants, and the inputs and outputs—including thermal effluents—of power plant projects. In fact, virtually every environmental problem seems to exist within

a patchwork of interrelated federal, state and local laws and policies which is growing by a process of constant accretion. The conceptual model discussed may prove helpful in organizing and integrating these diverse events for specific power plant projects.

What follows are some examples of new developments: one can only speculate on their potential for control of thermal water pollution from nuclear power plants.

In November 1972, the Coastal Zone Management bill became law.[53] This law authorizes the Secretary of Commerce to make annual grants to coastal states to aid in their development of resource management programs for the coastal zone. Six elements are required for funding of each management program:

(1) identification of boundaries of coastal zone subject to the state's management program;
(2) definition of permissible land and water uses;
(3) inventory and designation of areas of particular concern;
(4) identification of means of state control over coastal zone resources and uses, to prevent adverse impacts;
(5) guidelines on priority of uses; and
(6) organizational structure of management program and relationships to other agencies.

This law also establishes a National Council and Commission, and a 15-member Coastal Zone Management Advisory Committee.

However, another bill, the proposed Land Use Policy Act,[54] could render the Coastal Zone law of minimal value since the Land Use bill, if enacted, would be broader in scope and offer similar management programs to all states. And Congress is considering several power plant siting bills with obvious overlaps and conflicts with land and coastal management bills.

At the state level, similar developments are taking place, either in response to newly-emerging federal programs and funding sources, or in response to specific state needs and objectives. In New England, Maine has enacted a Mandatory Zoning Law for land within 250 feet of normal high tide, a Coastal Island Trust Law and an Unorganized Areas Law within the past two years to extend state authority for resource management purposes; New Hampshire has adopted a Power Siting Law (1971); Rhode Island a comprehensive Coastal Zone law (1971) which includes authority over power plants which affect tidal waters; and Massachusetts has established state task forces (1972) to develop recommenda-

tions for legislation on coastal and energy problems by 1973. In addition, Massachusetts is beginning to enforce coastal and inland wetlands laws passed in the 1960's for conservation purposes. The varieties appear endless,[55] and planning efforts are now being made at state-wide and regional levels by a number of public, quasi-public and private organizations.

Of course, most important land use controls are presently lodged at the local community level and zoning is a major siting consideration. Most states now seem to be grappling with the politically difficult task of regaining land use control from local authorities for environmental and resource management on a coherent state-wide level.

The role of citizens' groups and their access to information and to decision-makers is being enhanced by judicial action and the new bases for information and litigation afforded by NEPA and by state legislation, e.g. Citizen Suit Statutes in Michigan, Massachusetts, etc.[56]

With regard to the important procedural issue of citizen standing to obtain judicial review of federal agency decisions, the recent Supreme Court decision in *Sierra Club v. Morton*[57] represents the present "state of the art" or legal definition of "whether a party has a sufficient stake in an otherwise justiciable controversy to obtain judicial resolution of that controversy. . ." This issue is central to representation of environmental and resource interests in the legal system. In the project model discussed earlier, the issue is determinative of citizen challenges to agency decision-making in the courts. It is the first and major hurdle for most environmental groups to overcome.

The Supreme Court upheld the lower court's opinion that the Sierra Club lacked standing to maintain an action to enjoin Secretary of the Interior Morton from allowing a commercial development in Mineral King Valley. The Court carefully articulated its determination of the current status of standing: that injury other than economic harm is sufficient to bring a person within the zone of standing; that merely because an injury is widely shared by the public does not mean that an individual cannot assert it as a basis for personal standing; that injury sufficient for standing can include aesthetic, conservational and recreational, as well as economic and health injury. But the Court noted that ". . . broadening the categories of injury that may be alleged in support of standing is a different matter from abandoning the re-

quirement that the party seeking review must have himself suffered the injury . . ."; that ". . . a party seeking review must allege facts showing that he is himself adversely affected . . ." in order to prevent litigation by those ". . . who seek to do no more than vindicate their value preferences through the judicial process." Clearly, the decision is a sound one, clarifying highly liberalized criteria for citizen action and preserving sound judicial procedure. Implications of the case will doubtless be felt in a variety of pollution sectors, including thermal water pollution.

Finally, the effectiveness of thermal water pollution control measures will depend on the development and application of meaningful site selection procedures, cost-benefit analyses or "finely-tuned balancing" methods, technological advance and the reduction of consumer demands for power. Both the AEC and the utilities will be carefully monitored by citizens' groups and state and federal pollution control agencies for their performance.

To focus on but two areas of specific future concern:

(1) AEC guidelines for the preparation of environmental impact assessments and attendant cost-benefit analyses; and
(2) Research and development by the AEC and the Utilities.

New AEC guidelines have been proposed for use this year,[58] and their implementation under public scrutiny will determine how far we have progressed since *New Hampshire v. AEC*. Finally, with regard to research, the Council on Environmental Quality recently reported:

> Expenditures for all types of research and development by the electric utility industry, which accounts for a large share of several of our most damaging pollutants, were only $41 million in 1969. That is less than one-quarter of one per cent of their annual revenues, and about 60 per cent of their annual advertising expenditures . . . it will be necessary for the . . . industry to provide greater support in the future . . .[59]

Advances in technology, reduction of consumption, and government and corporate responsibility under citizen scrutiny and pressure may eventually bring about a solution to the thermal pollution problem.

FOOTNOTES

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versity School of Law. This article was presented at the 1973 Conference of the American Society of Civil Engineers, Washington, D.C., Feb. 2, 1973.

[1] Thomas, *Thermal Discharges: A Legal Problem,* 38 TENNESSEE L. REV. 369 (1971) (based on NSF-Oak Ridge Study).

[2] HEARINGS ON H.R. 4148 AND RELATED BILLS BEFORE HOUSE COMMITTEE ON PUBLIC WORKS, 91st Cong., 1st Sess., 387 (1969), cited in Tarlock, Tippy and Francis, *Environmental Regulation of Power Plant Siting,* 45 S. CAL. L. REV. 502 (1972).

[3] Hottel and Howard, NEW ENERGY TECHNOLOGY (Cambridge: MIT, 1971) 82.

[4] *See* MAN'S IMPACT ON THE GLOBAL ENVIRONMENT (Cambridge: MIT, 1970).

[5] "The National Estuarine Pollution Study projects that 30% of all power plants will be located in coastal zones . . ." REPORT OF THE SECRETARY OF INTERIOR TO U.S. CONGRESS PURSUANT TO P.L. 89–753, THE NATIONAL ESTUARINE POLLUTION STUDY, 1970, as cited in Tarlock, Tippy and Francis, *supra* n.2.

[6] *See,* Hottel and Howard, *supra* n.3, at 81–100; Harleman, *Heat—The Ultimate Waste,* TECHNOLOGY REVIEW (Dec. 1971).

[7] 1971 ANNUAL REPORT TO CONGRESS, Atomic Energy Commission (Jan. 1972) 67–72; *also see, Notice of Intent to Develop General Siting Criteria,* 38 Fed. Reg. 3106 (Feb. 1, 1973).

[8] *See,* CONSIDERATIONS AFFECTING STEAM POWER PLANT SITE SELECTION, Energy Policy Staff, Office of Science and Technology (1968) 22; Bronstein, *The AEC Decision-Making Process and the Environment: A Case Study of the Calvert Cliffs Nuclear Power Plant,* 1 ECOLOGY L. Q. 689 (1971).

[9] Under the Federal Water Pollution Control Act as amended through 1972 (P.L. 92-500) (1972).

[10] Inventory has been maintained since 1962 by the Federal Water Pollution Control Administration, now the Water Quality Office of the Federal Environmental Protection Agency. *See,* table of fish kills cited in Bloom, *Heat, A Growing Water Pollution Problem,* Bureau of National Affairs Monograph No. 4 (May, 1970).

[11] *Con Ed Fined $1.6 Million for Fish Kill at Atom Plant,* New York Times, May 24, 1972, p. 78.

[12] As reported in several articles in the New York Times in the spring of 1972.

[13] *See,* FINAL IMPACT STATEMENT ON VERMONT YANKEE NUCLEAR POWER STATION, Atomic Energy Commission, Docket No. 50-271.

[14] *See,* Nelkin, NUCLEAR POWER AND ITS CRITICS (Ithaca: Cornell

Univ. Press, 1971); in particular, the discussion and tabulation of siting controversies.

[15] The paucity of knowledge and action on thermal air pollution precludes extensive treatment at this time.

[16] The Vermont Yankee Nuclear Power Plant is a case in point.

[17] The Corps of Engineers is now experimenting with "Fishbowl Planning" to enhance citizen participation in project design and early planning. The MIT program on Transportation and Community Values is working on similar developments for the federal highway program, some of which have been adopted by the Department of Transportation in its Policies and Procedures.

[18] For a full discussion of the model presented in this paper, *see* Baram and Ducsick, *A Conceptual Framework for the Social Control of Science and Technology,* presented at the AAAS Conference, Dec., 1971.

[19] Thomas, *supra* n.1, at 379.

[20] Walker Ice Company v. American Steel and Wire Company, 70 N.E. 937 (Mass. 1904); Sandusky Portland Cement Company v. Dixon Pure Ice Company, 221 F. 200 (7th Cir. 1915); *see also,* Thomas, *supra* n.1.

[21] Other authorities have surveyed the case law with similar results. Grad, ENVIRONMENTAL LAW (New York: Matthew Bender, 1971) 2-281, notes that "Until 1969, there was only one reported case on thermal pollution in the United States, and it appeared to be somewhat inappropriate in the major context of the present problem . . ."

[22] *See* Baram, *Social Control of Science and Technology,* SCIENCE (May 7, 1971); Portnoy, *Role of the Courts in Technology Assessment,* 55 CORN. L. REV. 861 (1970).

[23] CONSIDERATIONS AFFECTING STEAM POWER PLANT SITE SELECTION, *supra* n.8, at 22.

[24] 33 U.S.C. §466 *et seq.*

[25] CONSIDERATIONS AFFECTING STEAM POWER PLANT SITE SELECTION, *supra* n.8, at 40–41.

[26] Cooperation was also reflected in several interagency memoranda of understanding. *See,* Tarlock, Tippy and Francis, *supra* n.2, at 524.

[27] 406 F.2d 170 (1st Cir. 1969), *cert. denied,* 395 U.S. 962 (1969).

[28] P.L. 91–224 (1970).

[29] 33 U.S.C. §466 *et seq.*

[30] 33 U.S.C. §1171(b)(1).

[31] 33 U.S.C. §1171(b)(2), (3), (4).

[32] 35 Fed. Reg. 18,469 (Dec. 4, 1970).

[33] Tarlock, Tippy and Francis, *supra* n.2, at 529–533.

[34] *See,* the summary of recommended temperature requirements for aquatic life in Bloom, *supra* n.10, at 7–11.

[35] Payment of $3,241 for fish losses in the Sandusky River has been made by the Northern Ohio Sugar Company to the Ohio Department of Natural Resources. Bloom, *supra* n.10, at 12. Payment of $1.6 million for fish impalement on cooling equipment has been made by Con Edison of New York to New York State. *See supra* n.11.

[36] 30 Stat. 1152, 33 U.S.C. §407.

[37] 335 F. Supp. 1 (D.D.C., 1971). EPA is appealing this decision, which has been described as "not persuasive that the EPA is bound by NEPA." Getty Oil Company (Eastern Operations) Inc. v. Ruckelshaus, 467 F.2d 349, 359, n.17 (3d Cir. 1972).

[38] *See,* Druley, *The Refuse Act of 1899,* Bureau of National Affairs Monograph No. 11 (Jan., 1972) 5.

[39] For example, Vermont Yankee will use and discharge chlorine and sulfuric acid. *See,* FINAL IMPACT STATEMENT ON VERMONT YANKEE NUCLEAR POWER STATION, *supra* n.13, at 20.

[40] 37 Fed. Reg. 28,755 (Dec. 29, 1972).

[41] 37 Fed. Reg. 25,898 (Dec. 5, 1972).

[42] 37 Fed. Reg. 28,390 (Dec. 22, 1972).

[43] 38 Fed. Reg. 1362 (Jan. 11, 1973).

[44] P.L. 91–190 (Jan. 1, 1970), 42 U.S.C. §4321 *et seq.*

[45] NEPA has been the subject of numerous analyses in the legal, public policy, and federal governmental literature. For a concise overview, *see* THIRD ANNUAL REPORT OF THE FEDERAL COUNCIL ON ENVIRONMENTAL QUALITY (August, 1972) Ch. 7.

[46] *See,* 102 MONITOR, a monthly publication of the Council of Environmental Quality for abstracts of draft and final impact assessments which have been released for public review.

[47] 102 MONITOR, Vol. 1, No. 6 (July, 1971).

[48] 449 F.2d 1109 (D.C. Cir. 1971).

[49] "Hearing board" refers to the Atomic Safety and Licensing Board.

[50] Other bills include H.R. 13731, H.R. 13732, and H.R. 11066. *See, Fight to Save the National Environmental Policy Act,* ENVIRONMENTAL ACTION BULLETIN (May 13, 1972) 6–7. *See also,* BILLS AMENDING OR RELATED TO NEPA, Hearings before the House Committee on Interior and Insular Affairs, 92nd Cong., 1st Sess. (1971).

[51] 38 Fed. Reg. 2713 (Jan. 29, 1973).

[52] *Id.*

[53] P.L. 92–583 (1972).

[54] S. 2401 (1973).

[55] *See,* ANNUAL REPORT 1971, New England River Basin Commission.

[56] *See,* McGregor, *Private Enforcement of Environmental Law: An Analysis of the Massachusetts Citizen Suit Statute,* 1 ENVIRONMENTAL AFFAIRS 606 (1971).

[57] 92 S. Ct. 1361 (1972).

[58] *See, Proposed AEC Guide to the Preparation of Benefit-Cost Analyses to be Included in Applicant's Environmental Reports,* 37 Fed. Reg. 548 (Jan. 7, 1972).

[59] SECOND ANNUAL REPORT OF THE FEDERAL COUNCIL ON ENVIRONMENTAL QUALITY (August, 1971) at 81.