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Electricity and the Environment: A Season of Discontent

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ELECTRICITY AND THE ENVIRONMENT: A SEASON OF DISCONTENT

*By George P. Smith, II**

THE ROOT CAUSE of the present energy crisis, one writer asserts, lies in the fact that the American people have a basic disclination to appreciate a potentially unpleasant situation before it occurs.[1] The warnings that environmental imbalances in energy conservation were imminent, went unheeded for quite some time. Optimism, an inherent quality of the American way of life, never allowed for too much of a pragmatic analysis of the problem area; it being maintained that ingenuity and technology would resolve any uncontrolled manifestations of disruption. It is abundantly clear, even to the Postivists today, that a sunburst of spectacular new technologies and proven levels of expertise cannot stay the direct consequences of the present energy dilemma. Research and development will—it is expected—within the next five years, produce new sources of energy.[2] For the present, however, other solutions must be sought in order to correct this grave problem.

Energy consumption and variances therefrom directly affect the environment in many diverse ways. The conversion of fossil and nuclear fuels into energy not only leads to air and water pollution, but to the creation of solid wastes, aesthetic degradation and basic land disruption. Thermal discharges into lakes and streams, automotive air pollution and land destruction by surface mining are but illustrative of the various environmental damages arising as a consequence of new strains on energy consumption.[3]

Electricity—which is produced from all primary sources of energy including coal, oil, natural gas, hydro, geothermal and nuclear—is, thus, not a primary source of energy nor is it an addition to the total energy supply; rather, it is but energy in another form.[4] Both the production and the consumption of electrical power has been growing steadily. In fact, it is estimated that both will continue to grow at a compound rate of approximately seven per cent per year.[5]

The responsiveness, or lack thereof, by the electric power industry which itself is less than one hundred years old, to the burgeoning environmental problems of the industry, the significance of cost-benefit analysis in

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[1]G. Clarke, *What Went Wrong*, TIME, December 10, 1973, p. 49 at 50. *See generally*, U.S. Cong., Joint Committee on Atomic Energy, *Understanding the National Energy Dilemma*, (1973), *Certain Background Information for Consideration When Evaluating the National Energy Dilemma*, (1973); U.S. Senate, Permanent Subcommittee on Investigations of the Committee of Govt. Operations, *Staff Study of the Oversight and Efficiency of Executive Agencies with Respect to the Petroleum Industry, As it Relates to Recent Fuel Shortages*, Nov. 8, 1973. See *generally*, Legal and Ecological Aspects of the International Energy Situation, 8 *Int'l Lawyer 1* (1974). The *National Journal* is an excellent reference guide to current developments in the energy field. Particularly helpful are numbers 41, 46, 48 and 49 of volume 5 (1973).

[2]U.S. Cong., Senate Committee on Interior and Insular Affairs, Subcommittee on Water and Power Resources, *Report, The Potential for Energy Production from Geothermal Resources*, Dec., 1973; W. N. Peach, *The Energy Outlook for the 1980's*. A Study prepared for the use of the Subcommittee on Economic Progress of the Joint Economic Committee, U.S. Cong., December 17, 1973, at p. 17 et seq. See *also* E. J. Mitchell, *U.S. Energy Policy: A Primer* (1974).

[3]Council on Environmental Quality, *Energy and the Environment—Electric Power* (1973), at p. 9 et seq.

[4]Peach, *supra*, n. 2.

[5]D. L. Scott, POLLUTION IN THE ELECTRIC POWER INDUSTRY, (1973) at p. 1.

Fossil-fuel-fired steam electric power plants are, without question, the worst environmental offenders per kilowatt-hour of power generated. These are the plants which pollute the air and water and create solid waste disposal problems since radioactive carbon particulates in fly ash from an older plant can produce more radiation exposure than a pressurized water reactor.[20] Due to economies of scale, utilities have continued to build larger generating units and have often placed the units close together or in the same plant.[21]

The burning of fossil fuels results in the emission of hydrocarbons, nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter. Coal burning plants are, unquestionably, the "dirtiest" in terms of each of the five pollutants, except nitrogen oxides—where oil fired plants emit slightly more for a similar sized plant.[22] Although natural gas may be regarded as the "cleanest" burning fuel, it is not available in sufficient quantities to be used to any great extent in power production. The coal reserves in the United States far exceed those of oil and gas and thus, it is coal which must provide most of the fossil fuel for increased electric generation in the future.[23]

In fossil-fuel steam plants, electricity is generated by having steam expand through a turbine—which in turn drives a generator. As a consequence of this process, much of the energy released by the burning fuel is converted into waste heat rather than electrical energy with the heat being released into rivers or lakes in the water that flows through the condenser. The best overall thermal efficiency of fossil fuel plants is forty per cent, and many of the older plants operate at efficiencies considerably less than this.[24] In operations of this type, it is necessary for the steam electric plant to be constructed and operated near a source of water sufficient to provide adequate cooling. In plants that do not attempt to cool the water after use, the water is taken directly from the river or lake, circulated through a steam condenser and returned to its source at a higher temperature. Thermal pollution, generally, is not considered directly injurious to public health.[25] It has been established, however, that dramatic—and sometimes even slight—changes in water temperature greatly affect aquatic life resulting in stunted or exaggerated growth patterns and often large scale fish kills.[26]

While not producing air pollution similar to that emitted by fossil-fuel facilities, the use of nuclear power plants does raise serious environmental problems in radiation control and radioactive waste disposal. Thermal pollution exists here on an even larger scale than for fossil fuel plants. Since nuclear facilities produce steam in order to power turbines and generators, they too must use cooling water to condense the steam before recycling it

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[20]D. L. Scott, *supra,* n. 5 at p. 46.

[21]C. Olson, SUPRA, n. 18.

[22]U.S. Atomic Energy Commission, *Proceedings: Nuclear Power and the Environment* (1970), p. 182; *See generally,* U.S. Cong., Senate subcommittee on Air & Water Pollution, *Hearings, Underground Uses of Nuclear Energy,* 91st Cong., 2nd Sess. (1970).

[23]D. Scott, *supra,* n. 5 at 46.

[24]U.S. Fed. Power Comm., *Problems in Disposal of Waste Heat From Steam Electric Plants* (1969).

[25]D. Scott, *supra,* n. 5 at p. 49.

[26]*See generally,* V. S. Kennedy & J. A. Mihursky, "Bibliography on the Effects of Temperature in the Aquatic Environment for the Subcommittee on Air & Water Pollution, HEARINGS, Thermal Pollution (1968) at 471-568.

back through the boiler.[27] Unlike the disposal through stacks of approximately ten per cent of the waste heat from fossil fuel plants, nearly all thermal wastes are released through cooling water.[28] Improvements in the state of the art-technology of nuclear reactors are expected to eventually increase the thermal efficiencies to levels comparable to modern fossil fuel units.[29] Yet, until such advances in technology actually occur, the principal concern of environmentalists will continue to be directed toward containing the waste heat problem of the nuclear facilities.

The dominant philosophy of the power companies has been to satisfy all potential demand, with little attention being paid to the environmental or resource side effects. Such an attitude can no longer be permitted as the prime motive force of regulation. Steps must be taken either to absolutely reduce the demand for electrical energy or at least to reduce its rate of growth until more rational methods of meeting current energy needs are developed.[30] A number of specific ways may be cited to curb excesses in the distribution of electricity: disclosure of the amount of electricity necessary to utilize consumer products through mandatory labelling by the manufacturer—in essence, truth-in-energy labelling; institution of a non-promotional rate structure which would eliminate the practice of offering a lower unit cost as consumption increases; development of a peak demand surcharge to discourage use of electricity at peak hours; establishment of an electricity use tax to reflect the social costs of power generation, supply and use; imposition of legal restrictions on electrical product manufacturers and distributors with respect to advertising and promotional activities that encourage the use of electricity or—in the alternative—propose an outright ban on such activities on the part of utilities; establishment of legal restrictions on load increases and/or the institution of outright per diem rationing of electricity consumption.[31] The second suggestion, a non-promotional rate structure, has become policy already for Washington, D.C. On November 17, 1973, the District of Columbia Public Service Commission ruled that the Potomac Electric Power Company could only charge higher rates to consumers who use more than four hundred kilowatt hours per month. Since the average residential use is four hundred fifty-five kilowatt hours per month the rate increase burden will fall on excessive residential users, and commercial and industrial concerns.[32]

II.

To the economist, the problem of pollution is viewed as originating from a discrepancy between both the social and the private costs of production.

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[27]National Power Survey, n. 8, Chapter 19, generally.

[28]*Id.*

[29]Tague & Davidson, The Evaluation of Nuclear Plant Costs, 15 *Nuclear News* 31 (Feb. 1972).

[30]Nat'l Assoc. of Attys. General, Committee on the Office of the Atty. General, *Report on the Energy Crisis* (1973) at p. 61.

[31]N. Fabricant, R. Hallman, TOWARD A RATIONAL POWER POLICY (1971) at pp. 186-194. *See generally*, Smith, "Energy and the Environment," 56 Am. Paper Industry 26 (Feb. 1974); Smith, Pollution and the Electric Power Industry, 59 ABAJ 1380 (1973).

[32]Bureau of Nat'l Affairs, ENERGY USERS REPORT A-24 (Nov. 22, 1973).

Since product prices take into account the cost of resources to the manufacturer, but not necessarily the full costs to society, people may be receiving too many or too few of some goods and services and they in turn may be produced by socially undesirable means.[33] Economists generally contend, then, that pollution control measures should be a function of the costs and benefits in each particular case being considered, since the resources devoted to excessively high purification levels might best be used elsewhere for greater benefits to society.[34] The total use and benefits of alternate power sources are forever being disputed. This disputation is inevitably tied to a very basic need to ensure that the savings realized by reducing the growth in demand for electric power is not offset by economic and social disruption of greater costs.

Regretably, much of the information which is necessary to implement the cost-benefit analysis in pragmatic problem-solving is absent. This fact becomes apparent when an attempt is made to place a dollar value on the damages from pollution. The costs of control equipment are more precise to be sure. Until considerably more knowledge is obtained on damages and the scope thereof, the economic analysis is subject to restrictions and value judgments.[35]

There is, without question, an interdisciplinary relation—indeed an interdependence—between law and economics as they combine to affect resolutions of current environmental problems. Balancing the equities for the lawyer shades into testing the cost-benefit analysis for the economist. Whether law is an initiator of change in environmental management or a response mechanism to economic pressures remains to be explored more fully. What is manifestly clear, however, is the vital need for these two disciplines to begin to understand the total extent of their influences and responsibilities in environmental management.

III.

Both the construction and the operation of large-scale electric power generation and transmission facilities pose a considerable number of very serious threats to environmental quality. Drawing on both past and present federal initiatives—as well as scattered state approaches—the Council of State Governments has formulated a set of guidelines for power plant siting among the states.[36] The major features of these guidelines would require publicly open, long-range planning by all electric utilities in the state, including annual reports with rolling ten-year projections of power needs and identification of required generation and transmission facilities; establish a siting agency in each state with authority and expertise to accommodate environmental and energy concerns; consolidate all local, county, regional, and state reviews and approvals into a single clearance system; implement a pre-

[33] D. L. Scott, POLLUTION IN THE ELECTRIC POWER INDUSTRY (1973), Chapter 2.
[34] *Id.*
[35] *Id.*, Chapter 6.
[36] 32 *Suggested State Legislation* 359 (1973).

construction certification procedure for the facilities themselves, whether power plants or transmission lines, with application by the utility for such approval suggested two years prior to planned commencement of construction; and establish an early review process for all power plant sites and a decision after application suggested five years prior to proposed commencement of construction.[37]

The American Bar Association's Special Committee on Environmental Law recently concluded a three-year study of legal reform needed to improve the decision-making process for industrial site selection.[38] Developing several ideas introduced by the Council of State Governments and suggesting new approaches at the same time, the Committee called upon each state to provide for comprehensive and co-ordinated statewide planning to assure wise and prudent use and conservation of national resources. The state should, furthermore, provide planning criteria for evaluating proposed uses of those resources in relation to developmental objectives and environmental values—including biophysical, social, cultural and economic. A single state siting agency, denominated as an Industrial Siting Council (ISC), should—it was found—be given broad jurisdiction over all applications to site major industrial facilities so that whenever the ISC has reason to believe environmental values are at stake which are of significance beyond local boundaries, it will have authority to invoke its jurisdiction. The ISC, in exercising its jurisdiction, should be given pre-emptive decision making authority over local governmental units and other state agencies and should have qualified authority to grant variances from standards established by other agencies for the issuance of licenses, permits or certificates.[39]

The Industrial Siting Council should be given the responsibility for designing and conducting the environmental evaluation and site assessment—with a full opportunity for public and other governmental unit participation. Legislative criteria defining the public interest and identifying the values to be considered and their relative priority should be set before the Council attempts to reach a decision.[40]

Calling for needed legislative reform at the federal level, the American Bar Committee found the need for an independent agency to review siting decisions of all federal agencies with a single adjudicatory hearing being allowed in lieu of separate adjudicatory hearings now conducted by various individual agencies. Any decision of the independent reviewing agency should be subject to judicial review in the United States Court of Appeals. Where both federal and state licenses or permits are required for a proposed project, a single environmental evaluation should be conducted.[41]

The states are beginning to respond to current energy problems by undertaking a number of actions—the most important being the creation of

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[37] *Id.*

[38] Special Committee on Env't Law, Am. Bar Assoc., *Development and the Environment: Legal Reforms to Facilitate Industrial Site Selection* (1974).

[39] *Id.*

[40] *Id.*

[41] *Id.*

Energy Policy Committees or Task Forces to conduct continuing studies of the problem and report to the governor and the legislature regarding possible recommendations and legislation. "Truth in Energy" legislation requiring appliances and equipment to meet performance standards in terms of efficiency prior to being sold in the state is being enacted. Implementation of state-wide building codes with emphasis on economical methods of insulation is being undertaken. Public transit systems are being modernized to make more efficient use of fuels and to thereby improve transportation during peak rush hour periods. Establishment of state energy conservation or assessment agencies which would develop state energy policy, project supply and demand, develop guidelines to balance energy needs and allocate reserves in times of short supply is being promoted. Modification of utility and common carrier rate structures to provide incentives for energy efficiencies and conservation is being sought.[42]

Under the Clean Air Act Amendments of 1970,[43] the Environmental Protection Agency is directed to set ambient air quality standards that protect the public health and welfare. Standards protecting health are called primary standards while those concerned with welfare, such as the impact of pollutants on crops, are called secondary standards. In addition, there are new source standards that apply to all new power plants regardless of location or ambient air quality.[44] The states are further required, by the Act, to meet the primary standards by 1975 and the stricter secondary standards within a "reasonable time."[45] Under the Act, the Administrator may in certain circumstances and upon application from a state governor grant a two year extension of the 1975 deadline for meeting primary standards. To achieve these standards, the states must submit implementation plans to the Environmental Protection Agency for review and approval. Thus far, these state plans have evinced two important characteristics. First, many have chosen 1975 as a "reasonable" time to meet the more stringent secondary standards in addition to the primary standards. Secondly, numerous states have imposed state-wide emission regulations that ignore differences in air quality between regions within the state itself. This means of course that scarce low sulfur fuels may be used indiscriminately throughout a state rather than in areas of greatest need.[46]

In order to meet state sulfur standards, several options are open to existing stationary sources burning high sulfur coal. First, they may burn "clean fuels" such as low sulfur coal. Secondly, they may install stack gas cleaning equipment that is being commercially developed. The same choice is also required of new sources. A careful study of the problem area, however, indicates that there simply will not be enough clean fuels or reliably demon-

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[42]Southern Interstate Nuclear Board, *The States and the Energy Crisis* (1973).
See also, Report of the Association of the Bar of the City of New York, *Electricity and the Environment,* (1972), Chapter 8; Assembly Science and Technology Advisory Committee, *California's Projected Electrical Energy Demand and Supply, A Report to Assembly General Research Committee,* California Legislature, Nov. (1971).
[43]42 U.S.C. §1857 et seq., 49 U.S.C., §§1421, 1430, originally enacted as P.L. 91-604, 84 Stat. 1676, (1970).
[44]Council on Envt'l Quality, Fourth Annual Report (1973), pp. 155-167.
[45]42 U.S.C. §§1857c-4, (1970).
[46]*Supra,* n. 43.

strated stack gas cleaning equipment available to meet both primary and secondary standards by 1975 for coal-burning combustion sources. The gap between "clean fuels" needed and those available has been described as the "clean fuels deficit;" it jeopardizes the achievement of the all important health-based primary standard. This follows because meeting the more stringent secondary standards would result in fuel shifts by large coal-burning installations to low sulfur oil or gas or in their use of increased quantities of low sulfur coal. Such a situation could effectively deny these scarce low sulfur fuels to those who may require them to meet the primary standards. Thus, high priority areas that may desperately need low sulfur fuels to meet primary standards may find themselves unable to procure these clean fuels since they will be siphoned off to meet secondary standards elsewhere:[47]

So it is, then, that something of an ironic impasse is reached. The states, assisted by the Environmental Protection Agency, by fully responding to the spirit of the Clean Air Act and in their desire to protect the health and welfare of their citizens, have by their aggregate response collectively generated a situation which imperils the attainment of the primary standard. Moreover, their response threatens the economic health of the high sulfur coal industry, endangers the jobs of twenty-six thousand men who mine such coal, encourages the wasteful use of scarce sulfur-free natural gases in industrial boilers, and places pressure on the balance of payments through the importation of oil.[48]

The United States Environmental Protection Agency's objective here is to discourage the use of scarce supplies of low sulfur coal, natural gas, or low sulfur fuel oil unless such steps are needed to meet primary standards. The states are continually being urged to review their standards, plans, specifications, and regulations to avoid requirements that would conflict with this policy. This policy is designed not to provide for a final solution, but merely to buy time until new sources of low sulfur fuel and improved stack gas cleaning equipment in quantity are available.[49]

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[47]Robert W. Fri, Acting Administrator, U.S. Envt'l Protection Agency, Testimony, Before the Committee on Interior & Insular Affairs, U.S. Senate, June 7, 1973.

[48]*Id.*

[49]*Id.* The apparent insouciance of the Nixon Administration to the advancement of an environmental ethic was underscored by recent proposed amendments to the Clean Air Act sponsored by the Administration. Under these proposals, up to five additional years for meeting air quality standards would be allowed in cases where attainment of the 1977 deadline would cause serious social and economic disruption. A second five year extension would be permissible for severely affected areas. The President has also proposed to maintain 1975 automotive standards for 1976 and 1977. Authority would be given to him to direct major fuel burning sources to convert to coal, granting them a one year exemption from filing impact statements as required by the National Environmental Policy Act. The United States Environmental Protection Agency would be authorized to review the availability of clean fuels and stack gas scrubbing technology to achieve air quality standards and to permit tailoring of implementation plans in order to assure that the areas with the highest needs receive priority in clean fuels or technology. These actions were taken, it was reported, in an effort to support President Nixon's goal of making the country self sufficient in energy by 1980. If subsequently passed into law, the full import of these measures will be to create a lacuna of considerabe dimension in present environmental programs. Whether new perspectives in this area will be generated under President Ford remains to be seen. The present Administration appears, initially, to be concerned with an 'internal power play' among Interior Secretary Morton, Federal Energy Administrator Sawhill and Treasury Secretary Simon regarding who will be the dominant force in energy policymaking. TIME, Sept. 23, 1974, p. 81; T. O'Toole, "Fuel Crisis Shifts Focus to Coal, Gas," *The Wash. Post,* Aug. 4, 1974, p. A8, cols. 1-2; T. O'Toole, "White House Eyes Clean Air Changes," *The Wash. Post,* July 28, 1974, p. A2, cols. 1-4; Bureau of Nat'l Affairs, 4 *Current Develops.* 1975 (Mar. 29, 1974, No. 48); *Wall Street Journal,* Mar. 25, 1974, p. 3, cols. 1-3. 50. P.L. 91-90,

IV.

The insatiable appetites of the American public for energy threatens to induce a devasting environmental contretemps if corrective measures are not taken soon. Those who seek to employ the energy crisis as an excuse for easing or abandoning current environmental efforts are in for an unpleasant surprise. For, upon careful investigation, they will discover that both the energy and environmental stresses of today stem from the same source: patterns of growth and development that waste energy resources just as shamefully as they lay waste the natural environment.

The point has been reached where the nature and extent of the costs involved in improving the environment are becoming rather painfully obvious by higher taxes and retail prices, foregone conveniences and by significant alterations in basic life styles. Regretably, the very real benefits which flow from a cleaner environment are not readily apparent. The average citizen can neither see azure skies and unpolluted waters nor breathe clean, fresh air. Some refuse to wait any longer for results. Tired and disillusioned, they have already decided the benefits of environmental sacrifice are not worth the costs. For others, the test of commitment to an environmental ethic will come shortly within the next few years. A sense of confidence in the public's ability to influence the decision making process and thereby effect meaningful change within the institutional framework should be promoted; for such actions will go exceedingly far toward underscoring the vitality of an environmental ethic. The National Environmental Policy Act is, unquestionably, the ideal *modus operandi* for assuring public participation and response to current challenges to environmental integrity.

By forcing institutional modifications in the electric power industry—modifications in corporate decision making which determine the optimal mix of ownership systems, the effect development of new and expanded construction site projects will have on the environment, and the net value of energy pricing policies on the economy, a greater degree of ecological responsiveness will be recorded. This—taken together with an equally strong, positive effort and undertaken by the Federal government to consolidate its various energy programs under a proposed Department of Energy and Natural Resources, will provide a strong and comprehensive institutional base at the Federal level from which to apply greater sophisticated analytical tools so that the nation can seek to reconcile its demands for dependable energy supplies with equal demands for a better environment. It is only through a cooperative venture, however, and firm resolve to achieve progress in resolving the energy crisis by the Federal government, the state and local units of government, the public, and the electric power industry itself, that the present season of ecological discontent will fade into one of positive achievement and sustained success.

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42 U.S.C. §4321 et seq. (1970).

The provisions requiring the filing of environmental impact statements by federal agencies when projects are undertaken that may materially affect the environment encourages citizen response through public evaluation.

Costs of Electricity by Regions—1968 Actual and 1990 Projected[17]

	Northeast		East Central		Southeast		West Central		South Central		West		Total U.S.	
	$ Million	Mills/ kWh	$ Million	Mills/ kWh	$ Million	Mills/ kWh	$ Million	Mills/ kWh	$ Million	Mills/ kWh	$ Million	Mills/ kWh	$ Million	Mills/ kWh
							1968							
Power Production Costs														
Fuel	062	3.04	629	2.84	560	2.48	371	2.69	368	2.48	340	1.43	2,960	2.47
Other O & M	330	1.45	307	1.39	284	1.26	225	1.63	186	1.26	277	1.17	1,609	1.34
Allocated Admin. & Gen'l.	70	0.31	47	0.21	44	0.19	40	0.29	38	0.26	39	0.16	39	0.16
Fixed Charges	1,022	4.48	743	3.36	624	2.76	633	4.59	462	3.12	959	4.05	4,443	3.71
Total Production Costs	2,114	9.28	1,726	7.80	1,512	6.69	1,269	9.20	1,054	7.12	1,615	6.81	9,290	7.75
Transmission Costs														
O & M Expenses	59	0.26	46	0.21	48	0.21	40	0.29	34	0.23	68	0.29	295	0.25
Allocated Admin. & Gen'l.	17	0.07	13	0.06	14	0.06	12	0.09	10	0.07	20	0.08	86	0.07
Fixed Charges	440	1.93	360	1.62	291	1.29	260	1.88	254	1.71	390	1.65	1,995	1.66
Total Transmission Costs	516	2.26	419	1.89	353	1.56	312	2.26	298	2.01	478	2.02	2,376	1.98
Districbution Costs														
O & M Expenses	502	2.20	327	1.48	292	1.29	262	1.90	231	1.56	349	1.47	1,963	1.64
Allocated Admin. & Gen'l.	147	0.64	98	0.44	93	0.41	85	0.62	80	0.54	82	0.35	585	0.49
Fixed Charges	1,109	4.87	635	2.87	623	2.76	580	4.20	535	3.62	788	3.32	4,270	3.56
Total Distribution Costs	1,758	7.71	1,060	4.79	1,008	4.46	927	6.72	846	5.72	1,219	5.14	6,818	5.69
Total Cost of Power	4,388	19.25	3,205	14.48	2,783	12.71	2,508	18.18	2,198	14.85	3,312	13.97	18,484	15.42
Sales—Billion kWh	227.9		221.3		226.1		138.0		148.0		237.1		1,198.4	
Total No. Customers—Millions.	16.8		11.3		11.1		9.7		8.2		12.3		69.4	
							1990							

Costs of Electricity by Regions—1968 Actual and 1990 Projected[17] (Continued)

(1968 Dollar Values)

Power Production Costs														
Fuel	2,176	2.60	2,599	3.22	3,407	3.09	1,720	2.67	2,706	3.27	2,627	2.37	15,235	2.86
Other O & M	619	0.74	577	0.71	768	0.70	481	0.75	597	0.72	744	0.67	3,786	0.71
Allocated Admin. & Gen'l.	223	0.27	208	0.26	276	0.25	183	0.28	215	0.26	268	0.24	1,373	0.26
Fixed Charges	7,101	8.48	5,581	6.91	6,763	6.14	5,065	7.85	5,291	6.39	7,467	6.74	37,268	7.00
Total Production Costs	10,119	12.09	8,965	11.10	11,214	10.18	7,449	11.55	8,809	10.64	11,106	10.02	57,662	10.83
Transmission Costs														
O & M Expenses	346	0.42	250	0.31	273	0.25	241	0.37	214	0.26	463	0.42	1,787	0.33
Allocated Admin. & Gen'l.	100	0.12	73	0.09	79	0.07	70	0.11	62	0.07	134	0.12	518	0.10
Fixed Charges	2,864	3.42	2,053	2.54	1,970	1.79	1,814	2.81	1,703	2.06	3,236	2.92	13,640	2.56
Total Transmission Costs	3,310	3.96	2,376	2.94	2,322	2.11	2,125	3.29	1,979	2.39	3,833	3.46	15,945	2.99
Distribution Costs														
O & M Expenses	1,133	1.35	722	0.89	610	0.55	632	0.98	659	0.80	968	0.87	4,724	0.89
Allocated Admin. & Gen'l.	362	0.43	231	0.29	195	0.18	226	0.35	211	0.25	310	0.28	1,535	0.29
Fixed Charges	4,392	5.25	2,333	2.89	2,177	1.98	2,432	3.77	2,589	3.12	3,411	3.08	17,334	3.25
Total Distribution Costs	5,887	7.03	3,286	4.07	2,982	2.71	3,290	5.10	3,459	4.17	4,689	4.23	23,593	4.43
Total Cost of Power	19,316	23.08	14,627	18.11	16,518	15.00	12,864	19.94	14,247	17.20	19,628	17.71	97,200	18.25
Sales—Billion kWh	836.7		807.8		1,101.1		645.2		828.2		1,108.1		5,327.1	
Total No. Customers—Millions	23.5		15.2		14.5		13.3		15.1		20.4		102.0	