CONSIDERATION OF ENVIRONMENTAL EXTERNALITY COSTS IN ELECTRIC UTILITY RESOURCE SELECTIONS AND REGULATION

Richard L. Ottinger
Pace University Law School
Center for Environmental Legal Studies

A surprising number of state electric utility regulatory commissions (half) have started to require consideration of environmental externality costs in utility planning and resource selection.

The principal rationale for doing so is that electric utility operations impose very real and large damages to human health and the environment which are not taken into account by traditional utility least cost planning, resource selection procedures, or by government pollution regulation. These failures effectively value the residual environmental costs to society of utility operations at zero. The likely future prospect for more stringent governmental pollution regulation renders imprudent the selection of resources without taking environmental externality costs into consideration.

Most regulatory commissions requiring environmental externality consideration have left it to the utilities to compute the societal costs, although a few have either set those costs themselves or used a proxy adder to polluting resource costs (or bonus for non-polluting resources). These commissions have used control or pollution mitigation costs, rather than societal damage costs, in their regulatory computations.

This paper recommends that damage costs be used where adequate studies exist to permit quantification, discusses the methodologies for their measurement, and describes the means that have been and might be used for their incorporation.

INTRODUCTION

Internalizing the environmental costs imposed on society by polluters through putting pollution costs in the marketplace is the wave of the future in addressing environmental problems like air, water and toxics pollution. Government regulation of pollution has proved to be inadequate to address the severe threats to the planet posed by global warming, acid rain, urban smog and toxic contamination of our air, water and food supplies. All these environmental insults take place despite the array of regulations designed to control them.

For example in the United States, even after the Clean Air Act revisions presently being considered by the U.S. Congress are enacted (with all their attendant political compromises), substantial environmental costs still will be imposed on society by residual impacts not controlled, many of which would be economic to address from a societal viewpoint. Inevitably economic growth, in both developing and industrialized countries, receives higher government priority and outpaces governmental efforts to control pollution or require switching to less polluting industrial resources.

Governments are just starting to consider supplementing pollution regulation with pollution taxes or fees that will introduce into the marketplace prices that reflect the damages to society inflicted by polluting resources. The OECD has recently published a review of pollution levies, indicating a total of 85 pollution taxing regimens in six of its

principal countries (Economist 1989). Germany, France and Holland impose waste water effluent charges ($2, $9 & $39 per capita respectively); Switzerland imposes extra landing fees on noisy aircraft; and Sweden and Norway require returnable deposits on automobile bodies to prevent their being dumped. West Germany is considering an auto tax based on tailpipe exhausts (*Ibid*). And the U.S. House of Representatives' Ways & Means Committee just held hearings on pollution taxes (March 6, 7 & 14, 1990).

The marketplace could be a powerful influence on industrial decisionmaking as it affects the environment. If industry were required to pay the costs imposed on society by its pollution, economics would dictate the choice of more environmentally benign resources.

The environmental organizations, which historically have resisted pricing environmental impacts on grounds that it would constitute a licence to pollute, have now embraced the idea. Daniel Dudek of the Environmental Defense Fund is a leading advocate of marketplace treatment of pollution, and he helped draft the Administration's Clean Air Act proposal to create emissions trading rights.

It is remarkable that the conservative electric utility industry, and its usually equally cautious utility regulatory commissions, have pioneered in applying marketplace principles to valuation of environmental externalities. In twenty-six jurisdictions, utility regulatory commissions have started formal consideration of incorporating these externalties into utility planning and resource selection procedures.

SIGNIFICANCE OF UTILITY CONSIDERATION OF ENVIRONMENTAL EXTERNALITY COSTS

Until recently, most utilities throughout the country have selected their supply and demand side resources on a least cost basis, without regard to the very real environmental costs imposed on society. The utilities and regulatory commissions have proceeded on the basis that full compliance with all applicable environmental laws and regulations is sufficient. This effectively assigns the very substantial residual environmental externality costs a value of zero.

As difficult as it is to fix exact dollar figures on environmental damages, one always has to come back to the basic tenet that "A crude approximation, made as exact as possible and changed over time to reflect new information, would be preferable to the manifestly unjust approximation caused by ignoring these costs" (Bland 1986) and thus valuing residual environmental damages at zero.

Incorporation of the dollar values of environmental externalities in utility resource selection procedures will enable utilities and regulators to take environmental costs into account in making resource acquisition decisions. In practical terms, the result will be to make to encourage utilities to invest in more environmentally benign resources.

WHY UTILITIES AND COMMISSIONS SHOULD CONSIDER ENVIRONMENTAL EXTERNALITY COSTS

It could be argued that consideration of environmental externalities should be addressed solely by pollution controls, taxes or fees enacted by Congress and state legislatures rather than by utility actions and regulatory commission orders affecting resource selection. Indeed, environmental costs are addressed only through legislated regulation for other industries such as automobile and chemical manufacturing, smelting, etc.

National pollution fees could internalize environmental externality costs for all polluting sources, thus sending correct price signals to the marketplace universally. Of course, complete regulation, eliminating all pollution that is economically acceptable, would also internalize environmental externality costs. Neither is likely to happen, however. Complete economic pollution controls are likely to be politically unfeasible. National pollution taxes or fees are unlikely to be enacted at present because of reluctance by the Administration and Congress to impose new taxes, although this reluctance appears to be receding.

Assuming that such legislative internalization does not occur, utilities nevertheless will go on selecting resources which, after regulation, will still impose significant environmental costs on society. The utilities and their regulatory commissions will assign costs to these resources as a principal basis for their selection. In this resource selection process, it is important that the environmental costs be counted.

There are two principal reasons why utilities and regulatory commissions should consider environmental externalities in their resource selection processes: (1) utilities are franchised monopolies vested with a public interest which includes environmental protection[1]; and (2) foreseeable international, federal and state environmental laws and regulations are likely to impose more stringent environmental controls over the thirty to forty-year life span of electric power plants, making it imprudent for utilities to invest in resources which will have to be abandoned or which will require expensive environmentally-required retrofits. It is within the traditional role of utility regulatory commissions to oversee utility public interest obligations and to prevent imprudent investments.

It should be noted that when commissions require consideration of environmental externalities in utility planning and resource selection, they are not internalizing these costs but are merely affecting prudent selection of new resources.

COSTS TO BE INCLUDED

Commissions and utilities that decide to consider externalities face the daunting task of determining those costs. The first threshold question they must face is what kind of costs to include. Most of the commissions that have addressed externalities have determined that only environmental externality costs should be included. However, the most thorough study of externality costs, completed recently for the European Economic Community, seeks to value impacts on production, employment and trade balance; depletion of non-renewable resources; public subsidies and R&D expenditures; and "induced public expenditures" such as defense costs; as well as traditional environmental costs (Hohmeyer 1989).

The most severe environmental costs imposed on society by electric utility operations derive from the risk of damages to human health and the environment from air pollutants emitted by fossil fuel-fired generation and from the radiation risks of nuclear plant operations.

The environmental costs of electric utility air pollutant emissions are significant. The principal culprits are the "greenhouse" gases, most significantly carbon dioxide (CO_2) emissions from the burning of fossil fuels[2]; acid rain and its principal precursors, sulphur dioxide (SO_2) and nitrogen oxides[3]; tropospheric ozone resulting from chemical interactions of NOx and volatile organic compounds in the presence of sunlight; and particulate pollution, providing the medium for ingestion and inspiration of toxic co-pollutants.

Many of the above air pollutants react synergistically, forming new chemical combinations after release which react together to inflict increased environmental damage. Furthermore, emission damages from future power plants will be cumulative on top of the damages from pollutants already emitted by existing plants. These synergistic and cumulative effects should be considered, not just the additive damages from each new pollutant.

Radiation damage from uranium milling and mining, the operation of nuclear power plants, the risk of catastrophic accidents such as occurred at Chernobyl and Three Mile Island, the risks of contamination from decommissioning nuclear plants, disposal of mill tailings, high and low level nuclear waste disposal, and the risk of impingement of fish at nuclear facilities, all impose significant costs on

---

[1] *See, for example, the New York Environmental Quality Review Act (SEQRA), New York Environmental Conservation Law, Section 8-0107 and its implementing regulation, 6 NYCRR, Part 617.9(c)(3), which require all state agencies to minimize or avoid environmental impacts "to the maximum extent practicable."*

[2] *Electric utilities accounted for 33% of national CO_2 emissions in 1988 (Machado and Piltz 1988).*

[3] *Electric utilities in 1985 contributed 68% of national SO_2 emissions (16,204,000 tons of 23,699,000 tons nationally), and 33% of national NO_x emissions (6,989,000 tons of 21,054,000 tons nationally). National Acid Precipitation Assessment Program (NPAP),* Interim Assessment, *Vol. I (1987).*

society that are also largely unaccounted for under current regulation. A recent British report asserts that the nuclear cycle emits carbon dioxide at levels comparable to fossil fuel plants (Hill 1990). In addition to air pollution and radiation damages, many electric service supply resources impose societal costs from water pollution contamination, land deprivation, agricultural losses (e.g. from flooding by dams) as well as waste disposal contamination risks. Electromagnetic field damage has also been asserted. While these costs are generally much less than air pollution and radiation damages, they nonetheless are significant enough to merit consideration.

Environmental costs from electric utility-generated air and water pollution emissions are often not restricted to the state or country in which the plant is located. Most state jurisdictions that have addressed environmental impact costs have included all costs to society, not just those affecting the jurisdiction in which a plant is located.[4]

Site-specific considerations must be taken into account in valuing environmental externality costs. Clearly a plant's polluting emissions affecting a heavily populated metropolis will incur vastly greater human health costs than a plant where the emissions affect unpopulated areas. Similarly, agricultural damage costs will be more significant where emissions are deposited on farming communities rather than on urban areas. At the least, an attempt should be made to differentiate pollution costs in urban and rural settings; where possible, emissions should be calculated per unit of population.

Costs from the entire fuel cycle should be considered (front-end, operational and back-end costs). It is difficult to know how far to pursue front end costs, of course. One could go back infinitely far, estimating the costs to society from manufacturing all the equipment and machinery necessary to manufacture the equipment and machinery, etc., at each stage of the fabrication process. However, at least the first generation costs of construction and transport to the plant site of electric power fuel and facilities and production costs of demand-saving or renewable equipment should be considered.

COSTING METHODOLOGIES

Having decided which costs to include and exclude, the next major problem facing a commission or utility is how to calculate environmental externality costs. The first major issue is whether to use the cost of damages imposed on society by the resource, or the costs of control or mitigation of the pollutants emitted by the resource. There is considerable difference among experts on this subject.[5]

Control vs. Damage Costs

The advantages of using control costs are that data is readily available and control costs are thus easier to determine and more defensible. An argument can be made in the case of costs derived from legislative standards that the level of protection has been determined by the relevant agency experts and the legislative body, though in fact standards tend to be determined politically in terms of their acceptability to the interested parties rather than scientifically.

As a result of the relative ease of determining control costs, however, all state commissions that have ordered consideration of environmental externality costs to date have used control costs both as the basis for quantification of such costs and, where used, in the calculation of adders to the cost of polluting resources.[6]

The disadvantages of using control costs are that they bear little or no relationship to the cost of

---

[4] *Vermont is the only exception, accounting for only out-of-state pollution from Vermont power plants which impacts on Vermont residents, though the Vermont Commission seems to be backing off this position in its most recent proceedings. Vermont PSB,* Re Least-Cost Investments, Energy Efficiency, Conservation and Management of Demand for Energy, *Docket No. 5330.*

[5] *Advocating use of control costs, see Chernick and Caverhill 1989; for damage costs, see EPRI 1988.*

[6] *The Oregon Commission, however, has ordered its utilities to seek to quantify damage costs in evaluating resource selections,* Re Least Cost Planning, *UM 180, OR PSC Order No. 89-507 (April 20, 1989), and the New York Commission has ordered a pooled study by its utilities of their environmental externality damage costs, NY PSC Case 28223,* Electric Utility Conservation Programs, *Opinion and Order 89-15 (May 23, 1989).*

damages imposed on society by the relevant pollutants and they seldom cover all the risks involved. Statutory controls usually fall substantially short of marginal damage costs since Western societies tend to enact controls well below marginal damage costs for political reasons.

Furthermore, control standards like the National Ambient Air Quality Standards of the Clean Air Act (40 U.S.C. Sec. 7409) are adopted at a level to protect the public health and welfare with "an adequate margin of safety," often without regard to the costs to society of health and welfare damages. Some standards are set to protect the most sensitive individuals in society, which would result in control costs which might exceed damage costs. And there are many power plant pollutants for which no standards have been set, such as CO_2.

The main advantage of using damage costs is that they are the relevant costs to be considered. It is the damage to society, rather than the cost of controls, that is sought to be addressed by incorporation of environmental externality costs into utility resource selection. Damage costs are useful as well for determining how much it is worth spending to institute additional controls. While damage costs are difficult to determine, there are some adequate scientific studies. Defense of a legal challenge to these values should be no more difficult than the generally successful defense of EPA health and safety standards which are based on similar kinds of scientific studies.

The main disadvantage of using damage costs is the difficulty of calculating and defending them. Some experts feel that utility regulatory commissions (as opposed to agencies with environmental expertise like EPA) would have difficulty dealing with technical matters like valuation of human life and non-monetarized costs like valuation of recreational facilities.

Where adequate studies exist valuing damages, damage costs should be used since they are most relevant to the impacts on society sought to be measured. Where damage costs studies are inadequate, as with global warming, then control costs should be used as the best available proxy, far superior to the zero valuation of ignoring these costs.

Where impending legislative controls are reasonably ascertainable (e.g. the Clean Air Act amendments), the effects of the new controls on damage costs must be taken into account since when enacted the pollutant costs covered will be internalized. Of course, if controls like scrubbers or bag houses are required by statutory or regulatory mandate, the costs imposed on society by the pollutants controlled will no longer be external costs.

MAJOR ISSUES IN DAMAGE RISK VALUATION

The major issues in damage risk valuation are: (1) the measurement methodologies to be used, involving use of market prices, revealed preference, hedonic pricing, awards, and contingent valuation; (2) allocating costs to joint projects; (3) discount rates and real value escalation; and (4) dealing with uncertainty.[7]

General Considerations

In valuing environmental damages, the most important principle is that it is the risk of damage that requires determination, rather than assessment of the damages themselves. It is the cost of the *risk* to life, health and the environment that is sought to be defined and the costs which people are willing to pay to avoid such risks or assume them.

For example, it would be inappropriate to measure mortality damages by seeking to measure the value of a human life, say by adding up the reasonably expected lost lifetime earnings of the individual or individuals affected. The value would vary by earning power with rich people valued more than poor ones, and housewives and the elderly considered to be of negligible value. But for each individual or population of individuals, it would be appropriate to measure the value of the risk posed to their lives by determining what they would be

[7] *For a good discussion of all the externality costing methodologies, their applications, advantages and disadvantages, see EPRI 1988; Freeman 1979; and, with respect to contingent valuation, Mitchell and Carson 1989.*

willing to pay to avoid the risk or what they would be willing to be compensated to assume the risk.

Similarly, it is inappropriate to use only mitigation costs as a measure of externality values. Adding up the doctors' bills is inadequate, for example, in valuing human health damages. Who among us would be willing to incur the doctors' bills associated with cancer or debilitating injury?

Also, it is not the damage to any one individual (or crop or animal) in society that is being valued, but the risk to populations of individuals. An event which may kill or harm a very small number of individuals may be very costly to them, but the environmental costs to society imposed by the resource will be insignificant. This does not have anything to do with the potential criminal or civil liability for taking an individual life or the value society places on every human being. It has only to do with valuation of risks to life for purposes of influencing utility resource selections. The value of the risk of loss to a very few individuals simply isn't large enough to affect the economics of choosing one kind of utility resource over another.

On similar principles, damage awards by a judge or jury for particular environmental damages are generally not very useful because, instead of valuing before the fact risks to populations, they value the harm to an individual for a known event. Also, particularly in the case of jury awards, they are not scientifically derived.

Measurement Methodologies

Market prices, where available, are useful in determining environmental damages. Where it is known that there is a 100% risk that a particular crop will be affected by a power plant and the extent of the harm that will be imposed, one can multiply the crop loss by the market value to obtain the damages. The risk and yield loss are seldom known with certainty, however, and with large losses, the market price may be affected by the loss.

Revealed preference values are based on observed behavior. They are derived from costs which individuals have revealed by their actions that they are willing to pay to avoid, or to be compensated for suffering, environmental damages. Thus in the case of loss of fishing opportunities in a lake by reason of acid deposition, travel costs to alternative fishing areas might be used to value the damages. Travel costs fail to take into account values not encompassed by the particular behavior measured, however. For example, travel costs would not accurately value the destruction of a unique historic resource even though there were other historic resources that could be visited. They may also fail to account for characteristics, such as an individual's age or income, that might prevent his or her traveling to alternative sites.

Hedonic pricing uses market based prices to infer prices of non-priced goods and services. For example, selling prices of comparable homes with and without a scenic view can be compared to determine the value of the scenic view. Great care must be exercised to determine that the values compared are truly comparable.

Contingent valuation seeks to determine by surveys the value assigned by individuals to avoid or be compensated for an environmental hazard. Great care must be exercised to eliminate biases in the framing of questions, and even then an individual's expression of willingness to pay to avoid a hazard or to be compensated for exposure to it may be colored by strategic motivations to influence a particular outcome. Nevertheless, for many non-market effects, it is the only or best means of valuing risks, and it can be used to value multiple aspects of a complex risk without having to separately value each attribute.

Allocation of Costs to Joint Projects

In allocating costs to joint projects, such as cogeneration or waste to energy facilities, the most important initial consideration is whether non-electricity purposes dominate the project. If the project that would operate regardless of electric generation, and the use of heat energy is the project's dominant purpose, then none of the environmental costs should be allocated to production of electricity.

If non-electricity purposes do not dominate, then the environmental costs can be allocated according to the separable costs of each operation, the value of the product of each process, the relative

importance of the purpose of the plant to each process, the added emissions from electricity production where that is calculable, or according to the heat rate of each process. Since it is environmental costs that are being valued, the use of emission contributions is best where ascertainable. This can be derived either directly or by determining the amount of fuel used in producing each product, or where this is difficult to ascertain, by allocation according to heat rate.

Discount Rates and Real Value Escalation

There is much controversy among economists and the scientific and utility experts that have dealt with the subject on what discount rate, if any, should be applied to environmental externalities. Discount rates are used to compare future economic benefits and costs to today's benefits and costs. Low discount rates weigh the future more heavily (and the present less heavily) than high discount rates do. The question is, what discount rate should be used in economic analysis of environmental externalities?

Some experts maintain that the discount rate applied by utilities to their capital investments should be used as a matter of consistency and because use of lower discount rates will undervalue the present value of environmental costs from a utility planning perspective. They assert that all utility resource selection decisions should be made on the same financial basis and that the use of low or zero discount rates place present damages too low to have meaningful environmental influence on utility resource selection decisions (Chernick and Caverhill 1989).

Others maintain that a zero discount rate should be used, particularly as applied to human life and health risks as a matter of morality, because a life in the future is as valuable as a present life (Shuman and Cavanagh 1984). They maintain that sound stewardship of the environment mandates that the value we put on future lives and other environmental assets be considered as highly as present values. Furthermore, they maintain that discounting (at rates higher than zero) double-counts future risks since the calculation of risk itself already takes into account events in the future that may diminish the chances that the risk may not be realized. Lastly, they assert that it is inappropriate to discount long-lasting risks, such as those from high level nuclear wastes which pose risks for millennia.

Many economists adopt a middle ground, using a social rate of time preference discount rate,[8] usually in the neighborhood of 3%, thus lower than utility investment rates which approximate 6.5%, but higher than a zero discount rate. Social discount rates should be calculated from the time environmental risk is created (DOE/BP/751 1986).[9] The main reason asserted for using a social discount rate rather than the utility discount rate is that the value of environmental costs and benefits *to the public* is being evaluated (and discounted), *not* the investments of the utility.[10]

The reasons for rejecting a zero discount rate for risks to human life and health are first, the assertion that the value of damages decrease over time, and second that a zero discount rate places the present value of environmental damages much too low. In the extreme case, for example, few would be willing to pay anything substantial for the risk of human fatality 10,000 years from now -- it is too remote and it is likely that, long before that distant time, technology will resolve the environmental threat (or the world will be destroyed). In a less extreme example, if forced to choose between a risk of death today and the same risk fifty years from now, it seems likely that the delayed health risk would be preferred (although if the issue were protecting one's own life versus protecting the lives of one's children, an individual might well choose the latter). Use of discount rates higher than zero takes into account the lesser values that may be put on future risks.

---

8 *The social rate of time preference (social discount rate) is the rate at which society is willing to exchange consumption now for consumption in the future. It reflects the ability of society to remedy environmental hazards over time.*

9 *Pace 1990 uses both a 3% social discount rate and a 6.5% utility discount rate applied to all damage studies it reviewed.*

10 *For reasons similar to those stated above for the marginal private rate of return on investment (the cost of capital on which utility discount rates are based), the opportunity cost of public investment and the consumption rate of interest are not preferred since they measure investor and individual risk costs and benefits rather than those of society.*

Advocates of a discount rate higher than zero also assert that the moral issue largely has been passed once it is determined to put dollar values on human life and health risks. Then the question is how to determine those values. Placing lower values on future lives than on present ones, they assert, takes into account the lesser willingness of the public to pay for damages far into the future and the likelihood that the risks will be alleviated during long time periods.

Real value escalation estimates the increases in price that will take place over time in environmental and energy resources, due to inflation and increased scarcity of finite resources. Real value escalation must be used in valuing environmental externalities.

Uncertainty

Valuation of all environmental externality costs must deal with a considerable margin of uncertainty. Often wide ranges of costs are advanced in different studies. An example is the enormous range of nuclear accident probability figures. These uncertainties should be dealt with by showing the full range of costs in the studies reviewed and their bases, and by applying sensitivity analysis. A reasonable point within the ranges of the studies must be selected and the rationale given for the selection.

Despite the uncertainties, the environmental externality damage costs of most electric utility-generated pollution *can* be estimated. The uncertainties involved usually are no greater than the uncertainty of pollution standards adopted by federal and state agencies (and upheld by the courts) to avoid "significant risk to human health and the environment" or "with a reasonable margin of safety," as prescribed by the environmental protection statutes.

The problem with use of environmental damages to determine electric utility externality costs is that too few of these damages have been valued adequately. Since it is the damages to society that are sought to be valued (and avoided), major research is vitally needed in this area. Reliable damage figures are as important to imposing accurate pollution fees and pollution control standards as for incorporating accurate externality costs in utility resource selections.

STATE INCORPORATION OF ENVIRONMENTAL EXTERNALITIES

Presently Used Methods[11]

The methodologies presently used by states to incorporate environmental externality costs include: quantitative, qualitative, rate of return, and avoided cost consideration. These methodologies have been implemented by the states in planning, bidding and other resource selection determinations. Collaborative processes between utilities, state agencies and interventors for determination of environmental costs and their application have also been used, but with little success. In addition, several innovative methodologies have been proposed for incorporation of environmental externalities in utility planning and resource selection which no state has yet adopted.

Orders for Consideration. Of the remarkable number of twenty-six state public service commissions or legislatures that have taken some action to incorporate environmental externality costs, nineteen have issued orders or passed legislation requiring their utilities to take into account these costs in planning and/or bidding; three states have such orders pending (meaning that a costing proceeding has been established and hearings are under way or an Administrative Law Judge decision is pending or has been issued and is awaiting commission action) and four states have orders for consideration of environmental externalities under active consideration (meaning

---

[11] *In the categories listed and in the following discussion of state treatment, there is overlap; thus, New York is listed as having quantitative, rate of return, avoided cost (by statute), collaborative, planning and bidding consideration.*

Treatment by the states of environmental externalities is presented graphically in Tables 1 and 2 at the end of this section. The sources for the state incorporation statistics which follow are detailed in the Pace 1990, Chapter X Appendix which outlines state-by-state treatment actions and statutory references. See also the Incorporation References, infra.

that an explicit statement has been made by the commission that it intends to consider externalities).[12] One state, Illinois, has considered and explicitly rejected the incorporation of environmental externalities.[13]

Quantitative Consideration. Quantitative consideration involves establishment of dollar values for environmental costs by a commission itself or by utilities under commission order. The values calculated are then added to the cost of resources in the selection process, or used in a resource rating system. Some commissions use a proxy percentage adder to polluting resources or a percentage credit to non-polluting resources or both.

Thirteen states have adopted quantification or have quantitative orders pending or under active consideration: Seven states plus Bonneville Power Administration (BPA) and the Northwest Power Planning Council (NWPPC) have acted to consider environmental externality costs quantitatively or use a proxy adder to represent these costs. Two states have such quantification orders pending and three states have them under active consideration.[14]

The New York Public Service Commission (PSC) has been the pioneer in incorporating quantified environmental externality costs, requiring its utilities to assign about 15% of total bid evaluation scoring points to environmental externality costs (about 24% of price scoring points or avoided cost), calculated at 1.405 cents/kWh total environmental externality costs, based on a coal-fired plant meeting new source performance standards.[15] These same environmental costs must be used in valuing demand-side management (DSM) investments in integrated resource planning.[16] The PSC has also ordered all New York utilities to do a pooled study, with participation of outside experts and public input, to quantify the environmental externality costs of pollution from their operations.[17]

In Wisconsin, a noncombustion credit/adder has been adopted for screening of all utility resource acquisitions, so that a non-combustion source that costs 15% more than a combustion source will be considered on a par with the latter; this screening is followed by a qualitative test requiring consideration of environmental impacts.[18] Also, in integrated planning, resources must be valued assuming a requirement that carbon dioxide emissions will have to be reduced to 80% of their 1985 level by 2000 and 50% in the long run.[19]

---

12 *Orders:* *AZ, CA, CO, DC, ID, KA, MA, MICH, NV, NJ, NY, OH, OR, PA, TX, VA, VT, WI; Statute: ALSK. (3 states that have limited orders now, have more extensive orders pending: CA, MA, MICH).*
Pending: *CT, IA, MN.*
Under consideration: *HW, ME, MD, MONT*

13 *The Illinois Commerce Commission rejected a staff recommendation that environmental impacts be quantified as part of its first statewide energy planning process.* Re Comprehensive Electric Energy Plan, *Docket No. 89-0034, Slip Op. at 33 (October 6, 1989). The Commission provides for discussion of environmental externalities in utility plans but does not provide for their incorporation (Cohen 1989).*

14 *Quantified Orders:* *CA, CO, NJ, NY, OR, VT, WI.*
Pending: *CT, MA (CA, limited order: more extensive order pending).*
Under consideration: *DC, MD, MICH.*

15 See *NY PSC Case 88-E-241,* Proceeding on Motion of the Commission (established in Opinion 88-15) as to the guidelines for bidding to meet future electric capacity needs of Orange & Rockland Utilities, Inc., *Order Issuing a Final Environmental Impact Statement and Adopting Staff's Response to Agency Comments (March 24, 1989).*

16 Formats and Guidelines for July 23, 1990 DSM Plan Filing in Case 29223, *NY Department of Public Service Staff (February 23, 1990). The Guidelines provide:*

Environmental benefits are to be explicitly quantified in the total resource cost test. The Staff estimates of environmental costs, developed initially in the electric capacity bidding cases, should be used in the assessments for the July 23, 1990 plan.

The environmental benefits to be used are:
1.4 cents/kwh for programs that promote energy efficiency.
0.9 cents/kwh for programs that are aimed at peak clipping
0.4 cents/kwh for programs that are aimed at load shifting.

17 *NY PSC Case 28223,* Electric Utility Conservation Programs, *Opinion and Order 89-15 (May 23, 1989).*

18 *WI PUC* Re Advance Plans, *Docket 05-EP-5, 102 P.U.R. 4th 245 (April 6, 1989).*

19 *WI Stat. Ann. Sec. 144.385-389 (1989). Wisconsin Acid Rain legislation also requires utilities to cut 1980 levels of sulphur dioxide emissions by 50% by 1993 (Cohen 1989); while not directly used in valuation, this statute is relevant (by internalizing some of the costs of acid rain).*

In Oregon, while the commission has not quantified environmental externality damage costs, it has ordered the utilities to do so "to the fullest extent practicable" and to indicate ranges of costs where definite damage costs cannot be determined. The utilities are required to consider these damage costs in resource selection.[20]

Qualitative Consideration. Nine states presently have ordered or have under consideration orders that their utilities take into account environmental externality costs in planning and/or resource selection, without specifying how they are to be calculated or considered.[21]

Rate of Return Consideration. Rate of return consideration involves an award by a commission of an increased rate of return to utilities, either on particular non-polluting resource investments (usually DSM and/or renewables or resource recovery plants), or on their total investments, as an incentive for their installation of non-polluting resources. While DSM incentives are not necessarily adopted primarily to capture environmental externality costs, but rather to make DSM investments as profitable as supply investments, most commissions cite environmental benefits as one of the reasons for their adoption. Where this is so, we have included the incentives in this compilation.

Nine states give rate of return consideration to environmental externality costs; Oklahoma does so for resource recovery plants only.[22]

Washington and Montana have statutes providing a 2% additional rate of return on energy conservation investments and Connecticut a 5% DSM rate of return adder, citing environmental externality costs as a justification; Kansas gives a .5% to 2.0% increased rate of return on renewable and conservation resources. The Idaho Commission has announced that in future rate cases it will take into account utility conservation efforts in determining the allowed rate of return on total investments. The Wisconsin Commission experimentally has allowed Wisconsin Electric Power Co. to earn an additional 1% rate of return for each 125 MW peak reduction achieved by efficiency investments. New York has adopted, as a temporary DSM incentive, the return of lost revenues from DSM investments plus a performance-based incentive.

Avoided Cost Consideration. Seven state legislatures or commissions have required, or are considering requiring, valuation of avoided cost at a premium over utility-calculated avoided power plant capacity and energy costs, to help account for environmental externalities.[23]

Thus, New Jersey has established avoided cost under the Public Utility Regulatory Policy Act[24] (PURPA) at 10% over the regional power pool's energy billing rate to reflect the potential cost savings to society from the presumably more environmentally benign "qualifying facilities" (as defined in PURPA). The Virginia Commission requires addition of 15% to a utility's avoided cost submission, also based on societal costs.

Collaborative Consideration. Six states are involved in collaborative efforts between utilities, state regulators and intervenors, to determine how environmental externality costs will be calculated

---

20 Re Least Cost Planning, *UM 180, OR PSC Order No. 89-507 (April 20, 1989).*

21 *Ordered: AZ, MN, NV, OH, OR, PA, TX;*
Under consideration: ME, MO.
Wisconsin uses qualitative consideration after applying a 15% non-combustion credit/adder. See note 18, supra.

22 *Orders: ID, KA, NJ, NY, OK, WI*
Statutes: CT, MONT, WA;

23 *Ordered: ALSK, ID, MICH, NJ, NY, VA;*
Pending: IA
In New York, the State Legislature, citing environmental considerations, set a statutory 6 cents/Kwh PURPA avoided cost rate, which is above most utility-calculated avoid costs; FERC voided application of this rate, interpreting PURPA to prohibit reimbursement in excess of avoided cost. Many state commissions objected to this decision as an unwarranted usurpation of state rights. The FERC decision is being appealed, and one of the FERC commissioners has stated that application of the decision to other situations would be decided on a generic basis.

24 *The Public Utilities Regulatory Policy Act of 1978, 16 U.S.C. 2601 et. seq.*

and incorporated.[25] None of these efforts has yet come to fruition, and a recent collaborative DSM effort in California resulted in inability of the parties to agree on externality values or incorporation methodologies.[26]

Planning Consideration. Twenty-one states have required or are contemplating consideration of environmental externality costs in least cost planning, as well as the Bonneville Power Administration (BPA) and the Northwest Power Planning Council; twelve states have present requirements, and nine states have requirements pending or under consideration.[27]

Bid Evaluation Consideration. Seven states and BPA have or are considering a requirement to take into account environmental externality costs in evaluating bid scores.[28] Three state commissions have provided for specific points to be assigned in bid evaluations to account for environmental externality costs (NY, NJ & CO), but only New York's effort is substantial.

Tables 1 and 2 summarize present state treatment of environmental externalities. Detailed references for each state are contained in the Pace 1990 Chapter X Appendix. See also, Incorporation References, *infra*.

Proposed Incorporation Methods

Environmental Dispatch. Environmental dispatch involves a commission order to a utility or to a power pool to dispatch environmentally benign resources ahead of more polluting resources, even though the latter may cost less -- or, more likely, dispatch on a basis of total least cost, including environmental costs in the least cost determination.

No states currently are employing environmental dispatch as a means of incorporating environmental externality costs; however, Wisconsin's recently enacted acid rain statute (Note 19) includes environmental dispatch among the compliance options for meeting the SO_2 and NOx standards established.[29]

Environmental dispatch has the advantages of maximizing the alleviation of environmental damages and costs and of displacing production from existing power plants which are universally the most heavily polluting, thus encouraging their early closure. All the methods presently adopted by states to incorporate environmental externality costs address only resource selection to meet new capacity or new energy needs.[30]

The Ohio Office of Consumers' Counsel did a recent study of cleaning up the state's very substantial contribution of acid rain precursors, finding that a combination of "Least Emissions Dispatching" and aggressive investment in energy efficiency could prevent increases in SO_2, reduce cleanup costs by more than 60% and reduce cumulative costs for electric energy services by as much as $3 billion through 2005 (Centolella 1988). A model has been developed for analyzing the environmental cost benefits of environmental dispatch.[31] Bonneville Power Administration's production models and resources planning models are capable of analyzing environmental dispatch but are usually run to determine lowest system for social cost of meeting loads; the Cornell Carnegie-Mellon model developed to model New York utility

---

[25] *CT, IA, MD, MA, NY, VT.*

[26] *California Energy Commission et. al. January, 1990.* An Energy Efficiency Blueprint for California: Report of the Statewide Collaborative Process *at p. 68. Sacramento, California.*

[27] *Ordered:* *AZ, CA, DC, NV, NY, OH, OR, PA, TX, WI;*
Statute: *ALSK*
Pending: *CT, MA, MN, VT.*
Under consideration: *HW, MICH, ME, MO, MONT, NH (stat.),*

[28] *Orders:* *CO (by fuel type), NJ, NY.*
Pending: *CT, MA, VT.*
Under consideration: *MD*

[29] *Wisc. Stats. Ann., Secs. 144.385-144.387;* See also, *Secs. 15.347, 16.02.*

[30] *In New York, the Commission did require inclusion of life extension of existing plants in its mandated bidding regime. It also stated that the cost of existing plants would be compared to the prices bid for new resources to determine the appropriateness of continuing their operations.*

[31] *Heslin and Hobbs 1989.*

Table 1. Status of State Actions Incorporating Environmental Externality Costs

Legend

O - Incorporation Ordered
P - Incorporation Order Pending
U - Under Consideration
N - No Action

STATE	O	P	U	N		STATE	O	P	U	N	
ALABAMA				X		NEBRASKA				X	
ALASKA	X				1	NEVADA	X				1
ARIZONA	X					NEW HAMPSHIRE				X	
ARKANSAS				X		NEW JERSEY	X				
CALIFORNIA	X				2	NEW MEXICO				X	
COLORADO	X					NEW YORK	X				
CONNECTICUT		X				NORTH CAROLINA			X		
DELAWARE				X		NORTH DAKOTA				X	
DISRTICT OF COLUMBIA	X					OHIO	X				
FLORIDA				X		OKLAHOMA				X	
GEORGIA				X		OREGON	X				
HAWAII			X			PENNSYLVANIA	X				
IDAHO	X					RHODE ISLAND				X	
ILLINOIS				X		SOUTH CAROLINA				X	
INDIANA				X		SOUTH DAKOTA				X	
IOWA		X				TEXAS	X				
KANSAS	X					TENNESSEE				X	
KENTUCKY				X		UTAH				X	
LOUISIANA				X		VERMONT	X				
MAINE			X			VIRGINIA	X				
MARYLAND			X			WASHINGTON				X	
MASSACHUSETTS	X				2	WEST VIRGINIA				X	
MICHIGAN	X				2	WISCONSIN	X				
MINNESOTA	X				2	WYOMING				X	
MISSISSIPPI				X							
MISSOURI				X	3	BPA	X				1
MONTANA			X			NWPPC	X				1

This table is derived from the references in Pace 1990, Appendix to Section X. See also, Incorporation References, infra.

[1] Established by legislation.

[2] Order issued to consider externalities; implementation pending.

[3] Commission has stated that it may consider externalities.

Table 2. Type of Action by States Acting to Incorporate Environmental Externality Costs

Legend

O - Incorp. Ordered	AC - Avoided Cost Consid.
P - Incorp. Order Pending	ED - Environmental Dispatch
U - Under Consideration	C - Collaborative Action
QN- Quantitative Consid.	PL - Planning Consideration
QL- Qualitative Consid.	B - Bidding Consideration
ROR- Rate Consideration	L - Legislative Action

State	QN	QL	ROR	AC	ED	C	PL	B	Comment
ALSK				O			L		
AZ		O					O		
CA	OP				U	C*	O		*Collab. ended
CO	O*							O*	*by fuel type
CT	P		L*			C	P	P	*5% ROR adder
DC	U						O		
HW							U		
ID			O	O					
IA				P		C			
KA	P		O						
ME		U					U		
MD	U					C		U	
MA	P*					C	P	P	*DSM Evaluations
MICH	U			O			U		
MN*		O					P		*Law caps SO2
MT		U	L*				U		*2% adder for DSM
NV	O	L					L		
NH							L*		*Law under consid.
NJ	O			O				O	
NY	O		O	L		C	O	O	
OH		O					O		
OK			O*						*ROR, trash only
OR*	O	O					O		*Law caps CO_2
PA		O*					O*		*Not implemented
TX		O					O		
VT	P*					C	P*	P*	*ALJ proposed order
VA				O*					*15% DSM adder to AC
WA			L*						*2% ROR law for DSM
WI	O		O		U		O		
BPA	L						L	U	
NWPPC	L						L		

This table is derived from the references in Pace 1990, Appendix to Section X. See also, Incorporation References, infra.

emission impacts could also accommodate environmental dispatch (Pace 1990).

Ranking. The Center for Global Change at the University of Maryland has worked out an innovative ranking and weighting methodology for evaluating environmental externality costs.[32] The problems with all ranking systems, however, is that their accuracy must inevitably be judged on the degree to which they approximate costs. To the extent that they depart from costs, they produce significant ranking and cost distortions. Using the best cost data available is easier to understand and can be varied more readily as new cost data becomes available.

"Environmental LCUP." "Environmental LCUP" is an innovative concept for incorporation of environmental externalities proposed by Florentin Krause of Lawrence Berkeley Laboratory.[33] Under the proposal, emission reduction targets would be set for principal power plant pollutants like CO_2, SO_2, NO_x and particulates, and the utilities would be required to meet these targets in a least cost manner. As an enforcement mechanism, utilities could receive a positive rate of return incentive for meeting or exceeding the targets and a negative incentive for failing to meet them. Wisconsin's new acid rain law, referred to above (Note 19), comes as close as any state has to this proposed methodology of setting emission standards which utilities have to meet at least cost.

The advantage of "Environmental LCUP" is that it avoids the necessity for calculating environmental externality costs and is designed to achieve specific emission reduction targets. It lends itself well to valuing hard to calculate regional and global externalities. The disadvantage is that it requires calculation of the emission reduction targets, a calculation of the emission reduction targets, a calculation with which commissions may have as much trouble as environmental externality costs and which may be viewed as invading legislative prerogatives. However, the Environmental LCUP can be used for hard-to-value resources only, using more readily established values for other resources. For example, Environmental LCUP might be used for CO_2 costing, requiring for example a 20% reduction in a least cost manner, while using conventional methods for valuing other pollutants.

Assessment of Environmental Costs Against Resources and Creation of a Pollution Mitigation Fund. An innovative proposal by former Maine Public Utilities Commissioner, David Moskovitz, would charge resource owners with the quantified environmental costs of each resource selected and deposit the proceeds in a Pollution Mitigation Fund, thus internalizing the environmental costs. This proposal has the enormous advantage of making resource owners pay the costs of the environmental damages they impose on society instead of just using these costs in resource selection. It would also create a very substantial fund which could be used for environmental mitigation, and promotion of use of environmentally benign renewable resources and marginally cost-effective DSM programs. It may be beyond the statutory authority of many commissions, although the New York Commission did require its utilities to devote .25% of gross revenues to establish a fund for DSM research and experimentation.[34]

RECOMMENDATIONS FOR INCORPORATION

There has not yet been sufficient experience with incorporating environmental externality costs under any of the statutes or state commission orders described above to be able to ascertain from them what methodology will work best. Considering all the pros and cons of the various proposals, our recommendations are as follows:

---

[32] *Vermont Public Service Board,* Application of Twenty-four Electric Utilities...for a Certificate of Public Good Authorizing Execution and Performance of a Firm Power and Energy Contract with Hydro-Quebec and a Hydro-Quebec Participation Agreement, *Docket No. 5330, testimony of Dr. Susan Hedman, Professor Alan S. Miller and Dr. Irving Mintzer (January 11, 1990).*

[33] *Least Cost Planning Training Workshop, Lawrence Berkeley Laboratory, Berkeley, CA, February 2, 1990.*

[34] *N.Y. Public Service Commission, Case 28223, Opinion and Order 84-15,* Requiring the Development of Conservation Programs, *May 21, 1984.*

1. Environmental externality costs should be incorporated in all utility planning, bidding and other resource selection;
2. Quantified environmental externality costs should be used, based on damage costs where adequate valuation studies are available, otherwise based on control costs;
3. A major research effort is critically important to better determine environmental damage costs.
4. Rate of return incentives should be provided for acquisition of energy efficiency resources, such that a kWh saved will be as profitable as a kWh sold (this may require decoupling profits from sales as well as an incentive);
5. Environmental externalities should be included in setting avoided costs;
6. Environmental costs should be internalized by an assessment against resources selected, to be placed in a Pollution Mitigation Fund;
7. Testing should be performed of environmental dispatch to determine the environmental and rate payer effects, and testing should also be performed of "Environmental LCUP" for use with respect to hard-to-quantify pollution costs.

NEXT STEPS

Environmental externality valuation is still at an early stage of development. Much research is needed to get firm and defensible costing figures. The Department of Energy and the Environmental Protection Agency should perform a thorough study of quantifying environmental damage costs, on a scale comparable to the Congressionally mandated National Acid Precipitation Program (NPAP) study of acid rain impacts and damages. The research area requiring greatest attention is dose-response relationships.

While twenty-six state jurisdictions (as well as the Bonneville Power Administration and Northwest Power Planning Council) have started to consider environmental externalities, many of their efforts are tentative. A great deal of experimentation is needed on the various means of incorporation that have been attempted and proposed. A concerted effort should be made to exchange information among state commissions and utilities and to get other commissions started incorporating environmental externalities. It is heartening that the National Association of Regulatory Utility Commissioners (NARUC) has taken a major interest in this area and is holding a national conference on the subject in October, 1990, in Jackson Hole, Wyoming.

Exchange of information is also needed among environmental costing experts, requiring a unique collaboration of economists, scientists and utility experts. The Pace University Center for Environmental Legal Studies and Fraunhofer Institut are holding an international costing conference in the Fall, sponsored by the German Marshall Fund of the United States and the Daimler-Stiftung Foundation. Academic, utility (EPRI, GRI, etc.) and government research institutes should devote major efforts to both quantification and incorporation issues.

ACKNOWLEDGEMENTS

This paper is based on a report being prepared by the Pace University Center for Environmental Legal Studies (Center) for the New York State Energy Research and Development Authority (NYSERDA), supplemented by funding from the U.S. Department of Energy (DOE) and the National Audubon Society, *Environmental Costs of Electricity* to be published in August, 1990. The report is being prepared by Center staff, Pace University Law School students, and consultants, Shepard C. Buchanan of Bonneville Power Administration, Paul Chernick and Emily Caverhill of PLC, Inc., and Alan Krupnick of Resources for the Future.

GENERAL REFERENCES

Bland, P. F. 1986. "Problems of Price and Transportation: Two Proposals to Encourage Competition from Alternative Energy Resources." *Harv. L. Rev.* 10:2.

Centolella, P. July, 1988. "Clearing the Air: Using Energy Conservation to Reduce Acid Rain Compliance Costs in Ohio," Ohio Office of the Consumers' Counsel.

Chernick, P., and E. Caverhill. 1989. "The valuation of Externalities from Energy Production, Delivery and Use." PLC, Inc., Boston, Massachusetts.

DOE/BP/751 1986. "Cost-Effectiveness Methodology." *Bonneville Power Administration [BPA] Resource Strategy.* BPA, Portland, Oregon.

Economist. 1989. "Money from Greenery." *The Economist,* London, England, October 21, 1988, at p. 16.

EPRI. 1988. "Benefits of Environmental Controls: Measures, Methods and Applications." Prepared by Energy and Resource, Consultants, Inc., Boulder, Colorado. Electric Power Research Institute, Palo Alto, California.

Freeman, A. M. 1979. "The Benefits of Environmental Improvement: Theory and Practice." Johns Hopkins Press.

Heslin, J. S., and B. J. Hobbs. 1989. "A Multiobjective Production Costing Model for Analyzing Emissions Dispatching and Fuel Switching," Department of Systems Engineering, Case Western Reserve University, Cleveland, Ohio, *IEEE Transactions on Power Systems,* V. 4, No. 3.

Hill, R. 1990. "The Impact of Energy on Environment and Development. *IVth Nobel Prizewinners Meeting, December, 1989, Man - Environment and Development - Towards a Global Approach.* Nova Spes Meeting Proceedings, February 1990.

Hohmeyer, O. 1989. "Social Costs of Energy Consumption." Springer-Verlag, Berlin-Heidelberg, Federal Republic of Germany, prepared under contract for the Commission of the European Communities, Directorate-General for Science, Research and Development, Document No. EUR 11519, by Fraunhofer-Institut fur Systemtechnik und Innovationsforschung, Karlsruhe, Federal Republic of Germany.

Machado, S. and R. Piltz. November 1988. "Reducing the Rate of Global Warming: The States' Role." *RenewAmerica*, Washington, D.C.

Mitchell, R. C., and R. T. Carson. 1989. "Using Surveys to Value Public Goods: The Contingent Valuation Method." Resources for the Future, Washington, D.C.

National Acid Precipitation Assessment Program (NPAP), *Interim Assessment*, Vol. I (1987).

National Regulatory Research Institute. 1982. "The Appropriateness and Feasibility of Various Methods of Calculating Avoided Costs."

Shuman, M., and R. Cavanagh. 1984. "A Model Electric Power and Conservation Plan for the Pacific Northwest, Environmental Costs." Bonneville Power Administration, Portland, Oregon.

INCORPORATION REFERENCES[35]

Brick, S. 1989. "Strategies and Methods for Incorporating Environmental Concerns Into Utility Planning and Utility Regulatory Decision-Making." MSB Energy Associates, Middleton, Wisconsin.

Cohen, S. D., and J. Eto. 1989. "Preliminary Results of LBL/NARUC Externalities Survey," Lawrence Berkeley Laboratory, Berkeley, California.

Pace 1990. "The Environmental Costs of Electricity." Report for the New York State Energy Research and Development Authority. Oceana Publications, Dobbs Ferry, New York.

Reid, M. W. 1988. "Ratebasing of Utility Conservation and Load Management Programs: Final Report." Prepared for Northeast Utilities. Alliance to Save Energy, Washington, D.C.

Vanderlindin, B. L. Summer, 1988. "Bidding Farewell to the Social Costs of Electricity Production: Pricing Alternative Energy under the Public Utility Regulatory Policies Act." *Journal of Corporate Law*, pp. 1011 *et. seq.*

---

[35] *References are to the State Incorporation of Environmental Externalities section of the paper.*