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THE INCINERATION CONFLICT: ADDRESSING PUBLIC CONCERNS

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Local concerns about the health and environmental effects of proposed incinerators have made it difficult to site such facilities. Litigation has stalemated the implementation of many new incinerators throughout the United States. While further research on the actual health and environmental effects of air emissions and ash residue from various kinds of incineration is important, it is unlikely that any group will be able to "win" an incinerator battle because it musters new scientific evidence. Rather, other strategic changes ought to be made that address the remaining uncertainty surrounding the health and environmental impacts of incineration. Four specific strategies, in our view, ought to be adopted in light of the continued stalemate over incineration:

- Implement recycling programs before new incineration plans are considered. Recycling is more economically and environmentally appealing than incineration. Impasse regarding the need for incineration will not be broken until full scale municipal recycling programs are operational.
- Adopt a careful "operations-oriented" approach to controlling incinerator emissions. Careful and continuous monitoring of incineration plants is the key to reducing the risks of toxic air emissions. The best pollution control technology is of little use if plants are poorly run. Thus, opponents of incineration facilities must be convinced that such plants will be operated in a consistent and appropriate fashion.
- Develop stricter ash disposal standards and alternative uses for ash. Landfills for ash disposal are often more controversial than the waste-to-energy plants (WTEP) that produce the ash. Ideally, alternative uses can be found for incinerator ash that will eliminate the need for land burial entirely.
- Increase state involvement in waste disposal planning and siting. Tradi-

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tionally, waste disposal planning has been in the hands of local government. Shifting more of this responsibility to the state will increase the prospect that reasonable compensation and other mitigation guarantees will be provided.

Implement Recycling Programs Before Incineration Plans Are Considered

Although incineration is the focus of this special issue of the *Review,* it is important to recognize that incineration should not be considered independently of other waste disposal options. In particular, plans for further incineration should be linked to plans for recycling.

While it is widely accepted that all solid waste cannot be recycled and that some portion will have to be disposed of through incineration and/or land burial, agreement on the need for further incineration is not likely until full scale municipal recycling programs are operational (see Ehrenfeld et al. in this issue). Moreover, establishing recycling programs before building new incineration plants makes sense for economic, environmental and political reasons.

Recycling is often more economical than incineration. Construction, operating and ash disposal costs make waste-to-energy plants a costly alternative. Construction costs average $100,000 per design ton (Kiser 1989). Tipping fees which include ash disposal costs as well as revenues from energy sales, range from approximately $19–100/ton depending on location (Kiser 1989). While recycling costs are more difficult to estimate (because they vary depending on the method of collection, the amount collected, participation rates, the type of material recycled and the stability of markets), the economic benefits associated with recycling include the avoided costs of incineration and landfilling as well as revenues from the sales of recyclable materials. In addition, recycling programs can reduce the size of the waste-to-energy plant needed by a community, thereby lowering construction, financing and other related costs.

The New York City Department of Sanitation, for example, estimates that garbage processing costs for New York City are $90/ton for resource recovery (including ash disposal) and $35/ton for recycling (based on a 15% recycling rate) (INFORM, 1989). An analysis of waste disposal costs for the Minneapolis and St. Paul area estimates that disposal costs per ton range from $40–$82 for recycling (depending on how often the waste is collected) and from $122–$152 for waste-to-energy plants. Both the recycling and incineration costs include collection (Moger 1989; Metropolitan Council 1988).

There are several important steps that must be taken to ensure that recycling is economically feasible. The most important is the development of stable markets for recyclable materials. A large, steady supply must be assured. With more

communities turning to recycling, and more states passing mandatory recycling laws, the supply will be guaranteed. Increasing supply necessitates increasing demand to avoid flooding the market and unstable prices. Industries must be given incentives to invest in recycling technologies, new applications must be found for recycled materials and export markets must be expanded. Higher quality recycled materials which have been cleaned and processed, will command higher prices. New processing facilities being built in several states—including Massachusetts and Rhode Island—can help ensure higher quality materials.

The recycling industry should be granted the same financial incentives (e.g., subsidies, loans and tax incentives) currently provided to the incineration industry. The avoided costs of incineration and landfilling should be shared with private recyclers. Some cities, including Chicago, Minneapolis and Newark, offer credits or subsidies to recyclers for each ton of waste they recycle (Environmental Defense Fund 1988; Barry and City of Chicago 1987).

Recycling is more environmentally sound than incineration. Recycling conserves raw materials and energy. While some recycling processes do produce toxic air emissions, the health risks are much smaller than those associated with air emissions and ash residues from incineration. Recycling can reduce the negative environmental impacts of incineration because it removes materials that do not burn (such as metal and glass) as well as products that, when burned, emit toxic air pollutants and increase the toxicity of ash residues (such as plastics and batteries).

Until full scale municipal recycling programs have been established, citizen and environmental groups will continue to question the wisdom of expanding incineration. In all likelihood, waste-to-energy plants will be blocked and delayed through litigation. Only after the concerns of those who question the wisdom of investing in incineration rather than recycling are met, will agreement be reached on how many additional incinerators are needed.

State and local governments can take steps to ensure that incineration does not interfere with recycling. Local governments should not use their powers to control the flow of waste to benefit incineration at the expense of recycling. It is difficult to implement a recycling program after a local government has signed a contract with an incinerator operator guaranteeing a minimum amount of waste. State level action is also needed. Minnesota, Connecticut and Maine have enacted legislation which prevents waste-to-energy facilities from accepting recycled goods (Environmental Defense Fund 1988). New York and other states require that recycling plans be submitted in conjunction with requests for permits to build additional waste-to-energy plants. States can go even further than this and require that recycling plans be implemented before new incinerators can receive permits. At the very least, state government should require that a certain percentage of waste be recycled and that incineration plants not exceed the size needed assuming that such a recycling level will be achieved.

Adopt a Careful "Operations-Oriented" Approach to Emission Controls

While incineration technology has progressed since the 1970's when plants were forced to shut down because they did not meet air quality standards, emissions must be more effectively controlled before waste-to-energy plants can gain broader acceptance. Emissions control does not depend solely on effective pollution control devices. Careful operation and monitoring of incineration plants are as important in reducing toxic emissions (including dioxins and furans). Operating an incinerator is a complex task. It involves controlling temperature, oxygen concentrations, and mixing to ensure maximum destruction of organic compounds. (For more information on good combustion practices, see Kilgroe in this issue.) In order to ensure that a plant is operating safely, numerous indicators (including temperature, oxygen and opacity) as well as levels of pollutant emissions (including carbon monoxide, sulphur dioxide, nitrous oxide, hydrogen chloride and particulate matter) must be monitored continuously.

Stricter emission, operating and monitoring standards should be required by federal and state government. At present, there are no national emission standards for pollutants other than particulate matter, although many states have set standards for other pollutants (USEPA 1988). Other countries that depend heavily on waste-to-energy plants regulate many more emissions. West Germany, for example, regulates hydrogen chloride, sulfur dioxide, nitrogen oxide, carbon monoxide, particulates and toxic metals (Hershkowitz 1987). Sweden regulates all of these pollutants as well as dioxins. (For more information see Modig in this issue.)

Standard operating procedures have not been established either, although it is expected that the U.S. Environmental Protection Agency (EPA) will be issuing "good combustion practice guidelines" in the near future (see Kilgroe in this issue). Shutdown procedures, in the event that a plant is not operating properly, have not been established by the federal government. There is no point to setting standards and specifying operating procedures if they are not strictly enforced, perhaps through stronger penalties. Lessons can be learned from other countries, such as West Germany, where incinerators that exceed standards can be shutdown and operators that violate regulations can be jailed (Hershkowitz 1987). West Germany's federal law requires that plants shut down if they exceed emissions limits for more than 1 hour. West Germany is planning to connect all its incinerators to state agencies to permit instant monitoring (Peracchio 1987).

Rigorous training programs for incinerator operators are another key to careful operations. Proper facility management requires a thorough understanding of the composition of the waste stream, the combustion process, and the requirements for emission controls. At present there are no national requirements for incinerator operators, nor is there an existing pool of trained, experienced operators (USEPA 1988). The American Society of Mechanical Engineers (ASME) is currently

working with the EPA to develop appropriate certification and training requirements. Certification standards for the positions of Chief Facility Operator and Shift Supervisor are expected to be announced in the near future (de Kadt 1989). (For more information on the training of incinerator operators, see Hershkowitz in this issue.)

If mandated and implemented, these measures could reduce the risks associated with waste-to-energy plants. Proper operation, close monitoring, extensive training of operators, and strict enforcement have been cited as the main reasons for greater public acceptance of incineration in West Germany, Japan and Sweden. (For more information on these countries see Barniske, Hershkowitz, and Modig in this issue.)

Develop Stricter Ash Disposal Standards and Alternative Uses for Ash

Locating sites for the disposal of incinerator ash is more difficult, in many instances, than locating incineration plants themselves. If such plants are to be accepted by the public, strict standards must be set at the federal and state levels for disposal of ash. Indeed, alternative uses for the incinerator ash would be even more desirable. Currently there are no federal standards regulating the disposal of incinerator ash. Standards that require monofills with composite and clay liners, leachate collection and treatment systems, and frequent groundwater monitoring ought to be established. Several ash disposal landfills that meet these standards have been built recently in response to the concerns of citizen and environmental groups. In our view, these standards should be mandated.

Ideally, alternative uses can be found for incinerator ash. The Marine Sciences Research Center at the State University of New York at Stonybrook is currently studying several alternative uses. These include stabilizing the ash by combining it with cement to form cement blocks or combining it with asphalt for use in road building. There is still concern, however, over the risk of exposure to fugitive dusts from cement block abrasion. Leaching is a concern in road construction applications. One of the most innovative alternatives might be to use the ash to build artificial ocean reefs. While it may seem counter-intuitive to bury toxic ash in the ocean as a means of protecting the environment, there are reasons that ocean disposal may be safer than land burial. The ocean provides an alkaline environment that is more favorable for metal retention. Reefs, which are composed of 85% ash, have been tested for two years; no leaching of metals has been observed. In addition, the reefs are holding up under colonization by marine organisms. These organisms have been tested and no uptake of metals has been observed. Leaching characteristics as well as dioxin and furan bioavailability are still being studied (Breslin 1989). (For more information on ash disposal and alternative uses, see Kellermeyer et al. in this issue).

Increase State Involvement in Strategic Waste Disposal Planning and Facility Siting

Incineration has made waste disposal planning much more complex. In exploring incineration as a possible waste disposal option, a community must address numerous health, scientific, technological, economic and siting issues. In addition, coordination among several communities is often necessary.

Although incineration has dramatically changed the way waste disposal must be addressed, the approach to public decision making in this field has remained largely unchanged. Waste disposal decisions continue to be made, for the most part, by local governments. They assess options, choose which option to pursue and determine where facilities will be built. Because local governments take these responsibilities, haphazard planning often results. Complex technological choices and important scientific consideration are sometimes overlooked. Alternatives such as recycling and waste reduction, which may require changes in state policy, are often ignored. The need for intermunicipal collaboration often goes unmet.

State governments must take a more active role. As Leslie Carothers, Commissioner of Connecticut's environmental agency recently put it,

> Our traditional reliance on local initiative and local option to solve the [waste disposal] problem made sense in the past, when each community accepted the responsibility to simply provide the old fashioned town dump . . . It's not working today when a limited number of larger, more costly and better engineered facilities will be required to serve regional and statewide disposal needs (*New York Times* 1988).

Historically, the states have not played a big role in solid waste disposal planning. However, this has begun to change. Twenty-two states now have solid waste management plans approved by the EPA. Most of the other states have either submitted plans to the EPA for approval or are in the process of developing them (Environmental Defense Fund 1988). Many states including New York, Massachusetts, Oregon, Washington, Illinois, Minnesota, New Jersey and Vermont have advocated a hierarchy of waste disposal policies calling for waste reduction and recycling first, followed by incineration and, finally, landfilling, if all the other options have been exhausted. Laws have been enacted in several states to implement this policy hierarchy. Some states, however, have not taken sufficient responsibility, still leaving most decision making in the hands of local government.

There are three key reasons why it is important to shift responsibility for waste disposal planning to the states. The first is that they have taxing power needed to generate sufficient revenues to support the construction and operation of the most efficient facilities. This includes the capacity to "tax the gainers" to "compensate the losers." Second, they have the expertise and resources to carry out continuous monitoring and enforcement. Third, through their authority to issue permits, they can ensure that appropriate standards are set.

Taxing the Gainers

Waste-to-energy plants, because of the efficiencies that can be realized through economies of scale, often serve several communities. While many communities benefit from this arrangement, the host community (particularly the abutters) bears most of the costs associated with a new facility. These costs include increased pollution and traffic and decreased property values. Opposition from potential host communities has lead to enormous difficulties in siting new plants.

A failed attempt by a group of local governments on Long Island (near New York City) to coordinate their efforts to build a waste-to-energy facility illustrates these problems. At the initiative of several municipalities on Long Island, a multi-town authority was created to site a regional facility. Many communities supported the idea until actual sites were proposed, then, every proposed site met with opposition. After several years of failed efforts, each town decided to act independently. They all hired separate consultants, assessed environmental impacts, conducted waste audits, and evaluated technologies and vendors on their own. The result was that many new incinerators were proposed and are being built. They will provide more waste disposal capacity than is needed, and they will discourage recycling (Bessent 1987; Fee and Firstman 1987; Fleisher, 1989).

To increase the likelihood that facilities will be sited, attempts must be made to mitigate adverse environmental and social impacts. All unmitigatable effects should be compensated. Potential host communities should have a major say in determining acceptable forms of mitigation and risk management (such as pollution control technology, tougher emissions standards, or additional operating requirements). Potential host communities should also be provided with the funds they need to adequately assess all possible ways of mitigating risks and impacts.

Compensation can take many forms. Host communities could receive annual or "up-front" payments. They could be given new recreational facilities, infrastructure improvements or insurance to protect property values (O'Hare, Bacow, and Sanderson 1983). The residents of Peekskill, New York (the host community for a waste-to-energy plant that serves Westchester County), were given price reductions for electricity produced by the facility (see page 00 for more details). Host communities could also be assured funds to finance county-local monitoring. This form of compensation has been practiced in Wisconsin (Shuff 1988).

The state's role in ensuring that compensation and mitigation are provided is critical. The state has the political power and the legal authority to collect and allocate revenue. The state should take the lead in ensuring that the terms of mitigation and fair compensation are appropriately negotiated on a site-by-site basis. If agreement cannot be reached, the state may have to arbitrate such agreements (as the law requires in Massachusetts, Rhode Island, North Carolina and elsewhere).

There is some concern that compensation will be used as a method to "buy

off" reluctant host communities. This might be particularly true in "poor" communities which are often "selected" to host facilities. These communities tend to have less political power and insufficient resources to assess fully what might be dangerous facilities. Compensation is also objectionable when it is seen as a bribe.[1]

Both concerns can be overcome. O'Hare, Bacow and Sanderson (1983) suggest in their book, *Facility Siting and Public Opposition,* that public participation be designed to guarantee that the siting process incorporates the concerns of people previously ignored and information that meets the needs of all interests.

The state must guarantee that citizen groups, environmentalists and other interests are brought into the decision-making process. This should occur at an early stage, preferably at the time when waste disposal alternatives are being assessed. The goal of such a process should be to reach informed agreements that respond to the legitimate concerns of all stakeholding groups (Susskind and Cruikshank 1987). If all attempts to reach an informed agreement fail, the state may have to make the final siting decisions and take the political heat.

Monitoring and Enforcement

State governments have the expertise and resources necessary to ensure that plants operate properly and that violations are met with strict penalties. States must guarantee that plants will be shut down if not operated properly.

Standard Setting

In permitting waste-to-energy plants, the state not only should assess whether a plant meets current standards, but also should require that certain criteria are met before permits will be issued. At the very least, the state should set guidelines regarding ash disposal, shutdown procedures, the implementation of recycling programs, fair compensation for host communities, and public participation in the siting process.

Three Illustrations

Three illustrations of very different approaches to the siting of waste-to-energy facilities follow:

[1]O'Hare, Bacow and Sanderson (1983) make an important distinction between compensation and bribes. They suggest that bribes are secret payments to decision makers made with the intent of influencing decisions.

Westchester County, New York: Compensation to Host Communities

In 1975, Westchester County took responsibility for finding a long range solution to the waste disposal problems facing its 43 municipalities which traditionally had full responsibility for waste disposal. After assessing various waste disposal alternatives, the County's Board of Legislators approved a waste-to-energy plant. The city of Peekskill, which was experiencing financial difficulties after a major industrial facility closed, voluntarily agreed to host the plant in return for compensation. It viewed the proposed waste-to-energy plant as a means of attracting industrial investment. In 1979, the City of Peekskill and Westchester County signed a Memorandum of Understanding which provided that the County would pay an annual rental for the facility portion of the site sufficient to amortize the purchase of the entire site by Peekskill's Industrial Development Agency. The County agreed to make payments in lieu of taxes to the City. While the original agreement amortized payments over the life of the waste disposal plant (approximately 20 years), an agreement was later reached in which these payments were accelerated and the entire site was paid off by 1986. The area, which was the site of an old industrial plant, was cleaned up. The County built several roads and a bridge to make the area more attractive for future industrial development. In addition, Peekskill receives a $1 million dollar annual energy credit from electricity produced by the plant. This energy credit is reflected on the utility bills of Peekskill residents (New York State Association of Solid Waste Management 1982; Robbins 1989; Miles 1989).

The 35 participating municipalities signed an Intermunicipal Agreement. The towns agreed to send their waste to the facility and to pay a $17 tipping fee. The participating municipalities formed a Solid Waste District which had taxing powers in the event that it was necessary to contribute further to the financing of the plant (New York State Association of Solid Waste Management 1982).

The facility in Peekskill was sited at a time when public opposition to incineration was not strong (Miles 1989). With the growing concern over the health and environmental effects associated with incineration, more than compensation will be needed to convince the public that waste-to-energy plants are acceptable.

Peekskill Facility Features

Tons/day (capacity):	2250
Air pollution control equipment:	Electrostatic precipitators

Marion County[2], Indiana: A Participatory Process

Concerned with future waste disposal options, in 1976 Indianapolis Mayor William Hudnut III appointed a 90-member Solid Waste Task Force to develop a solution. The task force included city and county government officials, business,

[2]Marion County consists primarily of the City of Indianapolis and four smaller towns. Most of the functions of the City and County are combined.

financial and technical experts and concerned citizens. The task force was involved in the entire process from the point at which waste disposal alternatives were being assessed. Committees were later formed to address environmental, financial, legal and technical issues. The Environmental Committee, consisting of a scientist and representatives of environmental and citizen groups, evaluated waste disposal options, particularly incineration and landfilling. After agreeing with the rest of the Task Force that a waste-to-energy plant would be the most feasible alternative, they evaluated the health and environmental effects such a facility may have. They made recommendations to mitigate harmful effects. Their recommendations specified the type of pollution control equipment to be used, operating standards, guidelines for the removal of recyclable and hazardous materials and members of a citizen's monitoring committee. Their recommendations were implemented. The citizens' monitoring committee oversaw the construction of the facility. Since the plant became operational in 1988, the committee has continued to meet bimonthly with the managers of the facility to review the operation of the plant and to assess the need for improvements in operations and upgrading of equipment (Environmental Committee 1986; Silver 1989; Stevens, Henderson and Tulli; Straus, 1989).

Indianapolis Facility Features

Tons/day (capacity):	1800
Air pollution control equipment:	Dry scrubber with lime injection; baghouse fabric filler

New Hampshire/Vermont Solid Waste Project: A Bi-State Cooperative Effort

Fifteen towns in New Hampshire and 13 towns in Vermont coordinated their efforts to site a regional waste-to-energy facility and ash disposal landfill. The effort was begun by the County Engineer from Sullivan County, New Hampshire. After assessing waste disposal options, he determined that incineration combined with recycling would be the best alternative. He also concluded that economies of scale could be realized if they coordinated their efforts with other communities. Sullivan County chose to work out an agreement with several Vermont towns because of their proximity. A Planning Committee was formed consisting of three members from each of the communities. Claremont, New Hampshire was eventually chosen to host the facility. A major consideration in choosing Claremont was that it was much larger than other communities and therefore produced the largest amount of waste. New Hampshire and Vermont formed an Interstate

Compact which was approved by the U.S. Congress and signed by President Reagan.

An ash monofill was located in Newport, New Hampshire. A wastewater treatment plant, which will treat the leachate produced by the landfill, will be built in Vermont. Recycling programs began while the plant was under construction. The New Hampshire/Vermont Solid Waste Project coordinates the recycling programs in the region and assists member communities in establishing recycling programs. They have instituted the county's first household battery collection program. Because most towns charge user fees for the disposal of waste by incineration and do not charge for recycling, recycling has been encouraged (Cook 1988; Siegler 1989; and New Hampshire/Vermont Solid Waste Project 1983).

Claremont Facility Features

Tons/day (capacity):	200
Air pollution control equipment:	Dry lime injection system; baghouse fabric filter

Conclusions

Each siting of an incineration plant described above illustrates steps that were taken to gain public support for incineration. Westchester County was able to make a waste-to-energy plant more acceptable to the City of Peekskill by offering compensation. By establishing a citizens' monitoring committee and implementing citizens' recommendations for mitigation, Marion County was able to allay some of the public's concerns over environmental and health impacts. The New Hampshire/Vermont Solid Waste Project (1983) has been working to combine recycling with incineration. In particular, its household battery collection program will reduce the toxicity of the ash.

An effective waste disposal planning process should include several key elements. To ensure that all concerns are adequately addressed, all stakeholding groups must be involved in the process and resources must be provided to ensure their participation. Harmful environmental and societal impacts must be mitigated and unmitigatable risks must be compensated. Ongoing monitoring must be backed up by strict enforcement including the shut down of plants for violation of standards. And finally, key responsibilities of state and local governments should be clearly assigned to ensure accountability. These measures can increase the prospects for greater public acceptance of incineration.

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