

DEVELOPMENT OF RESOURCE RECOVERY FACILITIES
PRIVATE versus PUBLIC OWNERSHIP

by

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Submitted to
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August 18, 1989

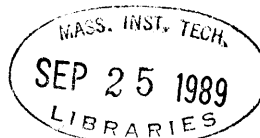
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ABSTRACT

This study examines the decision making process undertaken by public sector authorities in developing resource recovery facilities. The actual development practices of three such facilities are compared to other approaches gleaned from a literature search of recent project developments and decision making frameworks.

Specifically, these minicases are used as tools to isolate specific factors that most influenced the development of these environmentally and politically controversial facilities. The case studies point to the complexities inherent in the development process and provide insight into the critical role government must play, especially at the state and local levels, to ensure successful implementation of a project.

The principal conclusion of this research is as more state and local governments develop regulatory frameworks requiring regional solutions to the solid waste disposal problem, the trend toward municipal development and ownership will increase.

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INTRODUCTION

The disposal of solid waste is rapidly approaching a crisis point for many communities. In 1988, the United States generated and disposed of over 170 million tons of solid waste. It is projected that by 1993, 185 million tons will be generated, and by the year 2000, 205 million tons. The volume of solid waste will continue to increase for several reasons. The population will expand, consumers will continue to prefer disposable goods over reusables, and favorable economic growth in the 1990's will increase overall income and personal consumption expenditures, which eventually end up in the waste stream (Martineau, Weizer, 1989).

The most frequently used method of solid waste disposal is landfilling. Cities and towns in the United States still deposit 85% of their solid waste in landfills. According to the U.S. Conference of Mayors, by 1990, more than half of all municipalities will run out of landfill space. As the capacity of landfills declines, the cost of the remaining space increases. Clearly, landfills have become a valuable resource which must be conserved. Increasingly, the public recognizes that policies which regulate the existing facilities should be reassessed and revised to emphasize the need for conservation and alternatives to traditional landfilling as the sole form of solid waste disposal.

The cornerstone of any effective solid waste disposal system is the development of an integrated waste management

program. Integrated solid waste management sets a clear priority to reduce and re-use waste rather than to dispose of it. Such a program targets reduction of the waste produced, particularly that which is toxic either in production or disposal, the recycling of appropriate components of the waste stream, the combustion of the balance of waste stream which cannot be reduced or recycled, and the landfilling of only those wastes which cannot reasonably be reduced, recycled, or burned. Resource recovery is the combustion component of an integrated system. In this context, a resource recovery facility burns solid waste and produces energy as a byproduct in the form of steam or electricity. The waste becomes ash, which is then landfilled. The combustion process can reduce the raw waste volume by as much as 90%, thus vastly increasing the lifetime of existing landfills.

From a historical perspective, resource recovery facilities were subject to skepticism as a valid solution to the disposal problem, primarily due to antiquated incinerators which were susceptible to operational failures. Other factors included the lack of modern pollution controls to monitor emissions, and incidences of leachate contamination of aquifers underlying the landfill. As a result, many communities did not develop resource recovery facilities. However, in recent years, implementation of successful facilities have proven that resource recovery is a technologically viable alternative for solid waste disposal. In 1988, there were 111 resource recovery

facilities operating or in the process of coming on-line and 91 sites that were in advanced stages of development, e.g. secured contractual arrangements (Gould, 1988).

As more communities experience problems with handling their increased volume of solid waste, they increasingly look to private firms for assistance in developing resource recovery facilities. These facilities may be operated and owned privately or publicly, depending on governmental preferences, market conditions, and other factors. For example, municipalities may seek long-term arrangements in which an outside contractor assumes complete responsibility for solid waste disposal, or they may contract with vendors, under a management only or consulting basis, to oversee publicly owned facilities. The level of private participation is one of the most critical issues for communities considering the development of a resource recovery facility.

This thesis focuses on the various strategies employed by municipalities in the Northeast, represented by three regional agencies, who have implemented resource recovery facilities and through the process have selected the appropriate level of private participation.

The first chapter presents an overview of the project development process and ownership options available for resource recovery facilities. The organization of planning decisions, from establishing objectives through to project development was gleaned from a literature search and provides a structural basis

for the analysis.

The **second chapter** presents and discusses the factors and constraints which affect the decision making process during the developmental stages of a project.

The **third chapter** contains three minicases. Each case is a description of the efforts of the municipalities which have committed to develop a resource recovery facility. Each case demonstrates how the municipalities evaluated the contractual alternatives for their facility.

Chapter four analyzes the decision making process of the three regional authorities with respect to the political, legislative and environmental constraints. Conclusions about the case data are developed using the structural framework outlined in the first and second chapter. The analysis isolates the critical factors that influenced the selection process.

Chapter five presents conclusions on the development process based on the minicase analysis and trends identified by the literature review.

CHAPTER 1

PROJECT DEVELOPMENT AND FACILITY OWNERSHIP

Communities face a number of major decisions in the development of long term disposal solutions which include system technology selection, siting, financial and contractual structure. The development process is especially susceptible to risk and uncertainty because, once started, it is relatively fixed in time and place. The first section of this chapter presents an overview of the project development process. This is followed by a description of ownership options which must be considered prior to implementing a facility.

Section 1

Project Development

The Resource Conservation and Recovery Act of 1976 designated the primary responsibility for the regulation of solid waste to the state and local levels. Under the Clean Air Act and other federal legislation, the Environmental Protection Agency (EPA) is empowered to set mandatory guidelines and make recommendations for the operation of landfills, resource recovery facilities and recycling facilities.

In general, the unit of state government best equipped to cope with the solid waste disposal problem is the county or regional authority. This is especially true in municipalities which are too small and limited in area and resources to cope effectively and economically with the problem. Many states have enacted legislation which require regional solutions to solid

waste management. Such laws require the community to provide a cost effective means of solid waste disposal for both the residential and commercial entities. In addition, the community must ensure long-term solutions and guaranteed levels of service to their citizens and businesses.

Many communities consider resource recovery facilities an attractive alternative for solid waste disposal. Resource recovery facilities by definition process solid waste and convert it into commercially salable energy as electricity, refuse derived fuel (RDF), or steam. Recovered materials such as, scrap steel are also sold. Markets for fly ash to be used as a building material are currently being developed. The end product waste, which is reduced by as much as 90% of its original volume, is an ash residue which must be landfilled.

What are the ingredients of a good project?

- An environmentally suitable site
- A nearby landfill for residue and bypassed waste
- A proven technology and a vendor who will assume responsibility for its performance
- A long-term contract for the sale of energy
- Long-term contracts for the supply of waste
- Long-term financing at a reasonable cost

An **environmentally suitable site** for the facility should provide: good transportation access; compatibility with the present land use and zoning of the area; topography and subsurface conditions appropriate for the proposed facility;

adequate land for expansion options; and close proximity to a point of interconnection with the energy market. The site should also be free of environmental, site or facility design impediments which would prevent facility compliance with all of the approved major permits relating to environmental impact and solid waste regulations.

The importance of the capacity and proximity of waste landfill for the residue ash and bypass waste cannot be underestimated. The designated landfill and its expansion potential should be sufficient to fulfill the residue and unprocessed waste disposal needs of the facility throughout the term of the service agreement, if not the life of the facility.

Development of facilities with proven technologies and operating systems are more attractive due to the ease with which their financing can be obtained. Resource recovery facilities are divided into three basic types:

Mass burn facilities, which burn municipal solid waste as it is delivered to them, i.e. after recycling has taken place (Figure 1).

Refuse-derived fuel (RDF) plants, which remove recyclable materials and shred or process the rest into a uniform fuel (Figure 2).

Modular facilities, which are similar to mass burn plants but are usually smaller in size.

With regard to the type of processes being chosen for advanced-planned and existing projects, 47% are employing mass burn

FIGURE 1: MASS BURN FACILITY

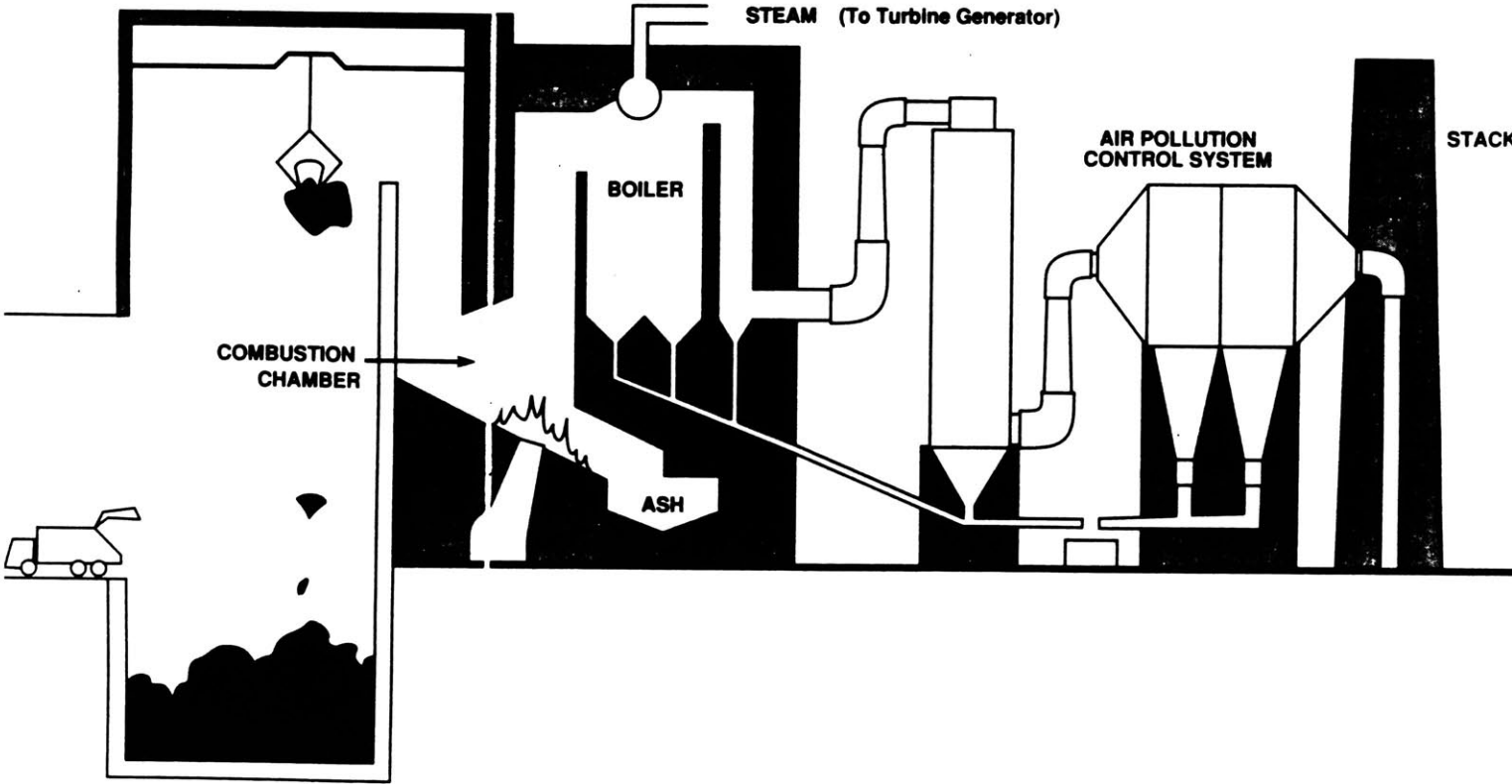
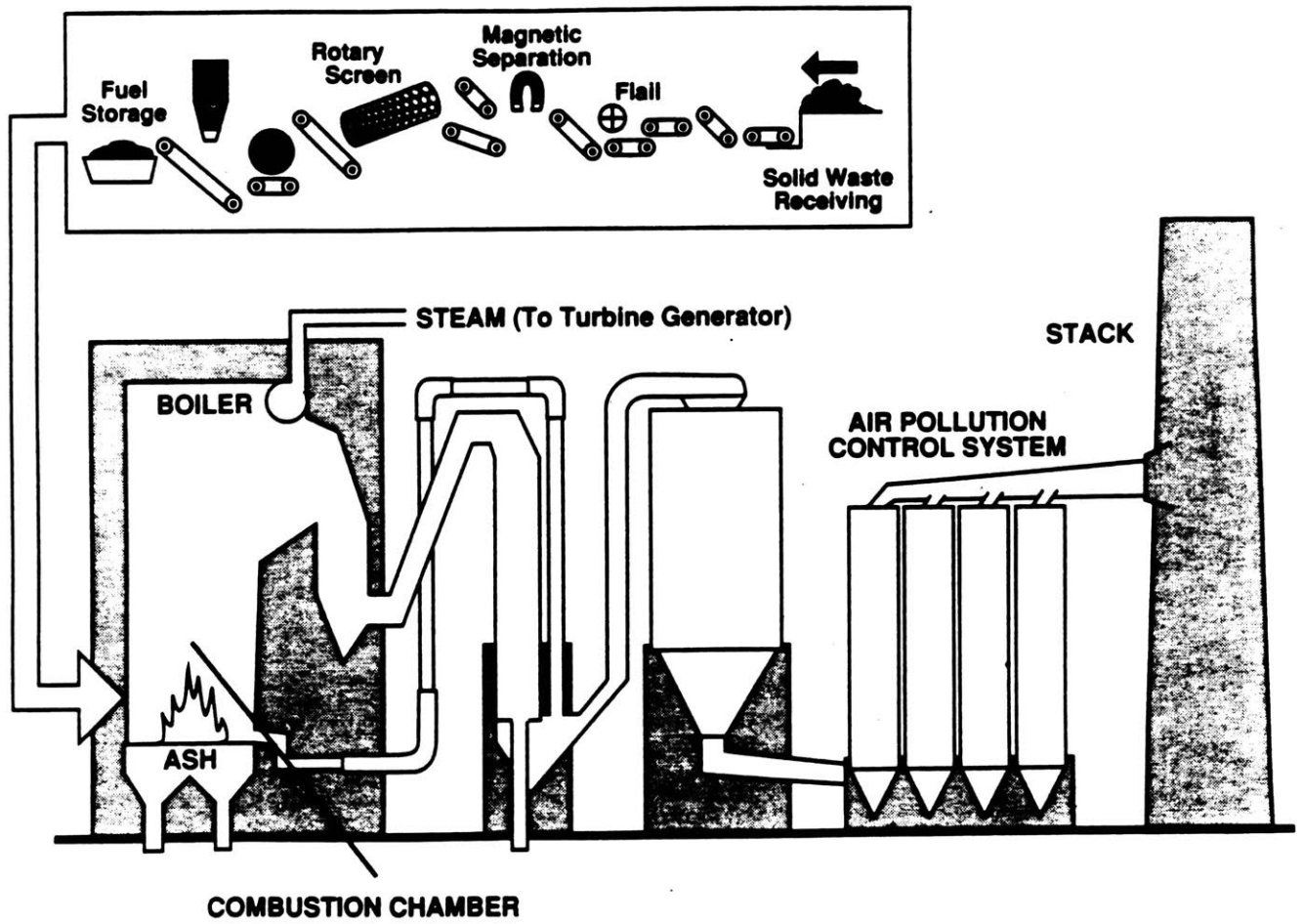


FIGURE 2: RDF FACILITY



technology, 34.2% are using modular incineration and 17.8% are using RDF technologies (Gould, 1988). Descriptions of major plant components of both mass burn and RDF technologies are detailed in Appendix A.

Energy produced from solid waste should be compatible with existing infrastructural contracts. Typically, the end user is a private firm, an industrial steam user or the local investor-owned utility purchasing electric power and energy under a Public Utility Regulatory Policies Act (PURPA) contract. PURPA requires electric utilities to purchase electricity from businesses that generate their own power. The price paid is based on the "avoided cost" of constructing their own generating plants or buying the electricity elsewhere. Even with PURPA, the facility must provide some incentive to the customer for the purchase of energy. Usually, the energy price per BTU is lower than the energy price of the natural fuel counterpart.

One of the most difficult aspects of project planning is providing both a reliable and adequate supply of waste. Furnaces are typically designed for continuous combustion of waste with the use of auxiliary fuel only during the initial startup phase. In some localities, the residential waste stream is controlled by government sponsors. It becomes difficult to identify and control the waste stream when flow control is fragmented among various local and commercial entities.

Resource recovery facilities are financed in a variety of ways. Capital costs for most mass burn and RDF facilities range

from \$50 million to \$400 million, depending on the plant capacities. At one end of the spectrum, the project can be municipally owned and financed with either general obligation or tax-exempt revenue debt. At the opposite end of the spectrum, the project can be financed entirely from a private vendor's equity. Between these two extremes, the combination of equity and debt is largely a factor of ownership and municipal requirements. Other important factors which influence the selection of financing include the vendor's creditworthiness, municipality's credit rating, project economics, vendor's preference for financing, availability of tax benefits and availability of state subsidies and grants. Major sources of capital funds are described in Appendix B.

Section 2

Ownership Options

Bringing a resource recovery facility into operation as expeditiously as possible is critically dependent upon the skills and commitment of public officials involved in designing and executing the development process. Each resource recovery project must address a common set of factors, even though the contracts are project specific. Variations of contractual structure arise due to the decision makers' perceptions concerning the probability of risk occurring. Perceptions differ as a result of diverse economic, political and legal contexts in which resource recovery projects are undertaken.

Statutes exist in all jurisdictions which govern the

selection of vendors for public projects. Most communities favor a competitive procurement process. With public ownership, the dicta of fairness and open government generally require that all responsive and responsible parties can compete to provide the service. Therefore, it is essential that the community have a well defined selection process. The first step is the solicitation of interested vendors through the Request for Qualification (RFQ) process. Qualified vendors are then selected by the municipality to participate in the Request for Proposals (RFP) process. The RFP process varies with different municipalities, but in general, the RFP would define the purpose and scope of the project, the preferred form of ownership, the preferred technology, the specifications of performance, and the risk and liability allocation between the municipality and developer. An effective RFP would produce comparable proposals, which would expedite identification, negotiations and resolution of open issues. It is important to note that consultation with competent financial, legal, tax, and technical advisors at an early stage in the development of the RFQ and RFP is a prudent step in understanding the scope and complexities of implementing a resource recovery facility.

Upon receipt of proposals, decision makers can then proceed to fully evaluate and compare the vendors on their ability to meet the overall solid waste disposal needs, on their pricing, on their risk posture and on their performance guarantees with regard to the service agreement. The municipality should

consider experience, reliability, creditworthiness, guarantees and other factors, in addition to cost for the service in choosing a resource recovery vendor.

The successful development of a facility by municipalities is a tremendous challenge. Preparing for and carrying out negotiations tests the soundness of the program concept and the ability of different entities to work together and to resolve their differences.

Although each contract is project specific, there are general guidelines which should be followed. The authority should clearly specify the rights and obligations of all parties concerning price structure, quantity and quality of service, length of the contract, and liability coverage. The contract finalizes these arrangements and establishes the structure of facility ownership, design, construction and operation. Under public ownership, most project agreements flow through the municipal sponsor (Figure 3). Alternatively, most project agreements flow through the project vendor under private ownership (Figure 4). However, in the case of public/private partnerships, project agreements tend to flow through the municipal sponsor, as in the case of public ownership.

Public ownership offers the municipality traditional security in having a long term ownership interest in the project and control of the assets of the project. Communities benefit from public ownership by retaining direct quality control over the operation; maintaining their responsibility for waste

disposal; continuing to finance the provisions of the service through taxes, user fees, or other means; and securing lower tax free bonds.

Under **public ownership**, the private vendor designs, constructs, operates and maintains the facility, and assumes certain responsibilities that the facility will operate as expected under a long-term service agreement, typically extending to 20 years. The contracts specify the technical and design standards in addition to performance standards. A private vendor operating a facility under a service agreement would be locked into a previously negotiated and relatively fixed revenue stream coming from the project and would have to control costs in order to achieve operating efficiency and profitability.

Public ownership of the facility places the community in the business arena as a seller of manufactured products. Communities may lack the expertise, especially in marketing, which could result in the facility's inability to bring revenues to the community. Thus, the facility would not be a contributor, but a negative factor to the overall economic base of the community. Moreover, projects are often beyond the capability of the local governmental agency to manage in-house. Municipalities often have political constraints, poor management or other limitations which prevent cost effective development and operation of waste disposal services. For example, municipalities may be slow to respond to technological advances

FIGURE 3

Resource Recovery Project Contract Diagram

Municipal Ownership

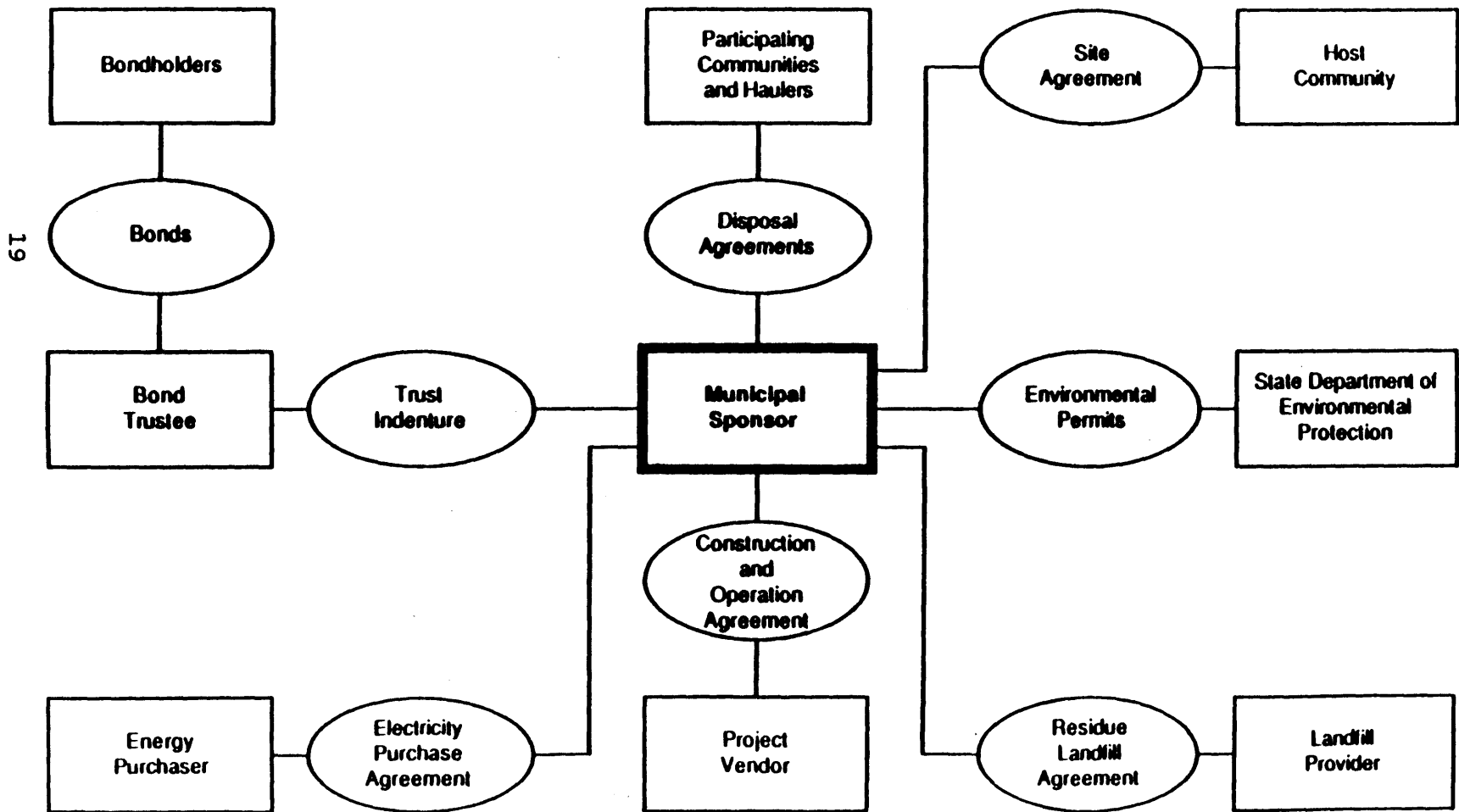
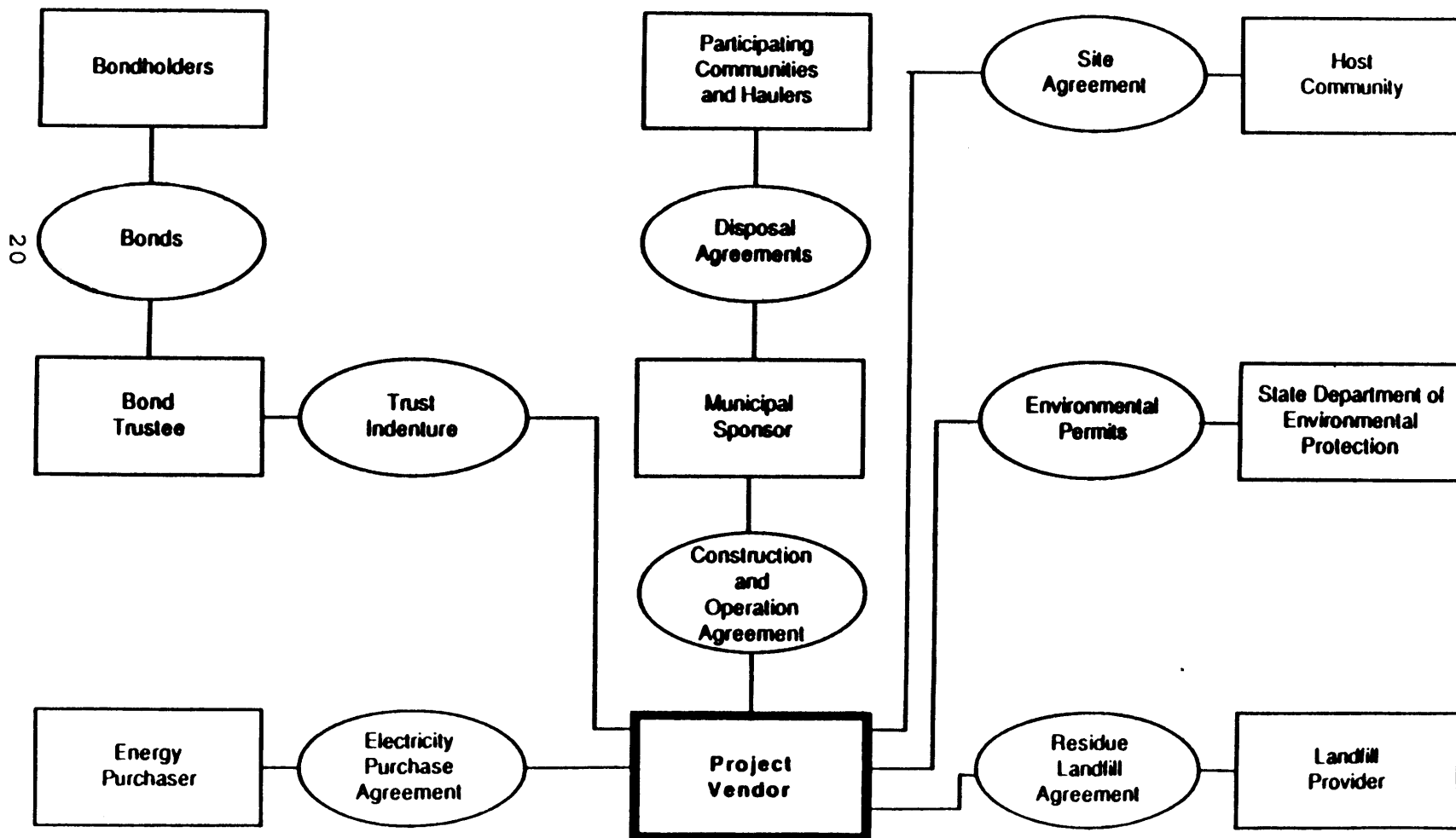


FIGURE 4

Resource Recovery Project Contract Diagram

Private Ownership



due to limited funds available to implement such capital improvements. Other restrictions which affect the cost of developing a publicly owned facility include: voter approval of the project, of the location, and of the financing; public procurement requirements for designers, architects, engineers, builders, and contractors; laws requiring use of union labor; and laws and regulations which impose excessive quality standards.

In general, **public ownership** affords the municipality more control of the project and eliminates the need for the municipality to pay fair market value for the service at the end of the service agreement. Tipping fees are typically related to the amount of service consumed (making them more like market prices), but may be varied by location and user eligibility. To this extent, the consumer should be able to realize a portion of the economic benefit derived from public ownership in the form of lower user charges. Other community benefits from public ownership include increased control of the quality and cost of the service, greater flexibility and increased stability in providing a long-term service, while enabling the municipality to stay out of the day to day operations.

Under **private ownership**, the vendor has a long-term contract with the municipality to provide a solid waste disposal service. The service contracts are typically 20 years in length. The vendor would assume total responsibility for the design, construction, operation and maintenance of the facility.

The vendor may also assume complete or partial responsibility for developing and financing the facility. Typically, the vendor must secure a minimum guaranteed waste flow from municipalities to qualify for financing. The public sector determines only the size and performance standards of the project.

Private ownership can result in significantly lower costs to the community and improved output by promoting conservation, efficiency, and prudence in the financing and operation of a facility. Private ownership also has the advantages of technology, qualified personnel, decision making authority, greater investment risk orientation and is buffered from public disclosure.

A reason often cited for limiting the involvement of private firms in solid waste management is that they may fail to comply with the terms of the agreement. This failure may be due to a variety of factors, ranging from inexperience, poor management, natural disasters, to substitution of lower quality resources and deliberate malfeasance (MacAvoy, Stanbury, Yarrow and Zeckhauser, 1989). Another criticism of private ownership is that private providers may seek to extract excess profits. Local governments should seek to avoid "lowballing" on the initial bid price with the express intention of increasing price later, explicit acts of bribery, kickbacks or collusive bidding through carefully specified agreements. Corruption requires market imperfections, since bribes do not occur in competitive

markets because they are paid from excess profits. Other common criticisms are the continued and sometimes hidden public administrative costs associated with monitoring and enforcing delivery of service and inducing providers to respond to changes in market conditions. These undesirable outcomes can be eliminated with proper control of qualified and proven vendors, special penalties for nonperformance, and special incentives for superior outputs.

CHAPTER 2

DECISION MAKING PROCESS

The decision making process and degree of involvement of a given municipality in the development of a resource recovery facility is often a function of the town's historical involvement and track record in solid waste management. One of the key criterion in the development process is the determination of the level of private participation that best equates with cost reduction and risk minimization by the municipality, while at the same time, allowing the community to play an active role in the development and control of the project. Selection of the most effective ownership option requires a comparison of the cost and the risks associated with full municipal development, private sector development, and partial private development.

Many factors must be considered in making the ownership decision early in the development of a project. Political and technical considerations tend to be project specific, whereas institutional, economic and risk allocation factors generally apply in all development circumstances. The ultimate decision of facility ownership will be primarily based on an evaluation of these factors in developing a project to best meet the needs of participating municipalities. Each of these issues are detailed below.

Institutional Considerations

The ability of a municipality to organize, fund and

contract for the development of a project is fundamental to the ownership decision. Since the major impetus for private involvement is derived from the inability or unwillingness of a community to implement resource recovery facilities, developing financial and ownership options at the outset is critical.

A community may not have the legal authority to contract out, franchise, or form some other agreement with the private sector. Local competitive procurement laws may preclude the selection of a project vendor on a negotiated basis. Legislation may be necessary to allow for a negotiated procurement or to establish a separate governmental entity such as a special purpose authority with such procurement powers. Authorities possess only such powers as have been expressly granted by law or may be necessarily implied in order to carry out an expressly granted power. Authorities have incentives, independent of its reputation and profitability, to consider the welfare of its customers. Authorities are less constrained than the rest of the public sector by either budgetary controls or civil service regulations. Its management is likely to worry about financial performance since authorities are financed largely from energy sales, tipping fees, and other revenue.

In states which do not specifically provide for the establishment of regional authorities for solid waste disposal, the development process may be politically more cumbersome. In this case, private ownership may expedite the development of a project by providing administrative resources to secure

financing and by serving as the contracting entity for disposal services between municipalities in a region.

One principal obstacle which arise from general attitudes and special interests with the populace is referred to as the Not-In-My-Backyard (NIMBY) syndrome. According to the NIMBY axiom, the majority of citizens accept solid waste as an inevitable by-product of living and feel little pressure to control its generation. Citizens oppose landfills, resource recovery facilities and even recycling centers based on the perception that these facilities are filthy and odorous, emit toxic contaminants into the air and water supply, and increase noisy truck traffic in their neighborhood.

The NIMBY syndrome has prompted many communities to adopt zoning restrictions against waste disposal facilities. In densely populated areas, this has made siting of resource recovery facilities and landfills impossible. While conceding that a portion of the large domestic solid waste load must be buried or combusted, environmental groups pressure legislators to require waste disposal sites to incorporate stringent air and water pollution controls and restrict the types of waste handled.

Pressure from the citizenry can result in politicians adopting a Not-In-My-Election-Year (NIMEY) position on resource recovery since it is often perceived as a lose-lose issue. Politicians may also elect to use the solid waste issue as a political platform.

Economic Considerations

An evaluation of the potential effect of ownership structure on local finance should be conducted. General obligations of municipalities are constitutionally limited in all states, in part, to assure the long-term soundness of their financial systems. These restrictions on public debt may not apply if the transaction is characterized as private, which would result in reduced pressure on local debt capacity. Therefore, private financing may bypass the constitutional limitations on debt issuance.

The private sector may be able to take advantage of financial opportunities and economies not available to the public sector. Under private ownership, costs savings may result from construction cost and timing efficiencies, and/or operational advantages. The cost of a resource recovery project may be considerably different under public or private ownership due to tax benefits available to private facility owners.

The availability of tax benefits provides an incentive for private owners of resource recovery projects to fund a portion of the total project cost with equity. The private owner's return on equity is derived from a combination of tax benefits, energy revenue, tipping fees and the project's residual value.

Risk Allocation Considerations

Regardless of ownership, risks are usually allocated by utilizing two major criteria: control and reward. The maxim is that the party who can best control risk, or who stands to gain

the greatest reward if the risk is not realized, should bear the burden.

Selecting an ownership structure requires the primary decision makers to understand what risks they are dealing with:

- What is the source of the risk?
- What are the consequences of the risks?
- What is the probability that an undesirable situation will occur?
- Which participant is best able to reduce the risk?
- What mechanisms can be used for risk sharing or allocation of the risk?

Answers to these questions, together with a clear understanding of the development environment, would enable municipalities to make the appropriate choice.

The variations in willingness to take risks are an important element in the decision making process. The following areas of risk should be considered: developmental; legislative; technological; supply of solid waste; energy revenues; construction completion; operational; and force majeure.

Developmental-Developmental risks are often shared between the municipal sponsor and private vendor. The municipality can best handle the long-term environmental risks, and thus, often gain better public acceptance of the project. The impact of special interest group pressures on the legislature have resulted in delays and higher costs of siting new landfills, more stringent landfill controls and regulation of resource

recovery operations.

Much of the debate over resource recovery has focused on dioxins, a group of 75 different chemical compounds, some of which are harmless and others of which are highly toxic. The EPA has deemed the dioxin risk from modern resource recovery facilities as inconsequential, but some scientists have disputed the conclusion, and further suggest that even small amounts of toxic releases may show up in the food chains. Predictably, the absence of a federal dioxin standard has not prevented states or cities from setting their own standards.

No matter how good the equipment and air pollution controls are, metals and other potentially toxic compounds still end up in the ash residue and fly ash. Better air pollution control of the emissions would paradoxically produce more pollutants in the fly ash, which is landfilled.

The primary environmental risk of landfills is posed by the seepage of leachate. Leachate is produced by the passage of water through buried solid waste. When this occurs, potential toxicants infiltrate the water and create a substance which can pollute ground and surface water if not contained. To avoid the adverse effects of leachate, state-of-the-art landfills incorporate a number of built-in safety features which minimize the seepage of water, collect hazardous liquids that penetrate the layers and monitor the quality of ground and surface water. Collected leachate is then stored in an appropriate tank and is periodically transported or piped to a wastewater treatment

facility.

Another potential environmental hazard of landfills occurs when anaerobic decomposition of buried organic waste results in the production of methane and carbon dioxide gases. In particular, methane gas can increase to explosive quantities and migrate beyond the landfill site boundary, posing serious danger to surrounding the area. Methane migration is prevented through a monitoring system comprised of wells which detect the presence of this gas. In contrast to its risk factors, the natural production of methane gas from decomposing organic waste can provide a potential benefit to landfill operators, since it can be sold to power utilities for conversion into electricity.

The strongest critics of resource recovery say that virtually no level of risk should be considered acceptable and argue that massive efforts to reduce and recycle garbage should take priority. Proponents of resource recovery assert that, granting the challenge of ash disposal, the technology is safer than simply burying garbage in landfills.

Legislative-Legislative risk is normally assumed by the municipality regardless of ownership. Examples of legislative risk are changes in environmental law and municipal ordinances. Private owners normally assume the risk of tax law change once project contracts have been executed.

Technological-Assurances typically must be given that the equipment will perform as specified. The vendor usually bears this risk under public or private ownership. One of the common

problems encountered is the reluctance of vendors to agree to assume liabilities greater than the value of the equipment furnished. The municipal sponsor should negotiate a reasonable value that will enable the retirement of project financing debt at a minimum.

Completion-Construction completion is normally borne by the vendor since it is in the best position of any participant to control the schedule, both from the standpoint of deciding the schedule and managing it. A fixed price contract with a specific date for completion should be the objective of the municipal sponsor. As with technological risk, municipal sponsors may find a reluctance on the part of vendors to assume liabilities in excess of the costs for performing the contract.

A vendor's financial completion guarantees should protect the sponsor against construction risks. Liquidated damages should be sufficient to meet debt service and operation costs if the plant does not come on-line on schedule. The vendor must guarantee the plant will meet air pollution and other environmental standards.

An owner's contingency plan must be in place from the start. Typically, time and resources would not be available to raise additional funds should a problem develop. The contingency fund is usually 5% of the construction price, but the fund size will vary with the depth and quality of the vendor's guarantees, insurance and operating reserves.

Operational-The vendor of a resource recovery facility

under a long-term contract is responsible for competent operation and maintenance pursuant to appropriate industry standards regardless of facility ownership. Where the facility is rendered inoperable or its capacity is derated due to poor performance, the vendor should bear the cost of rectifying his mistakes. Operational failures occur when a boiler fails, revenue commitments are not made, environmental permits are violated and the facility closes. Contract operators of municipally owned facilities may be reluctant to accept any liability for damage in excess of their contracted payments. Although the vendor will be out of business, the community and industrial customers are the real losers.

Examples of operational risks are the inability of the plant to meet design specifications and acceptance tests, and underestimation of residue quantity or related disposal costs. Cost of disposal of ash residue and fly ash should be fixed by long term contract with the landfill.

Acceptance testing determines if the vendor has met his principal obligation- to design and build a plant that burns waste and produces power. Failure can result from bad design or construction, faulty equipment design or installation, building codes, environmental or other imposed restrictions after execution of the design contract which limit the facility's performance. As stated above, the contractor is not responsible for alterations to accommodate subsequent municipal code changes without additional compensation.

Supply of Solid Waste-Municipalities normally guarantee the contracted quantity of solid waste, under either ownership approach. Examples of supply risk are failure to deliver waste, delivery of too much waste, waste delivery stoppages, failure of waste to meet BTU standards, and introduction of unacceptable waste including hazardous waste into the waste stream. The operator's guarantees are important, since introduction of improper waste could void the construction warranties.

Energy Revenues-The risk that energy sales do not meet the projected levels of revenues is subject to negotiation under either ownership approach. The outcome is dependent upon such factors as the risk preferences of the negotiating parties, i.e., who reaps the greatest benefit of energy revenues, and the ability to negotiate fixed price contracts with the energy purchaser(s). Currently, there's a movement towards requiring annual energy output guarantees from vendors to ensure a defined level of performance.

Force Majeure-Force majeure events or other uncontrollable, uninsurable risks are protected against by the sponsor to complete the project and by contingency reserves. Force majeure events at a minimum, include acts of God, war, civil disorders and riots. In the event of any of these occurrences, the construction schedule is usually extended as needed and the tipping fees are adjusted accordingly.

In projects sponsored by a municipality under any ownership

approach, private vendors will likely accept completion, technological, and certain operational risks. The municipality would accept solid waste supply risk, including stipulated payments for waste shortfalls, and certain energy revenue risks. Legislative risks (changes in law) and force majeure have commonly been accepted by municipalities under any ownership alternative.

In summary, a tightly drawn contract setting out the terms and conditions for ownership is the most important document of the contractual process. While private ownership places significant risk on the vendor, in the final analysis, risk allocation may not be significantly different under either ownership approach for a given project. Risk allocation does not necessarily follow ownership. As a practical matter, municipal officials will still be held responsible if problems with a privately owned project occur.

An effort should be made to plan contingencies which avoid damages. Mitigation of risk is found in: the involvement of experienced personnel and use of capable engineering support in design; the tempering of project expectations with respect to energy production and sales; a proper understanding of each party's risks; and an appropriate reserve fund/insurance package. There exists a point at which the attempt to anticipate every conceivable future occurrence becomes dysfunctional. For every day a project is delayed, one or more of the price components can escalate. If delays do occur, the

project can then become vulnerable to changing market conditions, changing political climate or changing laws. A recent survey found that due to significant uncertainties in federal and state regulatory policies regarding air emissions and ash disposal, a number of private and public developers have decided to hold off on planned new facilities (Martineau and Weizer, 1989).

CHAPTER 3

MINICASES

This chapter focuses on the efforts of three regional authorities who have undertaken the development of resource recovery facilities. Each authority was subjected to a detailed field research protocol to isolate and organize the various factors that most influenced their implementation process.

Project Selection

A database of the 111 existing resource recovery facilities and 27 permanently shut down facilities was assembled to identify the form of ownership, start-up date of operation, technology used (RDF or mass burn), location and reason for shutdown. For the existing facilities, public ownership was selected for 45.9% of the facilities, private ownership represented 36.1% and public/private partnerships represented 18%. The data illustrates the relatively short history of resource recovery as a disposal option, 86.5% of the facilities have come on-line since 1980. In fact, 47.7% of the facilities have initiated operations since 1985. When compared by regions, the Northeast shows the greatest share of facilities (36.6%), primarily due to the region's landfill crisis.

Of the 27 facilities which have shutdown permanently, 40.7% were publicly owned, 37% were privately owned and public/private partnerships represented 22.3%. The majority (66.7%) of the shutdowns resulted from equipment failures or failure to comply with environmental standards. This was followed by 18.5% due to

economic reasons, 11.2% were experimental facilities employing technologies such as pyrolysis and 3.6% due to legal action.

The projects selected for this research represent the scope of contractual structures which are prevalent today. One authority chose a private vendor to provide complete services. Another, acted under legislative mandate to maintain ownership and to contract with a private vendor under a full service agreement. The third, chose to maintain ownership and to contract with a private vendor under a full service contract without a legislative mandate. A fourth case was considered, but the Author was unable to obtain adequate data pertaining to this publicly owned and operated facility which shut down operations after 3 years due to economic reasons.

The projects were selected from the Northeast, where the solid waste disposal dilemma is well documented. This also allowed the researcher to control for a relatively common environment.

Research Methodology

The three cases presented in this chapter were based on interviews with public officials, planners, private industry developers, and citizens who participated in the implementation process. The interview protocol, which is detailed in Appendix C, evolved from the review of project development and decision making criteria established earlier in this study.

Background information concerning the contractual structure of the facilities was obtained from a wide variety of sources

including official statements for bond issues, trade and professional journals, local and national media sources. The research was conducted during a two-month period.

Case One: Millbury, Massachusetts

Communities in the Worcester, Massachusetts area formed a committee to develop a regional solution to solid waste management. When Wheelabrator Technologies Inc. (Wheelabrator) of Danvers, MA. offered to own, finance, design, build, and operate a resource recovery facility, the Town of Millbury offered to host the facility within its boundaries. In exchange, Millbury enjoys free tipping from Wheelabrator for 20 years for a specified amount of waste and receives "host community fees" each month from the 35 other communities providing waste to the facility. Wheelabrator sold the facility to the Ford Motor Credit Company after tax benefits of ownership were reduced by the Tax Reform Act of 1986 (TRA 86), but Wheelabrator continues to operate it, under a lease agreement with Ford.

The Central Massachusetts Resource Recovery Committee (Committee) was formed in 1975 and represented 35 communities. The Committee received a state grant to develop a strategy for solid waste management for the region. The City of Worcester, the second largest city in New England, retained a full-time administrator through state funding to oversee the Committee's

implementation schedule and to develop a planning framework. Independent consultants were retained to assist with the technical and financial evaluation of the solid waste management strategy. Initially, the City of Worcester considered siting a facility within its boundaries, but citizen opposition killed that notion. In 1980, amidst much public pressure, Worcester's city council passed a resolution which prohibited landfills, resource recovery facilities and transfer stations from being sited within city limits. Upon passage of the resolution, funding for the feasibility studies was withdrawn by the state. Bob Jacques, Director of Health for the Town of Shrewsbury commented:

The Board of Selectman of Millbury and especially Harold Ostrowsky [former Selectman and current Town Assessor] was the driving force. Millbury offered two sites for the facility. Their strength and leadership enabled the Committee to maintain momentum and control and to diffuse opposition.

There was little time to go through the comprehensive RFQ/RFP (request for qualifications/proposals) process. Landfills were approaching capacity in several towns. At the time, Millbury's landfill had a two year life span and Worcester was under order by the state environmental authorities to close its landfill by June 1, 1985. The Committee was interested in finding a private partner to hasten development of a resource recovery facility. Jacques the described process:

The Committee had determined that they did not have the expertise to run the facility and did not have the ability to respond to outages and shortfalls. In essence, their objective was to assume as little risk as possible. They realized that the communities were

not in the business of making money, only in providing steady, reliable, long-term service.

Fran Ouillete, Former Chairperson of the Committee explained:

The philosophy of life in central Massachusetts is that the private sector can do it better. A lot of communities are closet Republicans having a preference for government to make [as] much use of private enterprise [as possible].

Richard Schnorff, City of Worcester's Program Director of Resource Recovery Systems added:

We always considered a private developer. We had a lot of faith in Wheelabrator. Some city councilors sought revenue sharing, but they were not willing to accept the risks of shortfalls.

In early 1984, Wheelabrator approached the Committee and proposed to finance the facility's preconstruction process which included studies for the environmental impact review, permitting, and the purchase of land, with an aggregate value of \$1 million, for exclusive rights of consideration as the project vendor for six months. At the end of this period, Wheelabrator would determine the feasibility of the project, propose contractual agreements, and propose tipping fees. Concurrently, the Committee developed a short list of qualified vendors, established a preference for the mass burn technology, and proceeded to develop a RFP which served to exert competitive pressure on Wheelabrator.

After the six month period, Wheelabrator offered to design, build, operate and own a 650 Tons per Day (TPD) facility and proposed tipping fees of \$28.00/ton (1988). Worcester, being the largest potential supplier of waste stream, withheld

acceptance and sought a larger facility to ensure greater commercial disposal capability. Wheelabrator responded with a subsequent proposal for a larger 1500 TPD facility and proposed tipping fees of \$24.50/ton (1988) with an annual fee escalation based on the Consumer Price Index (CPI). Wheelabrator assumed the financial risk of waste flow undercommitment, since at that time bankers required guaranteed flow control of 65% of capacity (975 TPD) and the communities could only commit 650 TPD.

Wheelabrator's proposal also provided for a local transfer station on the site of the plant to accommodate Worcester's disposal needs between the period of the landfill closure of June, 1985 and the facility's opening in January, 1988. After the opening, the transfer station would remain in use to handle demolition wastes. On an emergency basis, the station would serve as back up to the resource recovery facility. The Committee agreed to Wheelabrator's second offer for a larger facility (through a non-competitive negotiation process) because it addressed the urgency of the region's current and future needs.

Approval of the non-competitive procurement process from the Massachusetts Inspector General was necessary. The State attempted to impose its control over the implementation process of the facility. Schnorff expressed:

The State's opposition reinforced our alliance with one another. Public administrators often forget their real role as policy makers and facilitators. The Committee was a successful example of regionalism. The Committee was composed of a group of people, despite a history of not trusting each other, who

were dedicated to solving a problem on a regional basis.

For Wheelabrator, the market was favorable and private control allowed the project to be completed ahead of schedule (September 1987) and below budget. Wheelabrator's responsibilities included: to build and operate a resource recovery facility; to secure a separate 20 year service agreement with each community, including a guarantee from each community to provide a minimum tonnage of waste per year; to comply with performance guarantees in the service agreements; to secure environmental licenses and permits required for construction and operation of both the plant and the landfill; to comply with environmental performance requirements; to contract with New England Power Co. for the sale of electricity generated by the facility; and to construct and operate an ash residue monofill which is located in Shrewsbury. The municipalities were responsible for conditions resulting from force majeure events and changes in law.

The service agreement between Wheelabrator and Millbury provides the town with free tipping for up to 11,315 tons of solid waste a year. Beyond that amount, Millbury pays the current per ton rate. In addition to free tipping, Millbury receives "host community fees" for waste processed at the facility on a per-ton basis. Two state laws facilitated the agreement: a state statute enabling municipalities to create industrial development finance authorities to issue bonds and a

1981 state law that requires payment of "host community fee" from communities delivering waste to a facility. The additional cost of "host community fees" and free tipping for Millbury are built into the tipping fees of the other participating communities.

Wheelabrator obtained private financing to purchase the land and to construct the facility with capital costs of approximately \$160 million (1986). Taxable private financing was preferred to take advantage of the available investment tax credit. TRA 86 reduced the tax benefits of ownership for Wheelabrator, while ownership offered tax advantages for Ford Motor Credit company. As a result, Wheelabrator undertook a leveraged lease transaction in which they sold the facility to the Ford Motor Credit Company and then leased the facility back.

Case Two: Quonset Point, Rhode Island

The Rhode Island Solid Waste Management Corporation (Corporation), created in 1974, has been in the process of developing a resource recovery facility at Quonset Point since 1983. Initially, the Corporation attempted to develop a comprehensive program which maximized resource recovery and recycling, and encouraged private industry to actively participate in the development of the Corporation's programs. As a result of extensive political debate, legislation was enacted that mandated public ownership. Blount Energy Resource Corp. (Blount) of Birmingham, AL. has been contracted by the

Corporation to design, construct and operate the facility. After years of planning, the project is awaiting final environmental permits. Construction ground breaking is anticipated by the end of 1989.

By 1970, there were 43 disposal facilities within the State of Rhode Island. As more and more communities exhausted their landfill capacity or closed their disposal facilities for environmental or economic reasons, only 12 facilities were in operation by 1984. The existing landfills had a limited capacity and did not provide for long-term disposal of solid waste. Neighboring states faced a similar long-term disposal problem.

The Corporation was established as a public, tax-exempt corporation with the appropriate powers and responsibilities to plan, finance, and implement an integrated, statewide system of solid waste management. Municipal participation in the statewide system was voluntary, provided that the municipality made effective solid waste disposal arrangements within its own geographic boundaries. Any revenue received by the Corporation was to provide for its own financial support to maintain financial solvency.

In 1984, the Corporation designated a 20 acre site at the Quonset Point/Davisville Industrial Park for the resource recovery facility. The site was owned by the Rhode Island Port Authority and Economic Development Corp, a state entity, which

planned to sell or lease the site to the Corporation. The site's advantages included a central location, zoning for heavy industry, close proximity to large steam users and the landfill, and expansion capacity. The 600 acre Central landfill was purchased as an integral first component to the Corporation's proposed long-term centralized waste management program.

Blount submitted a proposal to the Corporation in April, 1983 to design, construct, and operate a 1500 TPD resource recovery facility to be owned jointly by the Corporation and Blount. Blount proposed to provide 25% of construction cost as equity capital, which decreased the amount of financing required and resulted in lower tipping fees for individual communities and haulers.

In December, 1984 (to avoid the restrictions of TRA 86), the State of Rhode Island sold revenue bonds of \$226 Million and placed the monies in escrow to finance a private deal. Flow control, i.e. ownership of the solid waste which assured a reliable and permanent waste flow, was necessary to secure bondholders. Legislative mandate for flow control was reviewed by the Rhode Island Special House Commission of Resource Recovery (Commission) and subsequently adopted in 1986. During the review period, Westinghouse Electric Corp. (Westinghouse) of Pittsburgh, PA., submitted an alternate proposal to the Corporation. Westinghouse's proposal included three publicly owned regional facilities with a combined capacity of 1500 TPD and all energy revenues to be allocated to the Corporation.

Westinghouse defended their regional proposal as more cost effective due to reduced transportation costs.

The Corporation initially preferred private equity participation because it was perceived to be more cost effective on a short-term basis. However, some legislators did not favor a private equity deal. Under the terms of the public/private partnership, Blount would own the facility after the 20 year service contract. The anticipated life cycle of a facility is at least 30 years. Subsequent legislative amendments mandated public ownership, reversing the initial legislative intent of encouraging private industry participation.

The Commission, under advisement from technical and financial consultants, determined that Westinghouse's proposal was not more cost effective than Blount's proposal, and that a smaller facility would meet the state's needs. The Corporation then entered into negotiations with Blount for a 710 TPD facility under public ownership. Mr. Dante Ionata, Project Coordinator for the Corporation described the process:

State ownership was mandated, because Blount was perceived as getting a free ride at the expense of the public since the state was extending its credit to secure tax-exempt bonds. The Commission had a number of issues with public versus private ownership which were fueled by media and political intimacies. The issue of ownership had less to do with the decision than with the politician's perceptions and fears.

The Commission was aware that public ownership would result in higher users' costs due to additional financing required, but they were determined to eliminate the potential of price gouging

for the disposal services upon reversion of facility ownership. Under the private equity participation, Blount would own the facility after 20 years, at which time the capital costs and debt service would be paid for. Ionata expressed:

We came to the right decision, public ownership, for all the wrong reasons. Public ownership is best in terms of long-term economic return to the end user. Short-term economics favor a private deal.

After years of public hearings with environmentalists and concerned citizens, the resource recovery facility at Quonset Point is still in the permitting stages. Ionata anticipates the construction ground breaking of the \$72 million (1987) facility by the end of 1989 with a three year construction build-out. The proposed tipping fees upon operation will be \$65/ton (1992). To allay environmental concerns, an additional \$6 million (1987) will be spent on state-of-the-art environmental controls and associated air quality monitoring equipment.

Under the provisions of the contract, Blount will receive an annual fee to operate and maintain the publicly owned facility. Blount will be eligible for an incentive bonus that will be shared with the state on an equal basis if it operates the facility beyond the stipulated contract guarantees. Revenues generated from the sale of steam and electricity produced by the plant will be used by the Corporation to lower disposal costs for other Rhode Island communities.

The Corporation is in the advanced planning stages of two additional resource recovery facilities. Ogden Martin Systems

of Fairfield, N.J. has been contracted to design, construct and operate a 750 TPD facility in Johnston, R.I. The project is awaiting final permits and anticipates ground breaking in the 1990. The third facility is proposed for Blackstone Valley, R.I. The Corporation is currently in the vendor negotiation process for this 750 TPD facility.

Case Three: Pennsauken, New Jersey

The Township of Pennsauken, New Jersey and eight adjoining municipalities in Camden County have been relying on the Pennsauken Sanitary Landfill (Landfill) since 1978 for solid waste disposal. In 1981, it became clear that the Landfill was a limited resource. The Township and the adjoining municipalities created the Pennsauken Solid Waste Management Authority (Authority) in September, 1983. The Authority has contracted Ogden Martin Systems (Ogden) of Fairfield, N.J., to design, build, operate, and maintain a resource recovery facility. Construction had begun, only to be stopped by legal action (1989). Once resolved, construction build-out is expected to be approximately thirty months.

In the State of New Jersey, solid waste generation and disposal is regulated at multiple levels of authority by state, county, and municipal laws. In 1985, New Jersey adopted two acts, The McEnroe Bill and the N.J. Mandatory Source Separation and Recycling Act. The legislative objectives are to implement

a safe and efficient statewide solid waste and resource recovery management strategy, and to reduce dependence on sanitary landfills as a primary means of solid waste disposal. These two acts require counties and municipalities to enact specific legislation for the establishment of solid waste management districts. Under this legislation, two or more municipalities may plan and establish a regional resource recovery facility, or individual municipalities may operate their own facility.

The Authority was created to select a competent system supplier, to arrange for a dedicated solid waste stream, to market recovered materials and energy, to obtain environmental permits, to finance project construction, and to operate the Landfill. The Authority conducted a feasibility analysis of various solid waste processing technologies intended to preserve the disposal capabilities of the Landfill for a minimum of 20 years.

Although the project was conceived in 1979, it took another five years before a RFQ was issued. Mr. John Jacobs, Executive Director of the Authority offered the following explanation for the delay:

There are two types of politicians, those who act and those who react. Too many politicians react which was the case in Pennsauken. Two incumbent councilmen who were in favor of waste-to-energy were defeated by opponents who won on anti-waste-to-energy platforms. The two anti-waste-to-energy councilmen subsequently lost their seats and the project was rejuvenated.

Fourteen firms responded to the RFQ, but only two firms, Ogden and Foster Wheeler (Foster) of Livingston, N.J., were

shortlisted to submit proposals. The Authority had specified public ownership of the facility and the mass burn technology in the RFP. Jacobs expressed:

We always wanted control of the project. We were bothered by vendors willing to put up 20%-25% of the equity in return for ownership of the plant upon expiration of the service contract. These plants have more than a 20 year life cycle if operated and maintained properly. We don't have the expertise to run the facility. We always sought a long-term depository for solid waste. We did not want to give up the value of a fully functional facility because it would be an asset to the community upon completion and in the future.

Mr. Dan Spech, Project Manager for Ogden added:

Decision on ownership is [usually] made prior to issuing the RFP. With a public deal, the governmental body is on your side. It's one more piece of clout which may prove helpful in the permitting process. With merchant plants [solely private], the NIMBY opposition could kill the deal. Development expenses are at your own risk. The merchant developer must offer the host community benefits to mitigate opposition.

In April, 1988, the Authority contracted with Ogden to operate, maintain, and guarantee the performance of the facility, and guarantee the generation of electricity for sale on behalf of the Authority in consideration for an annual service fee. Ogden undertook the lead role in securing environmental permits for the facility. Ogden is also responsible for transporting the bypass waste and ash residue to the Landfill at cost. Should the plant not operate, Ogden would be responsible for the disposal of the waste for the 20 year length of the contract. Ogden's 10% share of the energy revenues, is perceived by Jacobs as providing a sufficient

incentive to run the plant efficiently.

The Authority has secured a solid waste disposal franchise from the N.J. Board of Public Utilities to ensure a solid waste supply. The franchised municipalities will be the exclusive users of the facility [The County of Camden is currently developing a 1050 TPD facility to serve all other communities in the county since the Authority was conceived prior to state the law]. The Authority also has executed a power purchase contract with Public Service Electric and Gas Company (PSE&G) for the generated electricity. The Authority has successfully operated the Landfill since its obligation began.

The 500 TPD facility will be located on a 3.5 acre site within the boundaries of the existing Landfill property. The site is owned by the Township and leased to the Authority. The site is zoned consistent with its use as a resource recovery facility and has good accessibility to the PSE&G electrical grid and to the area's highway system. Residue waste and ash will be disposed of at the Landfill.

The construction of the \$55 million (1988) facility will be financed with proceeds from industrial revenue bonds that were sold and placed in escrow (pre-TRA 86). The Authority expects to derive the revenues necessary to operate the facility and the Landfill from the electric power generation sales, recovered materials sales, and tipping fees. Anticipated tipping fees are in the range of \$90/ton (1992).

Construction had started, but was stopped pending the

outcome of litigation brought by adjacent communities which allege that they are not deriving benefit from the facility. Upon issuance of the Prevention of Significant Deterioration Permit by the N.J. Department of Environmental Protection, adjacent communities appealed the decision to the EPA on the basis of potential leachate contamination. Jacobs expressed his exasperation:

The American public has the misconception that they dispose of quality wholesome trash. Lead and heavy metals are found in newsprint. Batteries contain mercury, lead and cadmium. Ash is more controllable than trash. Construction should have continued pending the resolution of the litigation. The regulatory agencies don't care about the rate payers since they will bear the burden of the delay. It takes strong leadership to bring the issues to the public and ask for their input and assistance.

CHAPTER 4

ANALYSIS

Minicase Data

Each public sector authority was specifically established to address the issue of solid waste disposal. Landfills were reaching capacity and were not envisioned as a long-term solution. The degree of urgency to implement a cost effective, alternate form of waste disposal determined the rate at which the facilities were implemented. The level of government at which the development was undertaken directly influenced the timeliness of the project's implementation.

In the case of the facility in Millbury, MA., both the Town of Millbury and the City of Worcester were faced with the imminent closure of their landfills due to exhausted capacity and environmental non-compliance, respectively. In addition, Worcester's constituency had voted to prohibit the siting of landfills and resource recovery facilities within its boundaries. The short-term alternative was to transport the waste to transfer stations, other disposal facilities and landfills outside the region at a considerable expense. The absence of an economical long-term solution was a major impetus for the project's timely implementation. Another determinant was the "shared vision" of the 35 communities who were served by the facility. The state's withdrawal of funds, and its opposition to sole source negotiations reinforced the alliance among the communities. This alliance provided the forward

momentum necessary to facilitate the contractual process.

At the time of negotiations, Wheelabrator was a proven vendor with a successful track record. Wheelabrator had five large-scale facilities in operation throughout the country. Their first facility, located in Saugus, MA., had been continuously operating since 1975. The Committee was confident of Wheelabrator's technical and financial ability. When the state withdrew its funding, a former consultant to the City of Worcester was retained by Wheelabrator. He had been involved from the early stages of planning and had gained the respect of the Committee members. He subsequently played an integral role in the negotiations between the communities and Wheelabrator.

The Committee chose Wheelabrator under sole source procurement with guarantees of receiving a fair economic benefits package. Wheelabrator proposed host community fees of \$1 per processed ton and free tipping to Millbury, guaranteed tipping fees to other participating communities that were lower than the available alternatives, and residue landfill fees to Shrewsbury. Wheelabrator drew on its past experience to gain efficiencies in the design, construction, financing, and operation of the facility. By assuming greater financial risk for the undercommitment of waste flow of the 1500 TPD project, Wheelabrator was able to capture a lucrative market share from the rapidly expanding commercial activity which resulted from the "Massachusetts Miracle." The pricing structure also reflected Wheelabrator's ability to take advantage of the

investment tax credit which can be viewed as a federal tax subsidy. When TRA 86 eliminated this subsidy, Wheelabrator was quick to respond by selling the facility to Ford Motor Credit.

In summary, the timely implementation of the project was facilitated by a combination of factors: the participating communities' commitment to resolve a common problem collectively; Wheelabrator's ability as a proven vendor to guarantee levels of service and environmental compliance; the economic benefits to their communities' through long-term, cost effective tipping fees; and the compensation package to the host communities of Millbury and Shrewsbury to mitigate the potential inconveniences its citizens.

The development of the resource recovery facility at Quonset Point, R.I. was conceived as a statewide solution to the solid waste disposal dilemma. All communities within the state were considered to be within reasonable hauling distance of Quonset Point. Although the closure of landfills limited disposal options, the Corporation could rely on the 600 acre Central Landfill as an alternative. Thus, there was not a pressing urgency to implement disposal.

As a quasi-public authority, the Corporation was vested with the responsibility of providing cost effective, reliable, long-term waste disposal. Quonset Point was the first resource recovery facility proposed, and as a result, the statewide political and environmental decision making frameworks were not

in place. Therefore, the implementation process was susceptible to citizen opposition and political debate over a range of project issues—from ownership and vendor selection to flow control and siting.

The legislators determined that public ownership and consequently, control of the facility would ensure that the Corporation's responsibilities would be met. The issue of the facility being a long-term asset also influenced the legislation enacted that mandated public ownership.

The initial proposal in 1983 for a 1500 TPD facility was sized to meet the needs of the state. The siting of a sole statewide facility drew much opposition from communities who did not want to be the depository for all the state's waste. To compound this issue, the Corporation had not offered "host community benefits" which may have diffused some opposition. Subsequent reform legislation passed in June, 1989, established siting guidelines with the intent of diminishing NIMBY opposition and control of future projects.

Ionata described the Rhode Island Department of Environmental Protection as "leaderless," in the context of awaiting final permits after five years.

When Blount, the chosen vendor, was in the negotiation process with the Corporation, its first facility was under construction. Thus, Blount's inexperience made them vulnerable when their track record and credibility were questioned with regards to a public/private consideration. Their inexperience

resulted with the state being open to consider other proposals, e.g. Westinghouse. At the time, Westinghouse, also did not have an operating facility, but they were perceived as having unlimited financial resources should problems arise. Although Westinghouse's proposal was not accepted, the recommendation of smaller regional facilities was considered and adopted. Currently, the state generates 4,000 to 4500 TPD of solid waste. The state has enacted a mandatory recycling law which has targeted 30% attainment for recyclable and 50% attainment for combustion. Hence, plans for two additional resource recovery facilities are underway.

Blount's initial proposal of a public/private partnership proposed tipping fees of \$5.50/ton (1985). This low fee reflected the benefits anticipated from investment tax credits, tax-exempt financing, lower interest rates, guaranteed flow control and economies of scale for a 1500 TPD facility. The anticipated tip fee of \$65/ton (1992) reflects the higher development, financing, and construction costs for the 710 TPD facility, which resulted from delays experienced during the implementation process when decision making frameworks were still being developed.

The Authority in the case of the Pennsauken, N.J. project undertook the planning for a regional solution prior to the enactment of state legislation that required all counties to develop and implement a solid waste management plan. The

limited life span of the existing landfill provided the impetus for the municipalities to collectively take action.

The Authority had stipulated public ownership from the outset, since they were cognizant of the long-term value of these facilities beyond the initial term of the service agreement and had procured the financing pre-TRA 86. The Authority acknowledged their inexperience in developing and operating a facility and undertook the traditional procurement process of preparing a RFQ and a RFP. Proposals from two vendors with proven track records for the design, construction and operation of the facility were considered. The selected vendor, Ogden, is one of the largest market share leaders in the resource recovery industry. At the time of consideration, the resource recovery industry had matured and the probability of technological risks was perceived as minimal.

Since the facility was sited at the existing Landfill, which is owned by the Township, the issue of siting did not play a controversial role. The project was delayed by political orchestration on a local level. Some councilmen viewed the development process as a vehicle for political advancement. Two councilmen won their seats on the anti-waste-to-energy platform, but subsequently lost them. Once the state enacted legislation and provided guidelines and a framework to develop resource recovery facilities, the project was rejuvenated.

Although, siting was not a controversial issue within the region which the facility will be served, adjacent communities

have stopped the construction by appealing the state's permitting decision to the EPA on the basis of potential leachate contamination. This may be attributable to Pennsauken acting before the statewide framework was established. The facility will service a relatively small catchment area of 9 communities. The proposed tipping fees of \$90/ton reflects the economies of scale not available for a 500 TPD facility (Table 1). A 1050 TPD facility to serve the remaining communities within the county is currently in the permitting stage of development process.

Table 1

PROJECT ECONOMICS

<u>Project</u>	<u>Capacity(TPD)</u>	<u>Capital Costs (YR)</u>	<u>Tip Fee/Ton (YR)</u>
Millbury, MA	1500	\$160 million (86)	\$24.50 (86)
Quonset, RI	710	78 million (87)	65.00 (92)
Pennsauken, NJ	500	55 million (88)	90.00 (92)

CHAPTER 5

CONCLUSIONS

The demand for responsible solutions for the solid waste disposal crisis is expanding. A critical determinant of the timeliness of response to the problem, is the nature of the emergency- the urgency with which an alternative is sought.

One of the key criterion to the successful development of a resource recovery project is the existence of a decision making framework to facilitate the implementation. The framework may be as a result of state or local legislation governing management of solid waste or of ad hoc committees created for the purpose of solving the disposal problem. With the structural framework in place, municipalities are more likely to cooperate with one another and to resolve problems on a regional basis. An example of state legislation which led to successful project implementation can be found in the State of New Jersey. In 1985, New Jersey adopted two acts which required counties and municipalities to enact specific legislation for the establishments of solid waste management districts. Among the twenty-two counties in the state, one resource recovery facility is in operation, four projects are under construction, seven are awaiting final permitting, and seven are in the preliminary planning stages.

With a structural framework in place, municipal officials can distance themselves from the political volatility of the issue. As a practical matter, municipal officials realize that

they will be held responsible for problems that occur. To gain the support and commitment of the general populace and environmentalists for resource recovery facilities, waste disposal authorities must overcome the NIMBY syndrome and ease health concerns by involving more participants in the planning processes and by justifying planning decisions with documented evidence of benefits and guaranties. Financial incentives to host communities may increase support for siting regional projects.

It's not that we won friends, it's that we didn't make enemies. You never win friends for resource recovery. You just have to demonstrate that you've minimized the unfairness (Stains, 1987).

Benjamin Miller
Director of Public Policy
New York City's Office of Resource Recovery

The trend towards municipal development and ownership of resource recovery facilities has been influenced by state and local regulations governing the management of solid waste. These regulations can determine the priorities of municipal ownership which include the assurance of environmental compliance and the control of the quality of service and of the pricing.

During the industry's infancy stage, public officials lacked the expertise necessary to develop a facility and relied heavily on private industry participation. The technological advantage of private vendors has diminished with the maturation of the resource recovery industry which further reinforces the trend toward public ownership.

Solid waste disposal isn't a technological problem, it's a political problem. Plants are like landfills if you have to locate a new landfill, you become the villain very quickly. Politically, your best decision for survival is to postpone the decision. The biggest thing is making up your mind and doing it. You can't make everybody happy (Stains, 1987).

Richard Trainor
Baltimore Director of Transportation

The Tax Reform Act of 1986 (TRA 86) reduced the economic benefits of privately owned projects through the elimination of investment tax credits and the lengthened depreciation period, which further supports the trend towards public ownership.

The successful implementation of resource recovery projects is dependent upon the skills and tools available to committed public officials involved in designing and executing the development process.

APPENDIX A

MASS BURN AND REFUSE DERIVED FUEL TECHNOLOGIES

Mass Burn technology has been in existence for over 50 years and has proven to be a reliable means for volume reduction and energy recovery from solid waste. Most of the resource recovery facilities being designed today are based largely on technology obtained by license agreements from German and Swiss companies. Mass burn technology involves the combustion of solid waste, using boilers with a waterwall enclosed radiant section to recover the heat set free by the combustion. The combustion process produces steam which, when passed through a power generation train, generates electricity.

Typically, the entire plant will be enclosed in a single building to prevent emission of odors and to effect an efficient and clean operation. Solid waste is dumped by incoming garbage trucks into a refuse pit (no prior sorting or shredding of the waste is required), the waste is transferred to the feed hopper of each furnace, the waste is then moved on horizontal grates through the furnace (Figure 1). The furnace fires the waste at temperatures exceeding 2500 °F on the horizontal grates without auxiliary fuel (except for the initial startup), air from the refuse pit area is blown in above and below the grates to assure that the waste is completely burned. The temperature is high enough to destroy many volatile organic chemicals, including some solvents and polychlorinated biphenyls. The heat from the furnace is used to heat water in a boiler above the grates to

produce steam. Steam can be used directly or can drive a turbine generator to produce electricity.

The ash that is left from the combustion process (bottom ash) is further processed to remove the remaining metal components. The resultant product can be used for a variety of concrete products, lightweight fill material, cinder blocks, gravel substitutes and aggregate for asphalt. The refuse pit is designed to hold a supply of waste for four to five days fuel capacity for plant operation with emergency capability. This ensures continuous operation over weekends and holidays when waste is not delivered.

Acid gas scrubbers, fabric filters, and electrostatic precipitators are employed in any combination to thoroughly clean flue gas emissions to meet stringent environmental regulations. Dry scrubbers will remove acid gas components (preventing acid rain), dioxin and dangerous heavy metals (such as lead). Solid particles in the flue gas exiting the spray dryer are collected by electrostatic precipitator or by a fabric filter/baghouse. The electrostatic precipitator utilizes electric forces to remove particles suspended in the gas by charging the particles and separating them from the gas by means of an electric field. A series of fabric filters, which function like immense vacuum cleaner bags, trap dust by impingement. Filter fabrics or baghouses must be cleaned after a fixed operating period. The solid particles consist of reaction products and the fly ash. The cleaned flue gas leaves

the collection device and is exhausted through the stack.

The ash collected by the pollution control devices amounts to only 5% by weight of the original waste. This fly ash is neutralized and stabilized for disposal along with the bottom ash. Future plants will mainly rely on the baghouse/scrubber air pollution control systems, which are more effective and more expensive. In addition, some planned facilities are reporting the use of nitrogen oxide removal systems.

Refuse derived fuel (RDF) technology was developed in the U.S. as an alternative to the mass burn technology. RDF technology is driven by goals of providing more efficient, more load responsive and more economical boiler facilities coupled with a capability to recycle recovered materials (Figure 2). RDF also provides flexibility to collect and process waste at one location and to incinerate the beneficiated waste at another location.

Preliminary sorting and recovery begins when the solid waste arrives at the plant. Oversized items, such as refrigerators, mattresses, etc. are removed for separate processing. Solid waste is fed by conveyor into a shredder, which reduces the average size of the refuse to three inches or less. The shredding process makes the solid waste a much more uniform and efficient fuel. Shredded waste is passed under a magnetic separator which removes 90% of the ferrous materials for recycling. The remaining 10% is removed from the ash after incineration. The shredded waste then becomes a fuel which is

blown into a specially designed boiler. Light materials, such as paper and plastic remain airborne and burn at the hottest point in the boiler (2500 °F). Heavier components drop to the bottom, where they land on slow moving grate that gives them more time to burn. The ash discharged from the bottom of the boiler is sterile, inert material amounting to only 20% of the original waste by weight.

Steam produced by the plant is passed through a turbine to drive a generator which produces electricity. A portion of the steam can be extracted to be used as process steam for neighboring industries. Air pollution controls for RDF facilities are similar to those used at mass burn facilities.

APPENDIX B

SOURCES OF CAPITAL FUNDS

The major sources of capital funds used individually or in combination to finance resource recovery facilities, are general obligation bonds, revenue bonds, industrial revenue (IDR) bonds, and private equity. The trend in planned facilities has been toward the use of IDR bonds and private equity. Public forms of financing, however, are now beginning to be used more frequently, due to recent changes in the tax code which have limited tax-exempt bond issues. The Tax Reduction Act of 1986 (TRA 86) eliminated the investment tax credit for private vendors, lengthened the period of depreciation, retained the volume cap on tax-exempt bonds, including IDR bonds, and placed new limitations on IDR bonds.

A publicly owned project can be financed with general obligation bonds or revenue bonds.

General obligation bonds are supported by the general tax revenues of a community. Financing with general obligation bonds combines the capital requirement of the project with other current municipal needs. The community pledges to collect sufficient tax revenue to meet debt service payments in a timely manner irrespective of the performance of the project for which the bond funds are used. The municipality holds an election, or referendum to determine whether or not the taxpayers support the issue. When the issue goes to referendum, the residents may be voting upon their overall impression of the local administration

as well as the specific project involved. Should the bonds gain taxpayers support, the municipality then brings the bond issue to the tax free municipal bond market. The bonds are sold on the basis of the municipality's credit rating. The municipality develops a prospectus which discusses the project, demonstrates the legality of the issue through bond counsel opinion, and demonstrates the financial responsibility of the municipality, region, or county to pay off the obligations.

Some obstacles may surface with general obligation financing. The use of general obligation bonds impedes the ability of a municipality to build additional facilities such as schools and firehouses. The municipality must carefully evaluate its capital needs when evaluating the financing options. Municipalities with marginal credit ratings may not receive financing at low interest rates through this mechanism.

Revenue bonds are supported by the revenues of the project for which the bond funds are used. The project is treated as a cost/revenue center, separate and apart from general tax revenues. On the bond market, revenue bonds are judged on the merits of the project itself. Revenue bonds do not consume any of the municipality's tax supported borrowing capacity since it stands on its own. They do not impede the ability of a community to finance other capital projects. The use of revenue bond financing requires additional scrutiny of agreements since the bondholder must be convinced that the project will earn sufficient revenue to allow for timely repayment of debt.

Industrial development bonds are those bonds in which the revenue from private users constitutes more than 15% of the total revenue securing the bonds. Industrial development revenue bond financing has become less attractive as a means of project financing because of the cap placed on funds available to states per capita, as well as limits placed on tax exemptions for certain aspects of the project.

Project financing relies only on the revenues generated by the facility for payment of debt service. The revenues that can be derived from the sale of energy is large relative to the revenues received from tipping fees paid at the gate. Therefore, except where the energy purchaser, is, itself a tax exempt entity, the likelihood that the private user percentage will be exceeded is great. A municipality can avoid having its resource recovery financing declared IDR by owning the facility, by adopting a system revenue approach whereby collection, disposal, and energy revenues all support system bonds, or by selling the energy derived from the facility to a tax exempt user if possible.

The key element of a system based revenue bond financing is that the municipality would assume responsibility for all disposal activities in its region. A system financing would provide for on-going disposal operations and revenue flows, regardless of interruption of operations to any component of the system.

The municipality establishes user fees to generate

sufficient revenues to cover the cost of operating and maintaining all the components of the solid waste management system. The municipality pledges the entire revenue stream from its solid waste collection, disposal, and energy production activities to the payment of principal, premium, and interest on bonds issued for the entire capital needs of the system. Along with the revenue pledge is a covenant to raise rates to satisfy certain predetermined debt service coverage requirements.

A privately owned facility can be financed with a combination of debt and equity. In return for its financial commitment to the project, the project owner becomes eligible for certain federal tax benefits which enhance the return on its investment and reduce the overall cost of the project. In the private ownership case, the facility stands alone as a cost/revenue center and the revenue bond is the appropriate debt instrument to be used in raising all the capital which is not contributed in the form of an equity investment.

The bond rating agencies may require put or pay contracts, annual residential disposal assessments or general obligation pledges as the basic form of security for bondholders depending on the strength of the local waste flow control ordinances.

The combination of equity and debt is largely a factor of ownership and municipal requirements. Creditworthiness, project economics, the sponsor's preference, availability of tax benefits and availability of state industrial development bond volume cap also affect the financing available.

Other financing options include: partial federal or state grant; current revenues; carry over fund balances; low interest loans; and tax-exempt leases. The municipality can also subsidize solid waste disposal through investment credits; lowered interest rates on capital investments; tax breaks; unrestricted monetary allocations; restricted or earmarked allocations; matching funds, use of materials, equipment or personnel; and use of land and capital facilities.

APPENDIX C

INTERVIEW PROTOCOL

1. What motivated you to undertake the development of a resource recovery facility?
2. Who initiated the need for the facility?
3. How did you determine the valuateive process?
4. What were your objectives?
5. What benefits do you receive?
6. Who bears the risks of unexpected failures?
7. What common issues or concerns surfaced?
8. How do you monitor the facility's performance, technically and financially?
9. How does the form of ownership affect the existing financial structure?
10. Does the facility meet the capital needs of the area served?
11. Will the facility meet the future needs of the area?
12. How do you ensure that it does or will?
13. Does revenue sharing exist?
14. How was revenue sharing determined?
15. What type of procurement process was used? Why?
16. Does the public need control?
17. If so, control of what issues?
18. Is the public protected from price gouging?
19. Are you satisfied with your decisions?
20. What insights can you share with others who plan to develop a facility?

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