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INNOVATIVE FINANCING PLANS FOR
PRIVATELY OWNED WASTE-TO-ENERGY FACILITIES

VOLUME I: FINANCIAL OPTIONS
AND ANALYSES

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ENERGY TASK FORCE
OF THE URBAN CONSORTIUM

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COUNTY OF SAN DIEGO

Tom Hamilton, Chairman
County Board of Supervisors

Clifford W. Graves
Chief Administrative Officer

Conducted by:

Office of Special Projects
Nicole A. Clay, CAO Project Manager

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PREFACE

The Urban Consortium for Technology Initiatives was formed to pursue technological solutions to pressing urban problems. The Urban Consortium conducts its work program under the guidance of Task Forces structured according to the functions and concerns of local governments. The Energy Task Force, with a membership of municipal managers and technical professionals from nineteen Consortium jurisdictions, has sponsored over ninety energy management and technology projects in thirty-two Consortium member jurisdictions since 1978.

To develop in-house energy expertise, individual projects sponsored by the Task Force are managed and conducted by the staff of participating city and county governments. Projects with similar subjects are organized into "units" of four to five projects each, with each unit managed by a selected Task Force member. A description of the units and projects included in the Fifth Year (1983-1984) Energy Task Force Program follows:

UNIT -- MUNICIPAL OPERATIONS

Energy used to support public facilities and services by the nation's local governments in 1983 totaled approximately 1.4 quadrillion BTU's. By focusing on applied research to improve energy efficiency in municipal operations, the Energy Task Force helps reduce operating costs without increasing tax burdens on residents and commercial establishments. This Fifth Year unit consisted of five projects:

- Albuquerque, New Mexico - "Analysis of Municipal Bus Operations for the Advancement of Fuel Cell Technology"
- Baltimore, Maryland - "The Hydrate Process for Sewage Sludge Dewatering: Commercialization Assessment"
- Memphis, Tennessee - "Application of Mini-van Technology to Van Pool Services"
- Phoenix, Arizona - "Capacity Optimization of Hydronic Flows: Energy Savings in HVAC Systems"
- Washington, DC - "Facilities Energy Monitoring System: Application in a Large Municipal Government"

UNIT -- MUNICIPAL AND COMMUNITY ENERGY MANAGEMENT

Of the nation's estimated population of 232 million, approximately 60 percent reside or work in urbanized areas. The 543 cities and counties that contain populations greater than 100,000 consumed a total of 49 quadrillion BTU's in 1983. Applied research sponsored by the Energy Task Force helps improve the economic vitality of this urban community by aiding energy efficiency and reducing energy costs for public services and the community as a whole. This Fifth Year unit consisted of five projects:

- Boston, Massachusetts - "Computer-based Preventive Maintenance"
- Cleveland, Ohio - "Coordinating Preventive Maintenance with Energy Management"
- Columbus, Ohio - "Budgetary Incentives for Municipal Energy Management"

- Denver, Colorado - "Municipal Recycling Programs: Potential for Waste Management and Energy Savings"
- Philadelphia, Pennsylvania - "Energy Assistance Program Information System (EAPIS): Coordinating Residential Assistance Programs"

UNIT -- ALTERNATE/INTEGRATED SYSTEMS

Effective use of advanced energy technology and integrated energy systems in urban areas could save from 4 to 8 quadrillion BTU's during the next two decades. Urban governments can aid the realization of these savings and improve capabilities for the use of alternative energy resources by serving as test beds for the practical application of new and integrated technologies. This Fifth Year unit consisted of five projects:

- Chicago, Illinois - "Implementation Methods for an Integrated Energy System"
- Houston, Texas - "Pricing, Regulation and Competition in Cogeneration: A Method for Comprehensive Risk Analysis"
- New York, New York - "Feasibility of Water-based District Heating and Cooling"
- San Antonio, Texas - "Central Energy Systems Application to Economic Development"
- San Francisco, California - "On-site Cogeneration for Office Buildings"

UNIT -- PUBLIC/PRIVATE FINACING AND IMPLEMENTATION

City and county governments often have difficulty in carrying out otherwise sound energy efficiency or alternative energy projects due to constraints in the acquisition of initial investment capital. Many of these investment constraints can be overcome by providing means for private sector participation in innovative financing and financial management strategies. This Fifth Year unit consisted of five projects:

- Hennepin County, Minnesota - "Shared Savings in the Residential Market: Financing Single Family Energy Conservation"
- Kansas City, Missouri - "Street Light Inventory and Maintenance System"
- Pittsburgh, Pennsylvania - "Shared Savings for Energy Conservation: A Model Process for Local Governments"
- Saint Louis, Missouri - "A Development Strategy for Superinsulated Housing"
- San Diego County, California - "Innovative Financing for a Privately Owned Waste-to-Energy Facility"

Reports from each of these projects are specifically designed to aid the transfer of proven experience to other local governments. Readers interested in obtaining any of these reports or further information about the Energy Task Force and the Urban Consortium should contact:

Energy Program
Public Technology, Inc.
1301 Pennsylvania Avenue, NW
Washington, DC 20004

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Finally, the SANDER staff dedicates this report to County Supervisor Tom Hamilton and gratefully acknowledges his support. Perhaps more than any other person, he has been at the forefront of the major regional issue of waste management in San Diego. Supervisor Hamilton has given his leadership and guidance to the SANDER Authority Board of Directors for more than seven years. Supervisor Hamilton's wit and wisdom has been much appreciated by all who are privileged to work with him.

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CHAPTER 1 - OVERVIEW

EXECUTIVE SUMMARY

Communities throughout the United States are looking for economically and environmentally acceptable waste disposal methods. Waste-to-energy or resource recovery offers communities an excellent alternative. Resource recovery is capital intensive and costs for large scale projects can be in the \$150-250 million dollar range. This can be a difficult financial commitment for most local governments.

Private ownership combined with any one of a variety of financial mechanisms may offer a solution to communities that are concerned with solid waste management, but which do not have the ability to assume full financial responsibility for these very high capital costs.

The San Diego Energy Recovery Project (SANDER) analyzed several financing options as part of the procurement and contract negotiation process for a large waste-to-energy facility. This report discusses public and private options and the risks, tax implications, advantages and disadvantages of the various options. The report discusses in detail the financing options considered by the SANDER Project planners.

Early in the proposal evaluation and contract negotiation phases, project staff found that a computer program capable of fast and accurate calculation was needed. The proposals received had widely differing financing plans and base assumptions. Comparing these was a time consuming task. Once contract negotiations began, changes in one base assumption (i.e., interest rates or corporate rate of return) required recalculation to ascertain the impact on project economics.

The computer model that was developed as a part of this project had to be comprehensive yet portable and transferrable to other agencies. A Kaypro portable computer was chosen for the hardware and Perfect Calc

from Perfect Software, Inc. was chosen as the software; this model is also compatible with the IBM-PC. Five files were created with this package which provides space for more than 200 independent input variables. Volume II of this report is a step-by-step review of the model and its capabilities.

One of the most useful aspects of the Model is the understanding the user will develop about a local project from gathering the data for input into the Model. This is especially true for the corporate ledger spreadsheet portion of the Model. The user has the opportunity to see the project's economics from the private company's perspective. This provides a strong position for the public agency at the negotiating table.

The Model will prove very useful to any community in the early stages of the resource recovery procurement process. During contract negotiations, the ability of the computer to do sensitivity analysis will provide an up-to-the-minute view of the local agency's economic position on any change offered by a proposer. Finding the financing option which works best in meeting the community's needs will be enhanced by using the Model.

PROJECT PURPOSE

The primary objective of this project is to focus on innovative financing for large public purpose projects such as the Sander facility. The focus of this report is on financing a waste-to-energy project, however the information gathered will be useful to many other types of projects.

The concept behind this project is that various financing options and plans are available to local government. Public ownership may be most familiar to local government planners. Today, however, tax law allows cash benefits to tax paying corporations for certain types of projects. These tax benefits are so substantial that private firms are

often willing to share a portion of these benefits with project proponents. In the case of public purpose projects this sharing of tax benefits may reduce the cost of the project below that of a publicly owned project.

This report examines the variety of factors to be analyzed prior to concluding a financing plan. For instance, a public entity should be concerned with the project risks and their assignment between an agency and a corporation. An agency must understand the tax benefits available in order to understand their impact on project economics.

Research in this project focused on the factors relative to structuring and comparing various innovative financing plans. A computer model was designed to aid public agencies in evaluating bonding requirements, construction and operations costs, energy revenue, interest costs, tax benefits and effects of inflation on costs.

REPORT ORGANIZATION

SANDER Project staff felt strongly that understanding each facet of the economics of a waste-to-energy project was necessary to the successful structuring of the financing plan. Volume I of this Urban Consortium, Energy Task Force project is organized as follows:

Chapter 2 - presents an overview of waste-to-energy technologies, SANDER Project history and five key project planning decisions.

Chapter 3 - discusses ownership and financing options including those options proposed in San Diego. This chapter introduces the computer Model as a tool for financial analysis.

Chapter 4 - presents a financing case study detailing public vs private ownership, special credit vs equity and the SANDER financing decision.

Chapter 5 - provides a summary of the computer Model and its uses.

Appendices: contains the base case used for financial analysis in the SANDER case study as well as a summary of existing waste-to-energy facilities noting their financing arrangements.

CHAPTER 2 - SAN DIEGO ENERGY RECOVERY PROJECT

WASTE-TO-ENERGY TECHNOLOGIES

In the literature, focus is placed on four major resource recovery technologies used to recover energy from municipal solid waste (MSW):

- pyrolysis
- refuse derived fuel
- mass burning
- modular system

Of the four, mass burning is currently the most widely and successfully used technology. The pyrolysis technology is considered experimental at this time, while refuse derived fuel technologies have had mixed success. Modular systems are becoming more widely used in less populated communities since they are primarily useful where smaller systems are adequate for waste disposal. Also, mass-burning systems are generally unable to compete at these smaller scales. Each of these technologies is described briefly below.

Pyrolysis

In the pyrolysis process, organic materials are heated in the absence of oxygen producing a gaseous or liquid product and a carbonaceous char residue. This technology usually includes front end processing equipment capable of removing metals, glass and aluminum. The remaining organic materials are shredded prior to pyrolysis.

Fuel resulting from the pyrolysis technology can be stored, burned on site or transported. Pyrolysis systems may produce less air pollution problems as the process is a closed system. Pyrolysis has been used for centuries to produce coke and charcoal from wood; however, the experience with solid waste has not met with great success at a commercial scale. The County of San Diego participated with the Environmental Protection Agency (EPA) and Occidental Petroleum to build

a pyrolysis system to demonstrate the technical and economic feasibility of an Occidental design. It never worked according to specifications and was dismantled in 1983. The City of Baltimore worked with EPA and Monsanto to construct Monsanto's Languard system; this too failed to operate to expectations.

Refuse Derived Fuel

Refuse derived fuel (RDF) systems may include a variety of different equipment, however several characteristics are common to this type of facility:

- size reduction or shredding
- screening
- air classification
- magnetic separation

RDF processing results in a fuel which has most non-burnable materials removed from the raw MSW. The product has a relatively high heating value and in some cases can be stored or transported. Some RDF plants have removed glass, metal and aluminum. Projects utilizing RDF have experienced a variety of technical problems. The separation equipment often has not worked to desired specifications causing extended downtime. In most cases, RDF cofired in coal fired boilers has resulted in more abrasion and corrosive problems than anticipated.

Mass Burning

The third and most widely used technology is mass burning or mass combustion. Systems employing this technology burn solid waste without any pre-processing. Waste is fed into a furnace with a specially designed grate in an as-received condition with only oversized or bulky pieces removed. The steam produced in a boiler following the furnace is exported to nearby steam customers or sent to a turbine generator to produce electricity for subsequent sale to a utility or use in the plant.

Mass burning plants have been operating in Europe and Japan for many years. In the United States large scale mass burning plants are now in operation and under construction in Florida, Massachusetts, New York and Maryland.

Modular Systems

These systems usually consist of a series of relatively small furnaces and boilers that are generally fabricated at the supplier's plant then joined to a separate heat recovery section on site. One or more modular units can be operated in parallel to achieve the facility size needed for a community's particular waste disposal needs. Many systems are designed with two combustion units processing up to 300 tons per day of MSW. Energy recovery is limited relative to the other systems and costs are usually higher per ton of waste processed than the other systems.

SAN DIEGO ENERGY RECOVERY PROJECT HISTORY

In the late 1970's the California Waste Management Board drew attention to the growing landfill crisis and the rising cost of refuse disposal in the state. Feasibility studies funded by the state identified six potential state-wide areas for development of resource recovery projects. One of those areas was the City of San Diego. As the state-designated agency for solid waste planning and management, the County of San Diego joined the City in forming the San Diego Energy Recovery (SANDER) Project Task Force. In 1979, the Task Force issued a request for information and qualifications to the resource recovery industry to see if companies were interested in designing, constructing, operating and possibly financing a facility in San Diego. Four companies were prequalified to receive a request for proposal through this process. The four firms had extensive construction and operation experience and all were companies capable of owning or assisting in financing the project.

A joint powers authority, the SANDER Authority, was established in 1981 to formalize the development process. The Authority's Board of Directors consists of two members of the San Diego City Council and two members of the County Board of Supervisors. Top City and County officials form the management team with SANDER staff composed of County employees, who provide support to the Authority. The costs for staff as well as the services of experts in finance, environmental report writing, tax and bond counsel services and technical/management support are funded by City and County general fund budgets. A citizen's committee was formed in 1982 to assist the Authority and staff in various project planning areas.

In June 1982, the Authority issued a request for proposal to the four prequalified firms. After extensive evaluation, the two firms offering proposals were ranked and contract negotiations began with the top ranked firm.

Contract negotiations require the full support of all parties concerned. The lead negotiator, acting on behalf of the Authority, is San Diego Assistant City Attorney. Top County and City managers form a management committee who confers with the negotiating team regularly on negotiation developments. SANDER staff and several experts including the technical consultant, financial advisor and tax and bond counsel make up the Authority's negotiating team.

The company went through a corporate merger during the first 12 months of negotiations. This caused delays because of changes in personnel. The company's negotiating team consists of financial, technical and marketing people and the firm's lawyers. The company's lead negotiator is the president of the division responsible for waste-to-energy development.

The Authority's Board approved enlarging the SANDER facility from a two boiler mass burn plant capable of processing 1,500 tons of MSW per day, to a three boiler plant capable of processing 2,250 tons of MSW

daily. The maximum net power output of the plant also increased from 36 to more than 50 megawatts. California law requires facilities producing 50 megawatts or more to utilize the California Energy Commission's (CEC) siting process for thermal power plants. The CEC, upon receipt of an application from the prospective resource recovery facility owner, will analyze technical and environmental issues and specify mitigations and conditions prior to project approval. The CEC process (a "one-stop permit procedure" approximately 12 months in duration) encompasses and replaces the local and state permitting process.

The SANDER plant will be located adjacent to the City's only remaining landfill. Negotiations are underway with the United States Navy, the present property owner, to acquire the site in a land exchange. Federal legislation and voter approval allowing the exchange have been completed.

Financing and issuance of industrial development revenue bonds is scheduled for 1986. Facility operation should be fully underway in 1989.

KEY PLANNING DECISIONS

A multitude of decisions and initiatives are made by project proponents before a waste-to-energy project is up and operating. Five of these are particularly important to the success of a project:

- Site
- Waste Control
- Energy Customer Sales
- Environmental Controls
- Financing

Site

Siting a facility to dispose of municipal solid waste is difficult at best. Many activist citizens do not want a facility in their

"immediate" community and getting a definition of "immediate" is sometimes an exercise in futility. Planners should focus on objective siting criteria such as:

- size and topography of property
- freeway access to minimize traffic impacts to surface streets
- surrounding land use
- distance from the center of the waste generation area

Planners also must consider less objective criteria such as:

- history of the community
- distance of proposed facility from residential areas
- political support from elected officials representing the area

The SANDER Project has had several alternative sites. Community and elected officials have prevented use of all but one site. The selection of the current site, located adjacent to the city landfill, has proved to be the best siting decision. Early involvement with community activists and planning groups is important to successfully siting a plant.

Waste Control

The plant can not operate efficiently or effectively unless a firm supply of municipal solid waste is assured. Sizing the plant is an important design consideration. If the plant has more capacity than waste available, the facility will be inefficient and revenues will not be sufficient to cover costs. Conversely, an underdesigned facility will be prematurely obsolete and will present the community with the continuing problem of inadequate waste disposal capacity.

Another very important aspect of waste control is the issue of recycling. The recycling industry, particularly recycled paper com-

panies, perceive these plants as a potential threat to their source of material. This is especially true when the facility's processing capacity is larger than the quantity of waste available. Sizing of the facility should take into account current and projected recycling activities. Some materials are more valuable when reused and recycled than when burned.

Early review of local and state regulations regarding waste control is necessary. If the facility is economically competitive with landfills and the community has permit or franchise arrangements with private haulers, waste control can be a relatively easy issue to solve. To assure the quantity of waste required, project proponents should have signed agreements with private and public entities guaranteeing to deliver waste or pay for their shortfalls.

A single entity, the City of San Diego, will provide the waste required for the Sander Project. A portion of the City's waste has been set aside for current and anticipated recycling activities in San Diego.

Energy Sales

Waste-to-energy facilities are capital intensive and expensive to operate. Energy produced by the facility is the major source of revenue. It is essential that a customer for the power be identified early and the value of the energy be well known to assure the economic viability of the facility.

Federal law in the form of the Public Utility Regulatory Policies Act (PURPA) and many state utility commissions have provided guidelines for setting electrical rates, contract conditions, and access to utility company records. This will help planners to realistically project the expected revenues from the sale of electricity.

The energy customer(s) must be able to sign a long-term contract and take all the power produced. Utility and rate experts are useful in

assisting project planners in this phase. If a steam customer is nearby it may provide another alternative for energy sales.

SANDER's owners plan to sign a long-term power sales contract with the local utility. There is a possibility that a steam customer may be available in the planned industrial area adjacent to the facility. If both steam and electricity can be sold, the overall energy efficiency of the plant would increase as well as its revenues.

Environmental Controls

An aspect of project development that receives much community attention is the environmental effect of the facility. This attention is concentrated in two areas - ash disposal and air emissions. Much study of these areas has been done, particularly in California.

Interestingly enough, ash disposal for most projects outside of California is not a problem. In California, ash has been historically treated as a special waste. Also in California, the regulatory agency for hazardous waste disposal has developed a toxicity test that is very stringent. Recently these test conditions have been changed to more nearly mirror the Environmental Protection Agency's toxicity test. Recent legislation has also been enacted in California to simplify the procedure for obtaining and maintaining exemptions from the designation of ash as a hazardous or special waste.

Air emissions from resource recovery facilities are very controversial at this time. Part of this is due to advances in the field of analytic chemistry. Minute concentration of a variety of substances are now detectable. The problem is to determine what effect, if any, these minute concentrations have on the environment.

Generally, the air regulatory agencies, and sometimes the local citizens, are satisfied if sufficient study is done and if best available air pollution control equipment is installed. The SANDER Project

will install a fabric filter baghouse and acid gas scrubbing equipment to ensure compliance with current air emission regulations.

Financing

Financing is one of the most important decisions made during the project planning process. The project planners should develop a clear understanding of the range of financing options available. The type of financial option chosen affects the project in several areas:

- project economics
- ownership
- structure of risk taking
- contract terms and conditions

A well structured project with a financially strong owner, either public or private, will help assure a good bond rating. Bond rating agencies look carefully at the choice of technology, waste supply, energy contracts and guarantees offered by all parties in the financing. A good rating can lower debt service costs and help assure a timely bond sale.

Project planners should perform analyses on all financing options being considered to determine project economics. For most projects the bottom line is the cost to the community to dispose of the refuse - the tipping fee. The total financing cost must be used to determine project economics. Total costs include:

- capital cost - monies to construct the physical facility
- capitalized interest - monies to pay interest on the bonds through construction
- debt service reserve - monies to pay a minimum of one year's interest and principal payments
- contingency - monies set aside to pay unforeseen project costs. (usually 5-6% of the capital cost)

- ° issuance cost - monies to pay underwriters and bond counsel, and miscellaneous costs required to issue bonds (usually 3-4% of the bond issue)

This report focuses on the financing element as an integral part of the process for waste-to-energy facility implementation. It uses the SANDER experience to highlight the advantages of a public agency staff that possesses the analytical capabilities to negotiate a financing "Plan" with a private corporation.

CHAPTER 3 - FINANCING DECISIONS

PUBLIC AND PRIVATE ROLES

Typically, waste disposal and control of waste flow is a government function which at its most basic level is a health and safety issue. Improper handling of non-hazardous waste can threaten the safety of residents living near landfills because of methane gas migration. Leachate produced by poorly designed or operated landfills can threaten drinking water supplies.

Because government has the responsibility for waste handling and controls waste flow, resource recovery projects are often a partnership between a community and a private entity. Government often provides early planning, permitting, and site acquisition support for a waste-to-energy facility. On the other hand a private company will usually provide technical know-how, construction and operation expertise and perhaps equity. The two entities are commonly tied by long-term service agreements for disposal which specify the sharing of certain project related risks.

In the financing of a resource recovery facility however, ownership can be either public or private. The decision as to private or public ownership delineates the type of financing options available. The type of financing chosen strongly impacts the economics of the project. The community's risk taking ability, bond rates, the corporation's willingness to share tax benefits and the type of tax exempt bonds that are available are some of the factors to be considered before making the final decision on financing.

In planning a resource recovery project a community should answer three primary questions before making an ownership decision:

1. Which ownership/financing options are available for a major resource recovery facility?
2. What risks to the agency are associated with each ownership/financing option?
3. Which ownership/financing option has the potential for the greatest benefit to the community in terms of risk minimization and lowest tip fees?

Assessing the Risks

Even before defining the types of available ownership and financing options the community should realize that all projects have inherent risk elements. Understanding the various risks and knowing what position your community will take on various risks is necessary before contract negotiations begin and the financing structure is determined. Each ownership/financing option will deal with these risks in differing fashions.

Risk taking, as used in a resource recovery project and any other business deal, means accepting the obligation to set right or repair a problem with the project or make monetary payments to compensate others for their loss as a result of the problem. Risks can be standard, such as fire or theft or specific to resource recovery, such as making up revenue shortfalls if waste deliveries fall below expectations.

A partial list of risks that should be considered are:

Construction and Operating Risks

- cost overruns
- delays in completion
- noncompletion of facility
- inability to meet guaranteed performance levels

- unanticipated shut-downs of facility
- operating cost increases beyond anticipated levels
- energy product prices below projected levels
- strikes
- equipment shortages

Waste Supply Risks

- inability to secure and maintain the amount of waste required to meet the design performance levels of the project
- loss of landfill for back-up disposal of waste and disposal of residue
- changes in the composition of the waste stream (heating value increasing or decreasing)

Force majeure (uncontrollable circumstances)

- civil disruption
- natural disasters

Change in law

- tax
- environmental

In structuring the financing for a waste-to-energy project the various risks must be assigned to one or more of the parties to the financing. Bond rating agencies and bond buyers will look carefully at the financing to assure themselves that risks are covered. Accepting the responsibility for risks means the party will pay or correct the problem in the event something happens. The assignment of risk is an important part of contract negotiations as the contract is the document where the parties formalize their responsibilities.

PUBLIC OWNERSHIP AND FINANCING

Ownership options can be generally of three types: (1) public ownership; (2) private ownership; or (3) some combination of public/private

ownership. Each of these ownership types is discussed below with brief summaries of their advantages and disadvantages.

In public ownership financing the public entity assumes most of the risks, primarily in the area of raising funds if shortfalls occur or repair and replacements as needed. The public entity can, however, require firm guarantees by the designer/constructor of the facility to assure a completed facility. The public entity can also require performance guarantees by the construction company and operator to cover risks in the areas of technical performance. Put-or-pay waste delivery contracts will protect the public owner against a shortfall of the facility's fuel supply.

A long-term energy contract with a price floor assists in stabilizing the revenue source. Insurance can be obtained to cover many of the remaining risk areas.

Public Ownership Financing Mechanisms

Public financing generally can be placed in three categories:

1. General Obligation Bonds
2. Revenue Bonds
3. Lease arrangements with sub-categories:
 - lease revenue bonds
 - leveraged lease financing
 - certificates of participation

General Obligation Bonds

General Obligation bonds for resource recovery projects in California are an unrealistic means of financing. In California, this type of financing requires 2/3 voter approval which may be impossible to obtain for new and somewhat controversial projects, such as resource recovery.

Revenue Bonds

Revenue bonds are a common financing vehicle. Problems associated with revenue bonds are the potential for lower than anticipated revenues that may jeopardize debt service payments unless other government revenues can be pledged. In many cases voter approval and debt ceilings limit the usefulness of revenue bond financing.

Lease Revenue Bond

Lease revenue bonds utilizing a non-profit corporation or joint powers authority issuing tax-exempt bonds are a popular public financing vehicle. The advantages in using these bonds are:

- no interest rate limitation
- no referendum requirement
- a temporary period allowing for investment of funds offsetting rates of return

Often lease revenue bonds are not exempt from California income tax, which may result in higher interest rates.

Leverage Lease

Leverage lease financing has gained popularity in recent years with government utilities. The benefit of this financing is the equity provided by a tax-oriented third party which reduces the amount of bonds issued. A discussion of this financing follows under private ownership options.

Certificates of Participation

This financing mechanism is gaining in popularity. A public entity issues tax exempt bonds directly without competitive sale requirements, debt limits or vote of the people. The certificates are issued by a trustee bank and the funds are used to purchase equipment which will be operated to generate the revenues to cover debt service. No large scale resource recovery projects have utilized this method to date, however in

1982 a small project in Lassen County, California used certificates of participation.

Public Ownership: Advantages

1. Facility is exempted from state and federal income taxes and property taxes
2. Direct control of the project rests with the public entity
3. All revenues accrue to the public
4. At the end of the financing period for the bonds the government entity owns the plant and maintains control of tipping fees

Public Ownership: Disadvantages

1. Nearly all risks of ownership must be assumed by the community
2. Government entity cannot take advantage of tax benefits to reduce tip fee costs
3. Public entity may not have expertise or experience in some areas such as energy contracts, the marketing of secondary materials and operations of large scale facilities

PRIVATE OWNERSHIP AND FINANCING

The private owner, depending on the corporation and the stature of their proposed deal, may assume the risk (and most of the return) under a private ownership/financing arrangement. The owner covers facility risks by requiring performance guarantees from suppliers and subcontractors. The owner signs a long-term service or disposal agreement with the surrounding communities for waste disposal to assure waste flow to the plant. It is common, however, to find the risk of force majeure and change in environmental law shared by the private owner and the community. Insurance is usually obtained to cover a variety of other risks.

Determining Ownership

Private business can take advantage of several tax benefits not available to government entities. The form and structure of the financing is

particularly important to assure that the private company can take advantage of the tax benefits. If a company has little or no income tax liability to apply against the tax credits and deductions the form of ownership may be structured as a partnership, trust or corporation. The participants would be one or more companies having income tax liability and the resulting need for offsetting tax benefits.

In order to qualify for the tax benefits the contractual and financial arrangement must include such indicators of company ownership as:

- legal title to the facility
- capital investment
- financial benefits from project operation
- risk of loss through damage, etc.
- obligation to pay costs associated with the operating facility

Tax Benefits

Tax exempt bonds. Solid waste facilities are considered exempt facilities under the 1984 Federal Internal Revenue Code. If 90% of the bond proceeds are used to finance qualifying facilities for solid waste disposal the interest paid on the bonds is tax exempt. If the power is sold to a utility providing local electrical service (two or less counties) then the interest on bonds issued to finance facilities used to generate the power may also qualify for tax exempt status. Interest rates on tax exempt bonds are usually 200-300 basis points less than taxable bond rates thus saving considerable cost to the project developer and ultimately the facility user. Industrial Development Bonds (IDB) as a project or revenue financing vehicle are issued by public entities for the benefit of private companies and the interest on the bonds is tax exempt only if the proceeds are used for qualifying purposes as defined above.

Interest Expense Deductions. The Internal Revenue Code allows deductions from taxable income for interest expenses other than certain construction period interest. These deductions are especially significant in the case of a private owner of a waste-to-energy facility with substantial debt financing.

Investment Tax Credit. An investment tax credit (ITC) of up to 10% is allowed on investments of privately owned equipment and machinery (personal property) and are generally taken during the first year of operations. This is a substantial tax benefit. For example, on a resource recovery plant with \$200 million in qualifying equipment and machinery the private owner can realize a \$20 million investment tax credit spread through the construction period. Under Section 38 of the Internal Revenue Code, the ITC is generally available if the equipment and machinery:

- ° are depreciable property
- ° are either (i) tangible personal property, or (ii) tangible property used as an integral part of manufacturing, production or extracting, or of furnishing transportation, communications, electrical energy, gas, water or sewage services.

During SANDER Project negotiations it was estimated that 95% of the project cost would be eligible for the ITC.

Depreciation. The 1981 Economic Recovery Tax Act (ERTA) provided for an accelerated method of cost recovery which can be used in lieu of the standard straight line depreciation method. The depreciation allowance acknowledges the fact that the facility owner needs to recover the capital investment in the facility over the useful life of the facility.

The accelerated cost recovery system or ACRS allowed for the depreciation of most of the relevant capital assets over a period

of five years. This offers significant deductions from taxable income during the initial operational phase of a project.

The 1984 Deficit Reduction Act (DRA) made significant changes to the ACRS depreciation method for facilities financed with industrial development bonds, however only one change affected resource recovery projects. The depreciation schedule uses the same ACRS period, however the calculation is straight line rather than accelerated. The total amount available to be applied to the owner's income remained the same.

DEPRECIATION SCHEDULE (% per year)

<u>Year</u>	<u>Subsequent to 1981 ERTA and Prior to 1984 DRA</u>	<u>Current</u>
1	15%	10%
2	22%	20%
3	21%	20%
4	21%	20%
5	21%	20%
6	0	10%

Private Ownership Financing Mechanisms

There are three financing mechanisms used for private ownership:

- ° equity
- ° leveraged lease
- ° industrial development bonds

Equity. Under private ownership both taxable and tax exempt financing can be utilized. A company could issue taxable corporate bonds but the amount of debt required for large projects (\$100-200 million) and the high return on investment required by most corporate management makes this option unattractive for most projects.

Leveraged Lease. The leveraged lease is by far the most complicated financing arrangement. It requires a third party tax paying entity to own the facility in order to take advantage of tax benefits (e.g., investment tax credit, depreciation and interest deduction). The amount of debt incurred for financing the facility and indirectly paid for by the public entity is thereby reduced by the monies invested by the third party in return for the ownership of the facility.

One of the complicating factors for this type of financing is the need to establish an operating entity to separate the third party owner from directly leasing the facility to a government entity. The investment tax credit could be jeopardized if the project violates the "government use" rule of the Internal Revenue Code.

This financing method is limited by the level of sophistication required to structure it. Government entities need special counsel to assist them in putting such a deal together. Because of time delays complicated financing arrangements may cost more than they save.

Industrial Development Bond. Industrial Development Bond (IDB) financing as mentioned previously is another mechanism used extensively to finance resource recovery projects. This requires a public entity to issue tax exempt bonds on behalf of a private company. The company invests its own funds in the project (usually 20% of the required amounts) called equity participation. The remaining funds are raised by bonds secured by the project revenues and public or corporate guarantees. The attractiveness of this mechanism are:

- ° lower interest rates than taxable bonds
- ° tax benefits available to private entity

The Deficit Reduction Act of 1984 restricts the use of IDB's for many uses. Resource recovery projects, however, were exempted from the most restrictive provisions. The one area where resource recovery IDB's are affected is the state cap on the total amount of bonds which may be issued. As a result of the 1984 legislation, each state is restricted to annually issuing either the greater of \$150 per capita of the population, or \$200 million in bonds. In 1986 the cap drops to \$100 per capita. In New York and California, states with large populations, this restriction may not be a problem. In less populous states with several resource recovery projects or other eligible projects in the planning stages, attention will have to be paid to timing the bond issues so as not to exceed the cap.

Private Ownership Advantages

1. The private owner often may assume the majority of the business and operational risks.
2. The private owner can take advantage of tax benefits such as depreciation and investment tax credits, possibly passing some of these through to reduce tipping fees to facility users.
3. Private owners often contribute 20% of the funds required in order to take advantage of tax laws thus reducing the amount of debt financing and increasing their level of commitment to the project.

Private Ownership Disadvantages

1. The public loses direct control of a public service.
2. Profits may take precedence over community service.
3. The loss of ownership means loss of monetary rewards, particularly when the financing period for the bonds is over.
4. A private company may not receive highest bond rating which translates into higher interest rate and debt service costs.

5. At the end of the contract period, the community would have to purchase the facility at fair market value if it wanted to assume ownership at that time.

PUBLIC/PRIVATE INNOVATION

Private companies demand a high return on the investment of their funds. Equity participation may, therefore, prove costly to the project. The bottom line for most communities is the cost per ton of waste disposed that is charged to the facility's user. Thus financing plans which lower that cost are very important to consider.

One of the proposals submitted on the SANDER Project included an innovative 3-part plan to address the early year tip fee costs. The first part of the proposal provided annual payments over a 20 year period rather than an up front equity participation. The firm would return a portion of the tax benefits realized from private ownership in the form of an annual special credit to the public entity. The amount of the special credit would be dependent on the total project cost. The special credit would be viewed as additional revenue in that it would be treated as an offset to the operating and maintenance fee.

Secondly, the company proposed a combination of taxable and tax exempt debt. The taxable debt went into a revenue stabilization fund. The monies in this fund would pay a portion of the debt service costs over a 5-7 year period until all the monies in the fund had been expended.

Finally, the company proposed that no principal repayments would be made on outstanding debt until the stabilization fund had been exhausted. Interest-only payments would be made on all taxable and tax exempt debt during the initial 5-7 year period. During the mid-years, say years 6-12, scheduled payments were to be made against the taxable debt principal. During this same period interest-only payments would continue on the tax exempt debt. After taxable debt is retired and

continuing through the 20th and final year of the financing, scheduled payments are made against the tax exempt debt. The scheduled payments are not level, or even near level, but rather accelerate in amount with each passing year. The basis of this idea is that these accelerating payments would be offset by accelerating energy revenues.

The company would assume risks associated with performance and operation. The Authority was expected to assume some risk in the area of tax law. For example, if all or part of the innovative financing received an unfavorable ruling from the corporation's tax counsel the annual special credit which is tied to available tax benefits would be reduced. The Authority could experience higher per ton disposal costs if this occurred. The Authority could require the private firm to obtain an IRS ruling on the status of their tax benefits under this plan to reduce the risk to the Authority for the loss of these tax benefits.

This innovative financing tied the public entity to the private firm in several areas. A long term service agreement for waste delivery and a lease agreement between the Authority and company on the publicly held real property tied the two operationally. The revenue sharing and annual special credit tied the Authority to the company's economic interest in the project.

Public/Private Advantages

1. Helps lower early year tip fees.
2. Assures public/private partnership to perform an important public service.
3. Doesn't require any up front payments of the equity by the corporation.
4. Allows smaller corporations that don't have the funds to compete in offering private ownership deals; therefore offers more competition.

Public/Private Disadvantages

1. The tipping fee in the later years of the project operation would be more costly, everything else being equal.
2. Unknown position of the company relating to tax benefits under the proposed financing.
3. The company has not made any equity (cost) commitment to project.
4. Overall cost of using stabilization fund is always greater than without it.
5. This was a new financing technique at that time in that it had not been accomplished for any project.

OPTIONS FOR SAN DIEGO

In the early planning stages of the SANDER Project a variety of financing options were presented to the SANDER Authority by their financial consultant for consideration. [See Table I for a listing of those options.]

In analyzing these financing options all but two options were considered inappropriate. Because of legal and structural constraints the following options were eliminated: Enterprise Revenue Bonds (#3); Special Assessment Bonds (#4); System Contractor w/lease to County (#9); Tax Allocation Bonds (#11); City Charter Bonds (#12); Non-Profit Corporation Revenue Bonds (#10). Lease purchase with Certificates of Participation (#6) and leverage lease (#7) were eliminated because both were considered too untested as financing mechanisms for a California resource recovery project. Recent passage in California of Proposition 13 basically removed the two general obligation (GO) Bonds from consideration: County General Obligation Bonds (#1) and City General Obligation Bonds (#2).

The two financing options which were considered most appropriate for the SANDER Project were : Public ownership financing with revenue bonds issued by a joint powers authority (#5); Private ownership utili-

zing the California Pollution Control Financing Authority (State Industrial Development Bond (#8). These two financing options were incorporated into the SANDER Request for Proposal (RFP) issued in 1982 to design, construct, and operate a resource recovery facility in San Diego.

The RFP public financing option (#5) contained two provisions to help lower tip fees during the first four years; interest only payment on the bonds and use of interest earnings from the reserve fund. In the private financing option security on the bonds was provided through project revenues and certain performance guarantees by the parent firm.

TABLE 1
SANDER PROJECT
FINANCING OPTIONS

OPTION	BOND ISSUE	BOND RATINGS	NET INTEREST RATE	VOTER APPROVAL	SECURITY	OWNERSHIP OF FACILITY	MARKET-ABILITY OF BONDS	LEGAL COMPLEXITY
1. County General Obligation Bonds	County	¹ M : Aa ² S&P : AA	Medium	Yes; 2/3 vote	Full faith and credit	County	Excellent	Low
2. City General Obligation Bonds	City	M : Aa S&P: AA	Low	Yes; 2/3 vote	Full faith and credit	City	Excellent	Low
3. Enterprise Revenue Bonds	County	M: Aa S&P: AA	Low	Yes; Majority vote	User fees of the enterprise	County	Good	Medium
4. Special Assessment	District	M: AA S&P: AA	Low	No; Public benefit and hearings	Assessment charges	County	Fair	High
5. Lease Revenue Bonds with County as Lessee	JPA NPC	M: A S&P: A	Medium	No	County General Fund	County	Good	Medium
6. Lease Purchase with Certificate of Participation	County	M: A S&P: A	Medium	No	County General Fund	Lessor with assignment to County	Fair	High
7. Leverage Lease	³ CPCFA	M: Baa to A S&P: BBB to A-	High	No	Project Revenue	Private Company		High
8. Industrial Bond/System Contractor	CPCFA	M: Baa to A S&P: BBB to A-	High	No	Project and Company	State/ Private Company	Fair	Changing tax laws
9. System Contractor with lease to County	CPCFA	M: A S&P: A	Medium	No	Project, Company, County General Fund	State	Good	Medium
10. Revenue Bond	Non profit Corp	M: A S&P: A	Medium	No	Project and mortgage	NPC	Fair	No State tax exemption
11. Tax Allocation	Redevelop Authority	M: A S&P: A	Medium	No	Tax	Redevelopment Authority	Fair	Medium
12. City Charter/IDB	City	M: Aa	Medium	No	Project	City	Good	Medium

¹M = Moody's Rating Service

²SP = Standard and Poors

³CPCFA = California Pollution Control Financing Authority

The RFP allowed the firms to submit variations on the two financing options. Any alternative financing offered by a proposer, however, had to be accompanied by extensive detail for complete analysis and evaluation. Three financing plans were submitted by the proposers with a fourth plan submitted to SANDER during contract negotiations. All were variations of the two financing options.

Public Financing Option

Corporation A proposed a 20-year construction and operating agreement with a fixed guaranteed operator's fee. In addition, the company would receive a portion of the energy revenues. Tax exempt bonds were to be issued by the Authority, secured by project revenues and amortized utilizing a level debt service schedule. Performance guarantees and other commitments to strengthen the financing were offered by corporation A. Bonds were to be secured by project revenues.

Corporation B proposed a virtually identical financing plan but was willing to enter into a 30-year contract.

Private Ownership Plans

Corporation A proposed setting up a subsidiary corporation to construct, operate and own the facility. Taxable and non-taxable industrial development bonds were proposed to be issued by the California Pollution Control Financing Authority. The Authority was offered a choice of equity participation arrangements: (1) the standard "up front" equity offer with the company contributing \$35 million in equity; (2) an annual special credit. The special credit would flow to the Authority in the form of a reduced annual operating and maintenance fee. Bonds would be secured by project revenues and the company offered performance guarantees.

Under either equity plan, Corporation A proposed additional items to help reduce the early year tip fees:

1. Issuing taxable debt to establish a "revenue stabilization fund" to subsidize tip fees in the early years
2. Variable debt service repayment schedule. Early year payments (after stabilization fund has been exhausted) are approximately 75% of a level debt service payment
3. Energy revenues shared with the Authority: 90% years 1 through 5; decreasing 2% each subsequent year thus making the project tip fee more competitive in the early years with local landfill fees

The special credit plan was structured to achieve lower early year tip fees. Costs in the later years, however, appeared to be higher relying on energy inflation assumptions to control the increase in costs.

Corporation B proposed establishing a new company and payment of up front equity to reduce the amount of the remaining bond issue. Their plan was to raise the remaining funds required through industrial development bonds issued by the California Pollution Control Financing Authority. Corporation B offered to share the energy revenues on a sliding scale: 90% in the first year of the facility's operation, dropping 1% each year until the sixteenth year. The revenue share would remain constant from the sixteenth year onward.

No special credit proposal or other innovative private financing plan was presented. Debt service in this proposal was levelized and no revenue stabilization fund was suggested.

The SANDER Project's technical/management consultant recommended private ownership with the more traditional equity participation. During negotiations with the first ranked firm, a fourth plan was put on the table - the full service own and operate approach.

Own/Operate Plan

This approach is a more traditional entrepreneurial proposal. The own/operate deal offered a set tip fee that increased only with inflation. The company's initial up-front equity proposal was constructed along a risk-sharing approach which included sharing the risk of change in environmental law. Under the own/operate plan, the company assumed most of the major risks in the project including:

- changes in the heating value of the waste
- cost escalation during construction
- change in tax law
- changes in energy price

The own/operate proposal was economically feasible for the company because they proposed increasing the plant size by fifty percent. Economies of scale and potential for increasing the energy output made the economics work for the company. The own/operate proposal lessened the potential risk to the Authority.

The company continued to offer a share of the energy revenue once the plant's efficiency rose above an agreed upon base level. There was, however, no guarantee to the SANDER Authority that these excess energy revenues would be realized.

The four financing proposals included many variables, some with a substantial effect on the cost to the facility's users. To analyze which proposal was best for the Authority, a computer program was needed to include all the economic and technical variables.

PROBLEMS IN FINANCIAL ANALYSIS

In the initial stages of the SANDER Project all financial analyses were done by project consultants. These consultants were sometimes engineering and technically oriented while at other times they were from the financial community. SANDER experienced a problem timeliness of

response; after requesting a computer run a month could elapse before receiving the results of the request. Other factors such as the cost of each computer run and a general lack of control over the process led SANDER staff to conclude that it would be advantageous to have an in-house capacity. This, of course, was made possible in part by the fact that desktop computers were becoming not only readily available but also inexpensive.

There were other considerations besides the above. For instance, printouts of the data output without the data input were typical. This did not allow the reader of the printouts to validate the calculations. In addition, the computer program either was so highly case specific that it had to be reprogrammed each time that any change in the financing was encountered or the program was so general that headings for specific line items were confusing. Both of these types of programs led to data displays that, while perhaps correct, did not seem to follow any logical or sequential development of values. The generalized program would, for instance, draw data from succeeding pages while the specialized program would contain many steps and calculations bundled into a single step. Both made following the printout difficult.

Each agency may have at its disposal the services of staff who are capable of calculating by hand the financial impact of the project on the agency. While this may be acceptable for initial project screening purposes, it would not be practical as the need for analysis grows for the following reasons. First of all, these projects require a tremendous investment of community resources and as such they deserve to have the most refined in project costing computations. Secondly, it would not be realistically possible to expect individuals within the agency to toil through the highly tedious task of calculating cost and financial impact by hand. The task of calculating economic impacts is just too complex and subject to error to leave to hand calculations. In addition, there are numerous ways of working through these calculations depending on the financing, the revenue arrangements and the type of

equipment selected. All of this adds up to a very real need for an easily accessible, accurate and specially programmed computer Model.

A Computer Model

The computer Model (referred to as the Model) was in its infancy when SANDER first received proposals. Many of the capabilities that are now available in the Model were unavailable then. SANDER did, however, have the experience of analyzing all of the financing options offered by three major corporations operating in this field. The corporations have been very candid and open on most aspects of their proposed financings. As a result of this experience, the Model was repeatedly updated so that it would be capable of handling most of the financing options.

Currently the Model can switch between financial options and recalculate new results with a few keystrokes. To enhance the flexibility of the Model there has been incorporated into the program logic the ability to analyze different equipment options, which affect both price and performance, again with only a few keystrokes. Naturally, this is only possible if sufficient data is available to complete all calculations.

Sufficient data for the Model to fully utilize its potential is one of the very real constraints of the Model. It is recognized that there are limited valid data sources. Presumably an agency that is just beginning in this field would require the services of an experienced consultant who could provide the data that is needed. Alternatively, the agency could go directly to the corporations that have put these facilities together with a request for proposal. Perhaps such a request for proposal would ask for costs assuming two, possibly three, options in order to obtain the data needed to compare different financing options.

Capabilities of the Model

Specifically, the Model has the capability of analyzing project financings with the following characteristics:

1. Public Ownership
2. Private Ownership with combinations of:
 - A. Equity Input
 - B. Special Credit
 - C. Public Debt
 - D. Financed Equity

In addition to this, the Model has the capability of analyzing the proposal not only from the standpoint of the agency, and this is a particularly powerful element of the Model, but also from the standpoint of the corporation. The Model can analyze the equivalent of a corporate ledger to determine expected revenues and tax benefits, the expected return on equity, and the debt service coverage in each of the years that debt is being retired. Add to this a book statement and a tax statement and sufficient information is available to ascertain the corporation's potential cash flow and profit in any given year within the limits of the accuracy of the data input.

There are limitations to the Model in that it is unable to do some very simple projections. This was done to avoid encumbering limited memory for such uses. For example, the own-operate deal that has been offered to a number of agencies where the tipping fee is set to escalate periodically in accord with a cost of living index cannot be run from the standpoint of the agency. Because of its simplicity, one can use a hand calculator to determine the expected tipping fee in a given year for an assumed rate of inflation. The Model is capable of looking at this type of financing, however, from the standpoint of the corporation's profitability provided that the agency has sufficient information relative to capital costs and operations costs and revenues.

For those projects without complete data, the Model is able to give meaningful results with limited data. As the project proceeds, however, more data will need to be obtained so that the refinements built into the Model will become increasingly useful. The Model is able to easily perform sensitivity analyses relative to capital cost increases, rate of inflation changes, and other changes to the base assumptions.

For a complete description of the capabilities of the Model, please refer to Volume II.

CHAPTER 4 - A FINANCING CASE STUDY

INTRODUCTION

The following discussion is a short history of the various negotiations and decisions that followed from the original request for proposals (RFP) as released for the SANDER Project in late 1982. As has been related in other portions of this paper, the Model, developed under this grant project, was not available during this period. A simplified version was being developed during the negotiations but for at least some of that time its development was a step or two behind its need. This text will attempt to point out how the Model might have been used, had it been available from the beginning, in the decision making process.

A base case shown in Table 2, has been prepared to simplify comparisons of differing financial proposals in this report. The base case should not be assumed to be one of the proposals that SANDER received. In fact, it is a mix of many of them. A description of the base case is found in Appendix A to this volume.

PUBLIC OWNERSHIP VS. PRIVATE OWNERSHIP

In the initial stages of the SANDER project it was assumed that the facility would be publicly owned but operated under a service agreement with the corporation. Solid waste collection and disposal facilities, liquid waste treatment facilities and public buildings historically have been publicly owned and the idea of contracting for these services or facilities was relatively new. Private ownership at the local government level was normally seen as only a temporary solution until a traditional government owned replacement would be available.

TABLE 2
BASE CASE ASSUMPTIONS

I. Plant Operational Characteristics

- A. Peak Capacity - 1,500 Ton/Day
- B. Average Availability - 80%
- C. Plant Efficiency - 585 KWH/Ton
- D. Annual Tonnage Processed - 438,000 Tons
- E. Curtailment of Power Sales - 150 hours/Yr
- F. Net Peak Generation - 36.56 MW
- G. Annual Production - 250,746 MWH

II. Costs (As of 1-13-84)

- A. Construction - \$137,490,000
- B. Operation and Maintenance Fee - \$7,820,000/Yr
- C. Annual Passthrough Costs - \$2,165,000
- D. Ash Disposal - \$7.20/Ton
- E. Ash to Trash Ratio (wet) - 30%

III. Revenues

- A. Energy (years 1-10) - \$0.094/KWH
- B. Energy (years 11-20) - 0.143 KWH + CPI Increase from Year 11
- C. Capacity - \$127/KW/Yr
- D. Materials - 0
- E. Gate Fee - 0
- F. Revenue Sharing - Depends on Financing

IV. Financing Factors

- A. Tax Exempt Interest Rate - 10.5%
- B. Taxable Interest Rate - 13.25%
- C. Short Term Reinvestment Rate - 9.0%
- D. Long Term Reinvestment Rate - 12.0%
- E. Present Value Rate of Return - 10%
- F. Inflation (All) - 6%
- G. Financing Issuance Expense - 4%
- H. Bond Reserves - 1 year P&I
- I. O&M Working Capital - \$2,000,000

V. Timing

- A. Proposal Date - 1/13/84
- B. Beginning of Construction - 1/13/85
- C. Beginning of Operations - 12/13/87
- D. End of Contract - 12/13/07

Nevertheless, the Project's financial consultants reported that substantial tax benefits could accrue to the private owner of such a facility and that the private owner might be willing to share these benefits with the public entity. The big question was whether the private sector would really share tax benefits and if so, what portion of the total would be shared. The answer to this question implicitly requires information on the value of the tax benefits. Specifically, what is the dollar value of the tax benefits and what the value of equity or special credit to the agency? In addition, there would be a shift in the risk sharing under private ownership with the corporation picking up more of the project risks.

The SANDER RFP was written in such a way that the proposers could offer a privately owned facility, a publicly owned facility, or both. In fact, the two corporations that responded submitted proposals for both ownership options. After reviewing these proposals it seemed that capital and operational costs and the relative risk postures of the SANDER Authority and the Corporation changed little in moving from public to private ownership.

Primary Differences of Initial Proposals

A difference between the public and private proposals was that each corporation, in the case of private ownership, was willing to fund an equity contribution of 30 to 35 million dollars which would thereby reduce the amount of the bond funds required for construction. One of the corporations was also willing to make annual payments to the agency based on a proposed percentage of the project cost and tax benefits. These payments would be in lieu of, not in addition to, the equity contribution.

The only other difference between the public and private proposals was that of ownership, and thus control, of the facilities at the end of the bond repayment period. In the case of the publicly owned facility, ownership of the facility is always vested in the agency, although

control of the facility probably resides more closely in the corporation than it does in the agency during the term of the service agreement. As has already been noted, the corporation retains its ownership of the facility at the end of the operational service contract term in the case of the private ownership.

Tax Ownership and Facility Life Implications

Current Federal tax laws require that when tax exempt bonds are used by an owner which is a non-exempt entity certain requirements must be met. One of these is that the ground lease term must exceed by 20 to 25% of the term of the bonds. The contract with the corporation will therefore be no shorter than the longest term of the bonds used for financing the facility and will typically be four or five years longer. Since the bonds for these facilities would probably be for at least 20 years, the contract would extend possibly 25 years from the beginning of operations. The economic benefits of ownership that far in the future are difficult to estimate. The value of the facility after that many years will depend on the type or quality of materials used in construction and with the quality of operation and maintenance. Even when these are optimum, it may be expected that the present value of the facility 29 years from now (four years added for planning and construction) would be negligible even after adding a reasonable margin for inflation.

The value of energy receipts that far in the future no doubt will have a significant present value due to the expected inflation of energy. Here again, the ability of the facility to produce energy at that point will be dependent on the quality of materials and maintenance. Since corporations have indicated an interest in owning the facility after all bonds are retired and have requested options for extending the ground lease and continued operation of the facility, it may be assumed that these facilities have the potential of being profitable beyond the initial lease.

Key Tradeoffs

The initial case that needs analysis, then, is the trade off of reduced capital for construction resulting from equity infusions (which reduce bond indebtedness and the tipping fee) vs. lost ownership, tipping fees and energy revenues after bond retirement. A secondary problem which shall be analyzed later is the question of comparing the equity investment vs. the annual payment that was offered in lieu of equity.

Cost Analysis: Tip Fee and Facility Life

The Model does not have a built-in, automatic capability for analyzing costs beyond the twentieth year of operation and in general it is not useful to do analyses much beyond the tenth year for two reasons. One is that the early years are the critical years in terms of present value of revenues and expenditures. If the project looks healthy in the early years there is generally no foreseeable reason for the project to be unsound in the latter years. Secondly, calculating inflation of labor and energy costs is very uncertain when one attempts to project too far in the future. Some of that uncertainty can be eliminated by doing sensitivity analyses to find the critical parameters and then working with differences in inflation rates rather than absolute values. Additional discussion of sensitivity analysis is found at the end of this chapter.

Assuming that your agency wants to develop an estimate of lost revenues, i.e., revenues that flow to the corporation rather than to the Agency, after bond retirement, the following is a procedure for using the Model for that purpose. This procedure was used with the SANDER Base Case assumptions and the results are found in Table 3 - Present Value of Net Revenues Years 21 Through 40. Before reading the following sections it may be wise to review Volume II of this report to become familiar with the operation of the Model.

Assumptions need to be made for a rate of general inflation that is reasonable over the next 25 years and for an energy inflation rate, if different from that of general inflation over the same period of time.

Note, however, that a very small difference between these two can have a dramatic effect on the outcome. For the Table 3 Base Case column we assumed that there would be no difference between the rates of general inflation and energy inflation and that they would equal six percent.

Next, determine the rate of return that your agency would be satisfied with over this same time period and use that for your present value discount rate. Three to four percent more than the general rate of inflation would be appropriate for the typical agency that would invest conservatively. This difference is the numerical value that is placed on the agency's willingness, so to speak, to forego current revenue (or reductions in cost) for future revenue. In the Base Case, we used ten percent.

Since all bonds will have been retired by the 21st year, next set the capital cost for construction at zero. This will cause the bond amounts to also be zero. For the Base Case in Table 3 we set the plant availability parameters in year one (this will actually be the 21st year of operation) to start at 70 percent declining by two percent per year (this parameter, as you will note below, is not terribly critical). We also set the time of construction to 23 years, assuming that three years is the actual expected construction period. This will push all calculations forward 20 years and will cause the Model to inflate to the period after bond retirement and deflate (calculate present value) to today. Input current avoided costs and operation and maintenance cost as obtained from proposals or estimates (See Table 2 for SANDER Base Case values).

In addition to the Base Case which shows the value of the facility during the years beyond the retirement of bonds, additional scenarios are also included in Table 3 which explore some of the sensitivities of these input data.

TABLE 3
PRESENT VALUE OF NET REVENUES
YEARS 21 THROUGH 40
NO GATE FEES INCLUDED

	Base Case	Case I	Case II	Case III	Case IV	Case V	Case VI	Case VII
Pres. Value (million \$)	3.8	6.2	72.2	41.1	2.7	38.4	9.5	15.0
PV Tip Rev. (\$/ton) 21st yr.	3	4	16	10	2	10	4	4
PV Tip Rev. (\$/ton) 25th yr.	1	1	15	9	0	8.5	2	3
PV Tip Rev. (\$/ton) 30th yr.	-	-	13	7	-	7	0	2

Notes:

1. The Base Case utilizes a 6% general rate of inflation, 6% energy inflation, 10% present value rate of return and availability begining at 70% in year 21 and falling two percent per year. Case I through VII above are the same as the Base Case with the following exceptions.
2. Case I - The present value rate of return increased to 8%.
3. Case II - Same as Case I plus energy inflation increased to 8%.
4. Case III - Energy inflation increased to 8%.
5. Case IV - General inflation (CPI) increased to 8%; the rate of return for present value increased to 12%.
6. Case V - Same as Case IV plus energy inflation increased to 10%.
7. Case VI - Availability beginning in year 21 at 80% and decreasing by 2% per year.
8. Case VII - Same as Case VI but decreasing by 1% per year.
9. A dash indicates that the facility may not be economic at that point in time.
10. PV Tip Rev. is the present value of tip revenue.

Of initial interest, it may be noted that the relative availability of the facility in these out years is not terribly critical to the determination of the present value of the facility. Under the Base Case scenario, the present value of the net revenues after year 21 exclusive of gate fees would be \$3.8 million. On the other hand, if the availability began at 80 percent in the 21st year and dropped two percent per year (Case VI), then the present net value of the facility would be \$9.5 million. Finally, if the facility were to be initially capable of 80 percent and then dropped at the rate of one percent per year (Case VII), then the present value of the facility net revenues would be \$15.0 million.

The number of years over which these revenues are accumulated vary with each scenario since it is assumed that once the facility begins to lose money, that it will be closed. Thus, in the Base case, the life for the facility would extend only until the 27th or 28th year. In Case VI and Case VII, the economic life would extend through the 32nd year and through the 40th year respectively. This shows up on Table 3 as a dash for the tip revenue in the 30th year of the Base Case and a zero for the 30th year of Case VI.

Cost Analysis: Inflation and Return on Investment

As might be expected, the present value of these revenues is very sensitive to the absolute value of the rate of inflation that is selected. For example, if the rate of inflation of energy is assumed to increase at a rate that is two percent higher than other inflation rates, i.e., at eight percent instead of six percent (Case III), the present worth of revenues in the later years jumps from \$3.8 million to \$41.1 million. Although there have been some analyses that have predicted the rate of increase of energy values may increase at a rate greater than that of general inflation, it would seem that such a eventuality would not be sustainable.

Likewise, the value that the agency would place on money, i.e., the rate of return that is desired on investments and which is used in the present worth calculations, has a significant effect on the value of

these revenues, although not as dramatic as the energy inflation factor. If the rate of return to the agency is dropped to only eight percent (Case I), i.e., only two percent greater than the assumed overall general rate of inflation, the value of these revenues becomes \$6.2 million.

The interesting case to evaluate is the case when the relative values of general inflation rate vs. the return on investment rate remain fixed while the absolute values vary. That is, what happens when the spread between these two rates is fixed at four percent but the general rate of inflation is assumed to be greater than the Base Case assumption of six percent? Table 3 shows that in the case of general inflation at 8 percent and return on investment at 12 percent (Case IV) the value of later year revenues is reduced slightly to \$2.7 million. Additional analyses, not shown on Table 3, confirmed that the percent value is only fractionally affected when the spread is fixed while the general rate of inflation is increased. Apparently the compounding effect of the higher rate over such a long period of time overtakes the difference by maintaining the four percent spread.

In order to obtain a unique result it could be argued that because of the compounding effect on the rate of return the agency should be willing to narrow the spread between general inflation and its desired rate of return on projects of this type if the absolute value of inflation is greater than expected. For example, narrowing the spread to only 3.25 percent in Case IV returns the present value to its original value in the Base Case. This would place a somewhat unique value on these revenues independently of any projected general rate of inflation over the next 40 years.

It could be just as easily argued that, because of the time required to begin to recover any of these revenues (20 years) and the uncertainty in the intervening years, the agency should expect recovery of its investment at rates higher than have been used. Furthermore, it might also be argued that if inflation skyrockets sometime in the future the agency should be able to protect itself by requiring a greater spread between the general rate of inflation and the agency's rate of

return rather than a lesser spread. This line of reasoning does not assist in bringing these calculations to closure. As a consequence, the balance of the discussions of later year revenues assumes that a six percent general rate of inflation and a ten percent rate of return are reasonable and that the spread can be adjusted to compensate if in fact the general inflation rate turns out to be different.

TABLE 4
PRESENT VALUE OF GATE FEES (millions \$)

Current Gate Fee (\$/ton)	5	10	15	20	25
Years 21-25	3.5	6.9	10.4	13.9	17.3
Years 21-30	5.9	11.8	17.7	23.7	29.6
Years 21-35	7.6	15.2	22.7	30.3	37.9
Years 21-40	8.7	17.3	26.0	34.7	43.3

To understand the Model two terms must be defined. The term "gate fee" is specifically differentiated from another value that is sometimes called the tip or tipping fee. The differentiation between the two is that the gate fee is the dollar amount per ton of waste that is paid at the gate by the hauler and is oftentimes set by ordinance or otherwise published.

The tip fee, as used in this document, is the net cost to the agency after all revenues and expenditures have been summed and the difference between the two has been calculated. Table 4 presents the present value of gate fees that would be assessed in years 21 through 40. It has been separated from the above discussion since various projects throughout the country have rather widely varying gate fees whereas the revenues and expenditures for facilities might be more nearly uniform. In any case, the preferred scenario from the analysis of rates of inflation and availability can be combined with the appro-

priate current gate fee to obtain the total present value of the future year revenues. The gate fees in Table 4 have been inflated to the years indicated in the table for the Base Case tonnage and the present value of that revenue has been brought back using the ten percent rate of return as discussed above.

For SANDER the following scenario might have been adopted: Plant availability starting at 80 percent in year 21 and dropping at a rate of two percent per year together with the other base case assumptions. Such a facility would have a present value of \$9.5 million according to Table 3. In such a case the plant's operational life from the financial standpoint would be about 15 years (after gate fees are included) beyond the 21st year. Since the current gate fee in San Diego is approximately ten dollars this revenue source would yield a present value of approximately \$15.2 million. Combined, the net present value of the facility in these out years is approximately \$25 million (\$9.5 + \$15.2). The present value of the salvage value of the facility is assumed to be zero.

Another way of restating this is that the agency might reasonably pay the corporation \$25 million up front, in a private ownership deal, for the right of ownership and of net revenues for the years 21 and beyond and in doing so the agency would be financially indifferent. Naturally each agency will have its own opinion of the proper values of input data to determine the appropriate present value but the important thing is that this is a methodology for analyzing this part of the deal and the Model is a tool for assisting in that effort.

Cost Advantages of Private Ownership

In order to analyze the cost advantages of private ownership, it is necessary to run the Model at least twice; first without an equity contribution and then again with the equity contribution included. When dealing with several financial proposals with varying equipment options in each, more than two runs might be necessary. Table 5 tabulates the

results of some of these possible runs. All figures are listed in terms of present value.

TABLE 5
PRESENT VALUE OF FIVE FINANCING OPTIONS
NO GATE FEES INCLUDED

	Public Ownership/ Private Operation	Private Ownership \$35M Equity	Private Ownership 20% Equity	Private Ownership 25% Equity	Public Ownership Public Operation
Present Value (millions \$)	-115.6	-79.6	-68.6	-58.5	-81.0
Savings over Public Ownership w/Full Service	--	36.0	47.0	57.1	34.6
Present Value 1st yr. Tip Fee (\$/ton)	22	13	11	8	18
Present Value 5th yr. Tip Fee (\$/ton)	18	13	11	10	15
Present Value 10th yr. Tip Fee (\$/ton)	16	13	12	11	14

In addition to the present value of project costs, the present value of tipping fees are also included for some typical years. These are often important to communities, particularly when the initial years' tipping fees are greater than current landfill costs.

Equity Contribution

You will notice in Table 5 that there are several private ownership options that have been presented. The private sector may offer to provide 20 or 25 percent equity capital and Columns 3 and 4 of Table 5

illustrate that the difference of such a change to the agency, is approximately \$10 million in present value. It is important for the agency to recognize that the five percent differential is quite a bit more significant than it sounds and the agency should question this value. Other aspects of equity payments that should be questioned are what parts of the project costs will be supported with equity payments, the timing of the equity payments and the basis of proposed costs, actual or inflated.

The Model assumes that if a percentage of equity is proposed that percentage applies to all costs including bond sale expenses, bond reserves and working capital requirements. On the other hand, if a fixed dollar amount of equity is input into the Model the Model assumes that this amount is not inflated and that it is infused in proportion to construction completion.

For SANDER, it appears that even in the case of the least amount of equity capital the private deal saves the agency approximately \$35 million. (Once again, you are reminded that these figures do not include any gate fee but that does not affect the outcome of this analysis since the gate revenue washes out when considering differences). If the corporation is willing to put up 20 percent equity, as defined above, the savings grow to \$47 million. Since these savings are greater than the approximate \$25 million in lost revenues after bond retirement that was calculated for the public ownership option, it would appear that the private ownership option is preferred. This conclusion is reinforced when we recall that the savings of private ownership accrue immediately through reduced tipping fees whereas lost revenues are not available until the beginning of the 21st year of operation.

Public Ownership/Public Operation

There remains another plan for public ownership. This is the traditional way that a public works project is handled. Implicit in this plan is the willingness of the organization to undertake the responsibility of operating the facility.

The question to be resolved is whether the operation and maintenance fee that was bid by the corporation plus the passthrough costs are an accurate representation of the cost of operating the facility or are these costs to be supplemented by the energy and capacity revenue sharing in order to reach break even on the operation and maintenance. There was some evidence that the energy and capacity revenue share for the corporation was not a supplement for meeting operation expenses. These revenues, valued at \$34 million plus the \$25 million present value of the facility after bond retirement, represent \$59 million in possible lost revenues for the agency. Although a loss to the agency, these funds may not be all profit to a corporation. Some of the funds may be used to back up the facility performance guarantees the corporation made to the agency.

The principle reason at SANDER for considering this approach was the local experience with an earlier facility. This facility attempted fuel conversion using pyrolysis and failed to perform. Since the County of San Diego had put money into that facility, which was a demonstration project and thus untested concept, there was no interest in proceeding with any element of a project that did not have a fully supported track record; hence the design, construct, and operate full service contract in San Diego.

For another agency, however, it might be well to investigate the option of the historic public works approach of public ownership and operation. The potential for reductions of cost below that of the typical privately owned facility may be sufficient to warrant such an investigation. Although the agency should be aware of the financial risks to the agency if the facility doesn't perform as expected.

SPECIAL CREDIT VS. EQUITY

Another type of private ownership option which is being offered is the special credit plan. The special credit represents an annual payment in lieu of the equity contribution. This special credit payment, as it was

proposed, is a fixed percentage of the total project cost. Project cost is defined as the sum of the bonded indebtedness (both taxable and tax exempt) less the sum of the bond reserves and the taxable principal that remains at the beginning of the period of operation.

During negotiation another special equity plan was proposed. Rather than making payments on the basis of a percentage of project cost, these annual payments would simply be fixed at some dollar amount. The Model has the capability of handling either situation.

There were several aspects of these special credit deals that caused SANDER staff and their consultants some concern. One was that this type of deal had never been done before. Another concern was whether the IRS would recognize tax benefits as being available in this deal. A third concern was that the company had made the deal contingent upon a future opinion as to how these tax benefits were to be treated by the IRS. The interesting part of that contingency was that a ruling was not to be made by the IRS but rather it would be based on an opinion of the company's own tax counsel. The effect of an adverse opinion on the project's finances was to reduce the special credit by something more than 18 percent and to increase the tipping fee by approximately two dollars per ton in every year of operation.

Impact of Stabilization Funds

In addition to the special credit plan, a stabilization fund was proposed in order to help reduce the early year tipping fees. The principal in this fund was to be obtained from the sale of taxable bonds. Monies in this fund were to have been used over the initial five or six years for operational expenses. In addition, repayment of the principal for these taxable bonds and the usual tax exempt bonds was to have been postponed until after the stabilization fund was expended. During this initial five or six year period, interest only payments were to be made on both sets of bonds.

After this initial period, during which all taxable principal would have been expended, repayment of the principal on these taxable bonds would begin. However, repayment would be made on a scheduled basis, i.e., a certain percentage would be paid in year seven, say, a different percentage the following year, etc. During this period, there still would be no repayment of the principal on tax exempt bonds; they would continue to be paid interest only. The idea behind the differing principal payments was to smooth out the transitions in the tipping fee when going from a year of no principal repayments to a subsequent year with principal repayments.

In the third and final period of bond retirement (usually beginning in the 12th or 13th year), the tax exempt principal begins to be paid off, again on a scheduled repayment basis. Clearly, this requires some rather heavy debt burdens in these latter years. Such an eventuality can be handled if the cost of energy continues to escalate. On the other hand, such an indebtedness represents a substantial liability to the agency and a risk that may be unacceptable.

It should be pointed out that it is not necessary to combine the special credit deal with the stabilization fund although they were in the proposals to SANDER. There is no reason that the stabilization fund could not be combined with any of the other plans that have been discussed so far in this case study, provided that the agency is willing to accept the risks attendant to the repayment of the stabilization fund bonds in the later years.

Cost Analyses: Special Credit/Stabilization Fund

After careful consideration by SANDER staff and consultants it was decided to consider the special credit deal as only a remote possibility. Furthermore, comparing this with the equity deal, it appeared that the infusion of \$30 to 35 million was a more substantial commitment from the corporation and thus of more interest to the Agency all other things being equal. Since the corporation that had offered the special credit package had also offered a straight equity deal, the agency chose to pursue the equity plan.

Table 6 lists the cost of the special credit financing in comparison to the more typical equity plans. The special credit plan without the stabilization fund, has a present value during the life cycle of the project of \$82.7 million. This is virtually identical with the present value of the \$35 million equity plan. This is an indication that the two plans are essentially equivalent, at least from the standpoint of cost to the agency.

The present value of the special credit deal with the stabilization fund included increased the cost by about \$7 million over that of the straight special credit financing. This additional cost is due to the postponement of debt retirement and to the higher cost of taxable debt financing. Also note that in this plan, the tipping fee in the first year went to zero and that this calculation as in all the others does not include any gate fee. When a levelized ten year energy revenue is combined with a stabilization fund, a drop in the first year's tipping fee does occur.

TABLE 6

PRESENT WORTH OF SEVEN FINANCING OPTIONS
NO GATE FEES INCLUDED

	Public Ownership	Private \$35M Equity	Private 20% Equity	Private 25% Equity	A&E Public Bid Public Oper.	Special Credit and Stabili- zation Fund	Special Credit and Stabili- zation Fund	Special Credit \$1.4 Million
Present Worth (millions \$)	-115.6	-79.6	-68.6	-58.5	-81.0	-89.5	-82.7	-106.6
Savings over Public Ownership	--	36.0	47.0	57.1	34.6	26.6	32.9	9.0
Present Worth 1st yr. Tip Fee (\$/ton)	22	13	11	8	18	0	14	20
Present Worth 5th yr. Tip Fee (\$/ton)	18	13	11	10	15	10	13	17.5
Present Worth 10th yr. Tip Fee (\$/ton)	16	13	12	11	14	16	13	15.5

Normally, an agency would not combine the two since their purposes are similar, i.e., to reduce the first years' tipping fees, and the result will sometimes create too great a reduction in the early tipping fees, with a resultant higher tip fee in later years. The reason that they are combined here is to maintain a uniform base case throughout these analyses while at the same time exploring all the possible combinations of these deals. Typically a stabilization fund would be used where energy revenues begin low and inflate each year, thereby stabilizing the tip fee over the life of the project.

If for any reason both the stabilization fund and the levelized energy revenues were to be combined, different mixes of scheduled repayment rates, taxable principal amount, and taxable principal drawdown can be tried to obtain the optimum tipping fees in any given year(s). The first year tipping fee may be adjusted to be any value within reason that is preferred. But it will always be the case that the total life cycle present value cost of the project will be more to the agency than if no stabilization fund is utilized.

THE SANDER FINANCING DECISION

SANDER selected the corporation offering both the equity financing and the special credit plans. The final selection included analyses and considerations of varying equipment options. These equipment options, in addition to affecting the capital costs of the facility, also affect such things as overall plant efficiency, operation and maintenance costs, and generation capacity.

Four equipment options involving air pollution control equipment and water cooling methods were under consideration, along with the financial options already discussed. For some options one corporation would be preferred while for other options the other corporation would be preferred.

Problems in the Negotiations Process

Shortly after formal selection, SANDER was informed that the corporation selected was merging with another corporation. This created a problem for SANDER because the personnel involved in the earlier discussions were gradually replaced by new personnel. This delayed negotiations while the new team became familiar with the project. Six months later the original proposals received by the SANDER Authority expired. Each firm was asked to extend their proposal and continue to be considered for negotiations. Both firms agreed. The corporation SANDER was negotiating with updated their proposal in several areas which was allowed by the Authority, under the conditions of extending the proposals.

Alternative Proposals

The merged firm returned with updated proposals for the special credit and the equity plans. There were aspects of each plan that the Authority found agreeable although neither plan by itself met the needs of the Authority. The tip fee of the Special Credit plan was attractive economically, while the risk position in the equity deal was more favorable from the point of view of the Authority. The negotiating team asked the company to return with a plan combining certain aspects of each plan. These updated numbers indicated that the capital cost and the operational costs of the facility had increased. The increases were justified by the corporation based on inflation and on their experience operating one of these facilities.

The result of these changes was to raise the first year tipping fee for both the equity plan and the special credit plan. This was not acceptable and so SANDER asked the corporation to return with a better offer. They returned with a special credit plan that lowered the first year tip fees and changed some of the assumptions. For instance, the corporation requested exemption from state sales taxes, and was assuming that the stabilization fund could be funded from tax exempt bonds. They offered to reduce the new capital cost by \$5 million and to guarantee to operate the facility at 83% availability vs. the 80% that had been formerly assumed. Two other changes in assumption were to exclude the cost of ash disposal and the Authority's administrative costs for planning and negotiations. Under this plan the project risks were shared by the agency and the corporation.

The first year tip fee for the equity plan was increased. Under the equity deal, the majority of the project risk was assumed by the corporation and the underlying assumptions were much more agreeable to the agency.

The "Best and Final" Proposal

The alternative proposals offered by the corporation were still unacceptable to the Authority. After a meeting between top management on both sides the corporation agreed to return with a "best and final" offer. Their best and final proposal was to build a facility that could process up to 50% more than had been originally envisioned (1800 tons per day on average vs. the original 1200 tons per day), to contribute 20 to 25 percent of the total project cost as equity capital, and to assume the risks of the following:

1. Change in tax law.
2. Change in BTU content of the waste stream.
3. Change in the price of electricity.
4. Construction cost escalation.
5. Debt service.

The corporation proposed to charge a tipping fee of \$13.50 per ton for the first 438,000 annual tons and \$12.50 per ton for all subsequent tonnage. This tipping fee would escalate each year at the CPI. They also offered some alternative options. One would lower the first few years' tipping fee at the expense of higher out year tipping fees. Another would allow the corporation to take over the operation of the landfill and would offer a slight reduction in the tipping fee for tonnage beyond the first 438,000.

The corporation offered to provide SANDER staff with the assumptions that the corporation used in preparing their "best and final" offer. The corporation shared their computer printouts which in the opinion of the SANDER staff and consultants showed that the corporation's rate of return on its equity investment was quite low by industry standards.

In doing these calculations, the corporation did take a very conservative approach in their analysis. For instance, they were using 80% availability and a conversion efficiency of 540 KWH per ton of waste as compared with the 83% that and the 585 KWH used in the base case. In addition, they assumed that the equity amount that they would fund would be 25 percent of the total project cost rather than the more normal 20 percent.

One of the things that SANDER discovered in analyzing these printouts was 1987 energy prices were used instead of now 1988 prices. Instead of receiving 8.7 cents per KWH, the project was now eligible to receive 9.4 cents. Both of these values are held the same (levelized) over the first ten years of operation so the impact of this differential is substantial. The corporation shared 37 cents of the projected increased energy revenue with the agency. The average tipping fee for 657,000 tons per year was then established at \$12.80 per ton. The corporation also offered an energy sharing arrangement whereby, if the facility were to process more waste than the 657,000 or if the facility

were to be more efficient than 540 KWH per ton, then the excess energy receipts would be shared in 50/50 with SANDER.

This "best and final" proposal was taken to the Authority Board of Directors for their review and action. This package included both the economic analysis and the contract principles.

The Board approved the proposal and directed staff to complete contract negotiation and present the proposal to the City Council.

Sensitivity Analyses

Table 7 has been prepared to display some of the results of a typical sensitivity analysis using the base case with private ownership and \$35 million of equity input. The base case is first run on the Model to determine the present value of the project cost and the first year's tipping fee. The Model is then run with a single item changed to determine the effect on the present value and on the first year's tip fee. This process can be repeated for other variables. Thus the changes are not cumulative effects but only the result of the last change. Cumulative effects can be determined using the Model but that is left to the reader to do since there would be too many combinations that could be investigated and discussed.

There is no particular reason for choosing the factors shown in Table 7. The first that is shown in Table 7 is a reduction of the operational fee by the amount of \$1.0 million/yr. The base case assumptions for this fee was \$7.82 million plus \$2.165 million in passthrough costs. This change is slightly less than ten percent, yet it produces a \$12.8 million reduction in the present value of the facility. This is equivalent to a reduction of more than 16 percent of the original amount.

Changes in the value of energy also have significant impacts on the project cost. For this example, the value of electricity is lowered by one cent per kilowatt-hour, from 9.4 to 8.4. Remember that each of

these values is held for ten years resulting in an increase of the present value increases by \$16.8 million or more than 21 percent. On the other hand when the capacity credit, which is held fixed for twenty years, is increased by about eight percent or ten dollars to \$135 per kilowatt per year, the present value of the project cost is decreased by only \$2.0 million or by 2.5 percent.

Similar types of analyses were done for changes in plant efficiency and availability. Reducing the plant efficiency to 540 kilowatt-hours from 585 (less than eight percent) increases the project cost by \$12 million or more than 15 percent. An availability increase of three percent yields a present value cost decrease of more than seven percent or \$5.7 million.

Present value project costs are also strongly affected by bond financing rates. A single percentage increase in the rate for tax exempt bonds increases the project cost by \$15.7 million or almost 20 percent. Capital costs seem to move in a direct relation with project costs. For instance, by decreasing the capital cost (in today's dollar) by ten million the present value of the project cost decreased by \$11.6 million, or approximately one for one.

The impact of a year's delay on the project cost assuming everything else stays the same was an increase in the project cost of \$9.1 million for each year of delay.

For the agencies outside of California that do not have of a fixed value ten year energy price, the Model can determine energy costs which increase yearly starting at 5.75 cents per kilowatt-hour. Remember that the rate of inflation for energy is the same as it is for general inflation, i.e., six percent. In this case the project cost would be unaffected by the delay.

This type of analysis shows how different factors can vary in their impact on the project cost. Perhaps more importantly, a significant

variable for one agency may be of no concern for another. For example, the value of energy did not play a significant role in negotiations once that value became fixed. For another agency, however, the value of energy may be the determinant factor of project feasibility. The rate for tax exempt bonds, may be a concern when the bond market is volatile yet were it to stabilize, attention would quickly turn to more pressing concerns.

Having the Model gives an agency the flexibility to deal with these changing conditions. For negotiations this type of analysis will help the agency to focus on the more critical issues as well as to give the agency the perspective it needs to deal with each of these issues according to its importance.

TABLE 7

 SENSITIVITY ANALYSIS
 NO GATE FEE INCLUDED

	Base Case Put Owner- ship \$35.0 million Equity	Operation Fee \$-10 million	Value of Energy -1¢/KWH	Value of Capacity +\$10/KW/ Yr.	Effi- ciency -45KWH	Avail- ability + 3%	Bond Rate + 1.0%	Capital Cost -\$10 million	Project Delayed One Year	Project Delayed One Year Inflation CPI=6%
Present Value (Millions of \$)	-79.6	-66.8	-96.4	-77.6	-91.8	-73.9	-95.3	-68.0	-88.7	-
Change in Pres. Value (Millions of \$)	-	12.8	-16.8	2.0	-12.2	5.7	-15.7	11.6	-9.1	-0.1
Change in 1st Yr. Tip Fee (\$/Ton P.V.)	-	-2.02	+3.54	0.51	+2.65	-1.64	+3.89	-2.88	+2.16	+0.06
Actual Change in 1st Yr. Tip Fee (\$/Ton)	-	-2.95	+5.15	0.75	+3.72	-2.39	+5.66	-4.20	+5.40	+3.16

Corporate Ledger

The Model that has been developed also allows the agency to project the impacts on the corporation of various project financings.

Table 8 has been prepared to summarize some of the data that the Model is capable of producing. As before, these numbers have been run on the base case that is described in Appendix A. There are other assumptions implicit in these numbers that should be mentioned before proceeding.

It is assumed, for simplicity sake, that the corporation does not construct the facility, but does operate the facility. In the case of construction, it is assumed that the corporation does not profit and that it is insulated from loss. It has been assumed that the corporation will receive a 20 percent management fee.

There are tax credits that accrue during construction due to the investment that the corporation is making in the plant. These credits are generally known as investment tax credits. The actual equity investment that the corporation makes in the facility will vary according to the deal, from zero to 25 percent of the total project cost. In any of these cases the investment tax credit will be the same, i.e., ten percent of the total cost of the qualifying equipment and buildings.

The principal difference in the runs in Table 8 is whether the debt service is carried on the agency's books or on corporation's books. As this debt responsibility switches from the public side to private, other changes must occur to keep the books in general balance.

One of these is that energy revenues accrue differently. With public debt, generally, the energy revenues are shared, with the corporation typically getting from 10 to 25 percent with the balance going to the agency to retire debt. When the debt responsibility switches to the

corporation, these revenues also switch and will generally no longer be shared; 100 percent will accrue to the corporation.

Another thing that changes is that the corporation will charge a tip fee. By inserting a tip fee into the Model the corporation can determine its effect on factors such as the internal rate of return, the debt service coverage, and cash revenues. Since it affects each of these in a different way, there is no unique or easy way of solving for the tip fee given certain parameters as it is done for the agency's spreadsheet.

When the corporation agrees to underwrite bond repayment, the bond-holders will require a cushion for protection. Typically, this cushion is given in terms of the debt service coverage and they like to see 1.25 to 1.30 as minimums. Debt service coverage numbers have been omitted from the table in the case of public debt because they are not a product of calculations and do not show up on the corporate ledger of the Model.

As can be seen from Table 8, the bond issues that are required for each of these situations is significantly affected by the amount of equity that is invested. There is a multiplying affect associated with equity that is the result of reduced carrying costs during construction and reduced bond reserves that do not have to be funded when equity replaces bond funds.

Equity pay back is very rapid in all of these examples. This is due to the fact that funds are being earned during construction from the investment tax credits and also because depreciation of the facilities and equipment is completed during the first five years of operation. As a consequence, pay back occurs in the first to third year of operation.

Industry standards seem to dictate 30 to 35 percent as the minimum return on investment. This is probably due to the fact that larger corporations are able to obtain this type of return or greater on other

investments. A good rule of thumb for this rate of return is to take the prime rate plus 20 percent. Notice that the rate of return for the special credit deal is undefined since there is no equity investment. Net cash revenues over the presumed 20 year life of the project range from an average of about seven million dollars per year to about ten million.

In summary, what the Model does, is to give the agency a tool to uncover some of the facts relevant to a proposed plan from a corporate point of view. The Model needs to be used in a context of the political, business and economic realities.

TABLE 8
CORPORATE LEDGER SUMMARY

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Equity Investment (million of \$)	0	35.0	47.7	47.7	60.0	65.9	65.9
Bond Issue (million of \$)	234.1	181.9	166.0	166.0	151.3	153.3	151.3
Equity Pay Back Years of Operation)	N/A	1.1	1.9	1.7	2.4	2.7	2.6
Internal Rate of Return (%)	*	50	36	34	23	38	40
Net Cash Revenues (20 yrs.-millions \$)	176.8	197.4	184.4	176.4	141.0	135.1	152.9
Debt Service Coverage-1st Year	-	-	-	1.40	1.40	1.40	1.45
Debt Service Coverage-10th Year	-	-	-	1.24	1.14	1.14	1.22
Tipping Fee (\$/T) 1st Year	17.91	16.59	12.61	16.00	11.00	11.00	13.00
Tipping Fee (\$/T) 10th Year	40.21	39.21	35.32	27.03	18.59	18.59	21.97

NOTES:

Case 1 = Special Credit deal, public debt, shared energy revenues.

Case 2 = \$35 million equity, public debt, shared energy revenues.

Case 3 = 20% equity, otherwise same as Case 2.

Case 4 = 20% equity, private debt, initial tip fee = \$16.00/ton, no energy sharing.

Case 5 = 25% equity, \$11.00 tip fee, otherwise same as Case 4

Case 6 = Same as Case 5, except using financed equity.

Case 7 = Same as Case 6, except tip fee = \$13.00 (not corporations) and a coverage factor of 1.02 has been used.

* = Not defined; no equity input.

- = Debt on agency's spreadsheet; debt coverage of 1.02 used.

CHAPTER 5 - SUMMARY AND LESSONS LEARNED

INTRODUCTION

The goal of this project was twofold; first to simplify the task of comparing proposals received by an agency; and second to evaluate proposals during contract negotiations for the construction and operation of a resource recovery plant. An in-house computer model is particularly useful, if not imperative, to allow such comparisons when proposals are received that are predicated on widely differing financing plans and base assumptions. Once a corporation has been selected for negotiations, a computer model serves a very important function of developing a higher level of understanding of the proposal within the agency.

The computer model (Model) developed under this project has been designed for use by any agency planning a resource recovery project. To make that possible, the program has been written for two very common personal computers that are available on the market today. The cost of these machines is low and it is likely that most agencies already have a number of personal computers and that these are compatible with the program that has been developed. In any case, the goal has been to make this program as readily available as possible.

The remainder of this Chapter provides a brief discussion of the Model and a summary of lessons learned by the SANDER staff during its work in negotiating a waste-to-energy financing "Deal". Readers interested in more detailed information on the Model and its availability should obtain Volume II of this report "User's Guide".

THE COMPUTER MODEL

The Model that has been prepared for this project may be run on most minicomputers that have at least 64k of internal memory and at least 2 x

160k of disk storage. Included in the list of computers that will run this program is the Kaypro II, the IBM-PC, IBM compatibles, and most eight bit CP/M based computers. Software needs for running the Model require version 1.10 or later of Perfect Calc for the CP/M operating systems or version 2.0 of Perfect Calc for the IBM or IBM compatibles. Perfect Calc is an electronic spreadsheet developed by Perfect Software, Inc. and was part of the software package that came with the original Kaypros.

Unfortunately, the newer models of the Kaypro no longer come with the Perfect Calc software. This means that this software package will have to be purchased separately for a recently purchased computer. While this may be an inconvenience, it should not be a financial burden since it should be available for under \$200.

While there are currently better spreadsheets on the market for the IBM and its compatibles, those same spreadsheets are not available for eight bit machines. For eight bit machines, Perfect Calc is probably the best that is available and a version is also available for 16 bit machines such as the IBM. This is important since there is no requirement to write a new program file for the 16 bit computers after having written the program files for 8 bit computers. This is due to the fact that the program files that have been created are written in ASCII (typewriter characters) format and can thus be very easily transferred between 8 bit and 16 bit computers.

The method for transferring copies of the master files for the Model is simple and can take many forms. The easiest method is to obtain a copy of SANDER'S 5-1/4 inch diskette by mail from Public Technology, Inc. This will work only for users having a Kaypro or an IBM, since there has not been any standardization of the format that each machine manufacturer uses. As a consequence, other machines use formats that differ from each other and from those that SANDER has been using and thus are not able to read the Kaypro format or the IBM format. There are several ways around this; the most common way is through the use of a modem.

The modem is able to transfer files over the telephone with no real limit on the distance between the sending unit and the receiving unit. In order to make this type of transfer, however, it would be necessary that the receiver have a modem and a modem program. The modem is available at a cost as low as \$100 and as high as \$500. The modem program may be obtained from a software dealer for under \$100. Another way of doing the transfer is to purchase a software package for the non-Kaypro or IBM computer that is capable of reading foreign formats. Note that the software package must support either the Kaypro or the IBM formats.

The third simple method requires that two computers be utilized; one of which has the files in readable form, and the other, the computer to which the transfer of files is to be made. These two computers must be adjacent to one another and connected via their serial ports. The files are transferred using the "move" or the "pip" utility. The pin connections of the connecting cable must be carefully matched for this to work.

USE OF THE MODEL

Use of the Model is helpful at all stages of project development. Its greatest constraint is the need for the raw data. However, even with a limited base of data, calculations can be generated and results obtained. Obviously, greater accuracy and usefulness can be expected as your data base expands and becomes more precise.

This data, when used with the Model, would give an agency an indication of the approximate costs to pursue a resource recovery facility. This, then, could be compared with the costs of alternatives to allow preliminary decisions. In this way, substantial time and expense could be saved by the agency that wants to determine if an existing method of trash disposal is more economical.

NOTES ON THE FINANCING DECISION

As a learning experience, even though the Model is useful in determining costs to the agency and profits to the corporation, simply presenting these data to the corporation during negotiations will not necessarily be effective in getting the corporation to reduce its prices. Reductions of costs can only be obtained from a corporation that is committed to project development and against which, competitive pressures and leverage have been brought to bear. The Model and the results from its use will bring the agency an understanding of the new data and proposals brought to the negotiating table.

A second suggestion is to keep flexible. Always have an alternative plan, never make a premature decision, and fully understand and evaluate your proposals.

Finally, consider all costs, particularly the costs of risks that are to be assumed by the agency. This requires that the agency formulate some methodology for assessing the value of the risk that is being considered. A good example of this might be the BTU content of the waste. There may be substantial risk that a certain average level of heat content cannot be maintained. With data, such as a waste analysis and the experience of other facilities, you may be able to predict what your waste stream has in terms of heat content and how it varies with the day of the week and with month of the year. This information will then help the agency evaluate this risk.

APPENDICES

A - The "Base Case" For Analysis

B - Existing Waste-To-Energy Facilities

APPENDIX A

THE "BASE CASE" FOR ANALYSIS

The following paragraphs describe characteristics of a hypothetical facility that has been analyzed in the base case study. A tabular display of the input data for the data case is found in Volume I, Chapter 4. This facility is a mass burn facility capable of processing 1,500 tons per day of raw waste and of producing 36.5 MW of electricity at peak continuous operation. On average, however, only 80 percent of this peak capacity is available and as a consequence only 1,200 tons per day of trash are processed on a yearly average basis. This facility would be constructed during a 35 month period beginning in January of 1985 and would be completed in December of 1987. The facility would be designed, constructed, and operated by a private corporation whose contract would extend 25 years from the beginning of operations. Tax exempt bonds with a term of 20 years would be utilized to finance this facility.

Energy revenues during the initial ten years of operation would be leveled and would be paid at 9.4 cents per kilowatt-hour. Energy revenues in years eleven and beyond would be paid at the then current avoided cost rate. Additional energy revenue would be obtained from an annual capacity payment in the amount of \$127 per kilowatt of capacity that is dedicated to the utility at a minimum of 80 percent availability. Gate fees are generally assumed to be zero.

The cost of construction is 137.5 million dollars as a mid-January 1984. Bonds are able to be sold with an average coupon rate of 10.5 percent. Four percent of the principle from the bond sale is required for bond sale expenses. Construction funds are invested at the short-term rate of 9 percent; bond reserves (one year's worth of interest and principal payments) and working capital (\$2 million) are invested at the long-term rate of 12 percent.

Operation and maintenance fees as of the proposal date are \$7.8 million per year. Other costs, such as property taxes, utilities, insurance and bonds (sometimes referred to as passthrough costs) amount to \$2.2 million per year. Ash is assumed to be non-hazardous and to be generated at the rate of 30 percent (wet) of the incoming waste stream. The cost of ash disposal is \$7 per ton. All inflation rates are assumed to be 6 percent per year. All present value calculations use 10 percent as the desired rate of return.

Energy and capacity payments are assumed to be shared with the corporation. In years one through five, the corporation receives ten percent of these revenues. In the following five years the corporation's share increases by one percent each year to fifteen percent. Thereafter, the corporation's share increases by two percent per year until year 15 when the corporation will receive 25 percent of the revenues. In years 16 to 20 the corporation continues to receive 25 percent. In the years 20 to 25 it is assumed that all tip fees, all revenues, and all ownership rights accrue to the corporation.

In certain cases where there are analyses of the facility in years 21 through 40, the following assumptions have been made. Energy revenues are at the current avoided cost rate which is 5.8 cents per kilowatt-hour escalated at the standard 6 percent rate noted above. Capacity payments continue unchanged. There is no sharing of the energy or capacity payments. Finally, the availability of the facility starts out at 70 percent and declines at the rate of two percent per year.

APPENDIX B

EXISTING WASTE-TO-ENERGY FACILITIES

While the use of waste-to-energy plants is relatively new in the United States, there is sufficient history to warrant a comparison of some of the different plants.

In this appendix, eight official statements for waste-to-energy projects were reviewed, representing a cross-section of plants in the United States, a range of processing capacities and use of a variety of financing packages.

Listed below are the eight projects reviewed:

<u>Name</u>	<u>Location</u>
Cogeneration and Training Facility Project	Susanville, CA
Massachusetts Refusetech, Inc. Project	North Andover, MA
Ogden Martin Systems of Marion Inc. Project	Marion County, OK
Ogden Martin Systems of Tulsa, Inc. Project	Tulsa, OK
Pinellas County, Florida Resource Recovery Project	Pinellas County, FLA
Refuse Fuels Associates Project	Haverhill, MA
Southwest Resource Recovery Facility	Baltimore, MD
Westchester Resco Company Project	Peekskill, NY

Although similar in many respects, some dissimilarities should be highlighted. As discussed before, the tax benefits generally make it more economically feasible for private operation and ownership of waste-to-energy plants. Therefore, it is not surprising to find all the operations in these eight plants being performed by private companies. Ownership is also private in all cases except for the Pinellas County Florida Resource Recovery Project where the plant is owned by the

County of Pinellas. In the Florida experience, a State bond was issued and local officials decided that the tipping fee would be affordable even with public ownership.

As the main emphasis of this study is innovative financing, it is worthwhile to concentrate on some of the various ways the waste-to-energy projects were financed.

Probably the most distinctive financing package was used by the Cogeneration and Training Facility Project in Lassen County, California. The project was different to begin with due to its emphasis on training, and the fact that it is operated by the Community College District. But it also least resembles the other projects due to its use of Certificates of Participation to fund the project.

All of the other seven projects issued revenue bonds, serial and/or term bonds for funding. Occasionally, though, plants supplemented their needed monies with funds from loans and/or grants. The Refuse Fuels Associates Project received \$8 million in loans from the cities of Haverhill and Lawrence which were funded from proceeds of a United States HUD Urban Development Action Grant; the Westchester Resco Company Project received a \$27 million plus grant from the State of New York. Other supplemental monies have been supplied via Letter of Credit Notes (Southwest Resource Recovery Facility) and issues of subordinate bonds (Massachusetts Refusetech Inc. Project).

Cities and Counties which have identified the need for waste-to-energy plants and energy customers must by necessity work closely in the development of waste-to-energy projects. State and local issues impact greatly on the alternatives available when building a waste-to-energy

plant. Therefore, the project constraints identified in the early development of a project results in the wide diversification of the technologies used, location, ownership, and financing package as evidenced in the review of the eight projects herein.

The succeeding pages are charts on each of the eight projects reviewed. Each page represents one of the projects with facts on the type of plant, owner/operator information and a variety of data on the financing aspects.

<u>NAME</u>	COGENERATION AND TRAINING FACILITY PROJECT
<u>OWNER</u>	Bankers Leasing and Financial Corporation
<u>LOCATION</u>	Susanville, County of Lassen, California
<u>OPERATOR</u>	Lassen Community College District
<u>BONDS USED</u>	Certificates of Participation
<u>AMOUNT</u>	\$7,150,000
<u>ISSUER OF BONDS</u>	LASSEN COMMUNITY COLLEGE DISTRICT (LCCD)
<u>UNDERWRITERS</u>	Merrill Lynch White Weld Capital Markets Group
<u>ISSUE DATE</u>	October, 1982
<u>SECURITY</u>	Reserve Fund (for the certificate holders revenue lease payments by LCCD)
<u>INTEREST RATE</u>	7.5% - 9.75%
<u>TERM</u>	22 years
<u>RATINGS</u>	Standard & Poor's: BBB-Prov.
<u>TECHNOLOGY</u>	Mass burn (Bruun and Sorensen) 96 tons per day processing capacity steam/electricity generation
<u>ENERGY CUSTOMERS</u>	LCCD (steam for heating and its electricity needs) Pacific Gas and Electric (excess electricity) Nearby industries (excess steam)
<u>SPECIAL PROVISIONS</u>	Establishment of four funds Construction Fund Certificate Fund Reserve Fund Insurance and Condemnation Fund

NAME MASSACHUSETTS REFUSETECH, INC. PROJECT
OWNER MASSACHUSETTS REFUSETECH, INC. (a subsidiary of
 Signal Resco, Inc.)
OPERATOR MASSACHUSETTS REFUSETECH, INC.
LOCATION Town of North Andover, Massachusetts
BONDS USED Resource Recovery Revenue Bonds
 (Term Bonds)

AMOUNT \$160,000,000
 plus subordinate Stabilization Fund Bonds plus
 \$37,000,000 Private Placement Bonds

ISSUER OF BONDS Town of North Andover, Massachusetts acting through
 its Industrial Development Financing Authority

UNDERWRITER Smith Barney, Harris Upham & Co. Incorporated,
 et al

ISSUE DATE April, 1983

INTEREST RATE 10 1/8%

TERM 23 years

RATINGS

TECHNOLOGY Mass burn (Martin)
 1,500 tons per day processing capacity
 Steam/electricity generation

ENERGY CUSTOMER New England Power Company

SECURITY Service Fees payable by contract communities
 Bond Reserve Fund
 Mortgage interest in facility
 Service fees for disposal of waste

SPECIAL PROVISIONS Establishment of at least thirteen funds:

 Project Fund Debt Service Fund
 Capitalized Interest Fund Operation and Maintenance Fund
 Revenue Fund Pass-through Cost Fund
 Base Fee Fund Base Fee Credit Fund
 Taxable Bond Debt Service Fund Repair, Replacement and
 Separate Bond Reserve Funds Improvement Fund
 (for each series to which Contract Community Fund
 a Bond Reserve Fund Requirement Applies) Stabilization Fund

NAME OGDEN MARTIN SYSTEMS OF MARION, INC. PROJECT

OWNER Ogden Martin Systems of Marion, Inc. (a subsidiary of Ogden Corporation)

LOCATION Marion County, Oregon

OPERATOR Ogden Martin Systems of Marion, Inc.

BONDS USED Floating/Fixed Rate
Solid Waste and Electric Revenue Bonds

AMOUNT \$57,325,000 plus \$12,600,000 Initial Equity Capital

ISSUER OF BONDS Marion County Oregon

UNDERWRITERS Shearson Lehman/American Express Inc., et al

ISSUE DATE September, 1984

SECURITY Mortgage lien and security interest in facility

INTEREST RATE 6.9% variable

TERM 25 years

RATINGS Standard & Poor's: AAA/A-1+ (AMBAC Indemnity Corporation insured)

TECHNOLOGY Mass burn (Martin)
550 tons per day processing capacity
Electricity generating

ENERGY CUSTOMER Portland General Electric Company

SPECIAL PROVISIONS Establishment of 8 special funds
Project Fund
Revenue Fund
Debt Service Fund
Debt Service Reserve Fund
Fixed Rate Conversion Fund
Variable Rate Interest Reserve Fund
Renewal Fund
Permanent Credit Support Fee Fund

NAME OGDEN MARTIN SYSTEMS OF TULSA, INC. PROJECT

OWNER Ogden Martin Systems of Tulsa, Inc.
(a subsidiary of Ogden Martin Systems, Inc. (a
subsidiary of Ogden Corporation))

OPERATOR Ogden Martin Systems of Tulsa, Inc.

LOCATION Tulsa, Oklahoma

BONDS USED Solid Waste, Steam and Electric Revenue Bonds
(Serial Bonds and Term Bonds)

AMOUNT \$58,475,000 plus \$15,900,000 equity capital

ISSUER OF BONDS Tulsa Public Facilities Authority (a public trust
created for the use and benefit of the City of
Tulsa, Oklahoma)

UNDERWRITERS Stifel, Nicolaus & Company Incorporated, et al

ISSUE DATE May, 1984

INTEREST RATE 8.50 - 10.375%

TERM 23 years

LOANS \$58,475,000 from Tulsa Public Facilities
Authority (TPFA) evidenced by mortgage note.

SECURITY Pledge of Revenues; first mortgage lien and
security interest in facility

GRANT

RATINGS Standard & Poor's: AAA (MGIC Indemnity Corporation
Insured)

TECHNOLOGY Mass burn (Martin)
Steam/electricity generation
750 tons per day processing capacity

ENERGY CUSTOMERS Sun Refining and Marketing Company (steam)
Public Service Company of Oklahoma (electricity)

SPECIAL PROVISIONS Establishment of six funds

Project Fund
Revenue Fund
Debt Service Fund
Debt Service Reserve Fund
Contingency Reserve Fund
Renewal Fund

NAME PINELLAS COUNTY, FLORIDA
RESOURCE RECOVERY PROJECT

OWNER Pinellas County, Florida

OPERATOR PINELLAS REFUSETECH, INC. (Subsidiary of Signal
Resco, Inc.)

LOCATION Pinellas County, Florida

BONDS USED Solid Waste and Electric Revenue Bonds
(Serial & Term Bonds)

ISSUE DATE April, 1980

AMOUNT \$160,000,000

ISSUER OF BONDS County of Pinellas

UNDERWRITER Kidder, Peabody & Co.

INTEREST RATE 6 - 9%

TERM 23 years

RATINGS Moody's: Con. (A)
Standard & Poor's: A-p
2003 Term Bonds (guaranteed by Municipal Bond
Insurance Association): Moody's: Con. (A);
Standard & Poor's: AAA

TECHNOLOGY Mass burning (Martin)
Steam/electricity generation

SECURITY Pledged Revenues

ENERGY CUSTOMER Florida Power Corporation

SPECIAL PROVISIONS Establishment of seven funds.

Construction Fund
Revenue Fund
Debt Service Fund
Renewal, Replacement and Improvement Fund
Debt Service Reserve Fund
Reserve and Contingency Fund
Non-Ad Valorem Revenues Fund

NAME REFUSE FUELS ASSOCIATES PROJECT
OWNER SBR Associates, a Massachusetts general partnership
 whose partners are Citicorp Omega Lease, Inc. and
 New England Merchants Leasing Corporation B-13
OPERATOR Refuse Fuels Associates
LOCATION Resource Recovery Plant and Landfill will be in
 Haverhill, Massachusetts
 Thermal Converter, Steam Line and Power Plant will
 be in Lawrence, Massachusetts
BONDS USED Solid Waste Disposal Revenue Bonds
 (Serial & Term Bonds)
ISSUE DATE May, 1982
AMOUNT \$58,200,000
ISSUER OF BONDS Massachusetts Industrial Finance Agency
UNDERWRITERS Lehman Brothers Kuhn Loeb Incorporated
INTEREST RATE 10 - 12-5/8%
TERM 24 years
LOANS \$8,000,000 loans from the cities of Haverhill and
 Lawrence (proceeds from U.S. HUD Urban Development
 Action Grants - the "UDAG loans")
RATINGS Standard & Poor's: AAA (MGIC Indemnity)
TECHNOLOGY 1,300 tons per day processing capacity
 Burning of refuse derived fuel
 Steam generation
SECURITY Facility revenues including assignment of solid
 waste disposal and steam/electricity sales,
 contracts, insurance proceeds, right to draw on
 letters of credit.
SPECIAL PROVISIONS Ten funds established
 Revenue Fund Lease Rentals Reserve Fund
 Operating Fund Capital Equipment and
 Debt Service Fund Maintenance Fund
 UDAG Debt Service Fund Special Rent Reserve Fund
 Equity Fund Redemption Fund
 Tax Fund

NAME SOUTHWEST RESOURCE RECOVERY FACILITY

OWNER Baltimore Refuse Energy Systems Company,
Limited Partnership

LOCATION Baltimore, Maryland

OPERATOR Baltimore Refuse Energy Systems Company
Limited Partnership

BONDS USED Resource Recovery Revenue Bonds
(Serial & Term Bonds)

AMOUNT \$190,765,000 plus \$45,000,000 Letter of Credit
Notes

UNDERWRITERS Alex. Brown & Sons, Lazard Freres & Co., et al

ISSUER OF BONDS NORTHEAST MARYLAND WASTE DISPOSAL AUTHORITY

ISSUE DATE January, 1983

SECURITY Security Interest in Receipts, Mortgage
on the Real and Personal Property

INTEREST RATE 7% - 10-1/8% on bonds
(5-7/8% Letter of Credit Notes)

TERM 24 years

RATINGS Moody's Con.(A);
Standard & Poor's: Ap

TECHNOLOGY Mass burn (Von Roll)
Electricity generation
2,010 tons per day processing capacity

ENERGY CUSTOMER Baltimore Gas and Electric Company

SPECIAL PROVISIONS Project Completion Agreement
Additional Contributions Agreement

NAME WESTCHESTER RESCO COMPANY PROJECT

OWNERS Westchester Resco Company, L.P.
Limited Partner - John Hancock Mutual Life
Insurance Company

OPERATOR Westchester Resco Company, L.P., a Delaware Limited
Partnership (lessee)

MANAGING PARTNER WESI Westchester, Inc. (subsidiary of Wheelabrator
- Frye, Inc.)

LOCATION Peekskill, New York

BONDS USED Resource Recovery Revenue Bonds
(Serial & Term Bonds)

AMOUNT \$157,390,000 plus equity contributions
(\$51,715,000)

ISSUER OF BONDS County of Westchester Industrial Development
Agency

UNDERWRITERS Lazard Freres & Co., Merrill Lynch White Weld
Capital Markets Group, et al

ISSUE DATE October, 1982

INTEREST RATE 8% - 10 1/4%

TERM 23 years

GRANT Grants from the State of New York under the State
Environmental Quality Bond Act (\$27,865,000)

RATINGS Moody's: Con. (A), Standard & Poor's: Ap 2005 Term
Bonds (AMBAC insured): Moody's: Con.(A), Standard
and Poor's: AAA

TECHNOLOGY Mass burn (Von Roll)
Steam/electricity generation
2,250 tons per day processing capacity

ENERGY CUSTOMER Consolidated Edison Company of New York, Inc.

SECURITY Revenues, first mortgage lien and security interest
in the facility

SPECIAL PROVISIONS Project Completion Agreement
Additional Contributions Agreement

REPORT AND INFORMATION SOURCES

Additional copies of this report "Innovative Financing Plans for Privately Owned Waste-to-Energy Facilities: Volumes I and II", are available from:

Publications and Distribution
Public Technology, Inc.
1301 Pennsylvania Avenue, NW
Washington, DC 20004

For further information on the progress and status of the waste-to-energy facility in San Diego County, or for more information on energy management in the County, please contact:

Office of Special Projects
County of San Diego
1600 Pacific Highway
MS-A359
San Diego, CA 92101

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The preparation of this report was the responsibility of:

Nicole A. Clay

Kathy Warburton

Tom Erpelding

Merrillyn Carpenter

Laura Lopez

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