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REPORT TO THE CONGRESS 095050



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Using Solid Waste To Conserve Resources And To Create Energy

Environmental Protection Agency

**BY THE COMPTROLLER GENERAL
OF THE UNITED STATES**

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FEB. 27, 1975

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-166506

To the President of the Senate and the
Speaker of the House of Representatives

This is our report entitled "Using Solid Waste to Con-
serve Resources and to Create Energy."

We made our review pursuant to the Budget and Accounting
Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act
of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director,
Office of Management and Budget; the Secretaries of Defense
and the Interior; the Chairmen of the Interstate Commerce
Commission and the Federal Maritime Commission; and the
Administrators of General Services and the Environmental
Protection Agency.

A handwritten signature in black ink, reading "James B. Stacks".

Comptroller General
of the United States

C o n t e n t s

		<u>Page</u>
DIGEST		i
CHAPTER		
1	RESOURCE RECOVERY: WHAT IT IS AND WHY IT IS IMPORTANT	1
	The solid waste problem	1
	The material resources problem	4
	Resource recovery and recycling	5
	Legislation	8
2	PROGRESS IN IMPLEMENTING PROVISIONS OF THE RESOURCE RECOVERY ACT HAS BEEN SLOW	9
	Demonstration grants	9
	Studies and investigations	15
	Recommended guidelines	16
	Congressional concern over EPA's slow progress in implementing the 1970 act	16
	Other EPA-funded demonstration grants	17
	Conclusion	22
	Agency comments	26
3	MAJOR ISSUES CONFRONTING RESOURCE RECOVERY, RECYCLING, AND REUSE	29
	Freight rates	29
	Federal procurement	35
	Taxes	37
	Product controls	39
	Conclusion	41
	Agency comments	41
4	ENERGY RECOVERY FROM SOLID WASTE	43
	Potential use of solid waste as fuel	44
	Projects featuring energy recovery	45
	EPA's energy recovery research project	46
	Waste oil as an energy source	47
	Conclusion	47

	<u>Page</u>	
CHAPTER		
5	THE FEDERAL ROLE IN ASSISTING STATES AND LOCALITIES IN ESTABLISHING RESOURCE RECOVERY PROGRAMS	49
	Federal assistance provided to State and local governments	49
	State legislation and programs directed at resource recovery	53
	How the States view the Federal role in resource recovery	56
	Conclusion	59
	Recommendation to the Administrator of EPA	60
	Agency comments	61
6	SCOPE OF REVIEW	62
APPENDIX		
I	Letter dated October 31, 1974, from EPA to GAO	63
II	Description of certain EPA-funded demon- stration projects	67
III	Principal EPA officials responsible for activities discussed in this report	69

ABBREVIATIONS

CPU	Combustion Power Unit
EPA	Environmental Protection Agency
FMC	Federal Maritime Commission
GAO	General Accounting Office
GSA	General Services Administration
ICC	Interstate Commerce Commission
OMB	Office of Management and Budget

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

USING SOLID WASTE TO CONSERVE
RESOURCES AND TO CREATE ENERGY
Environmental Protection Agency 24

D I G E S T

WHY THE REVIEW WAS MADE

Recovery of materials and energy from solid waste (i.e., resource recovery) is becoming the focal point for attacking the mounting solid waste problem in the Nation's cities. Resource recovery reduces the volume of wastes requiring disposal and helps conserve dwindling material resources.

In view of the increasing public and congressional concern over solid waste disposal problems, GAO examined steps taken toward resource recovery with Federal assistance since the passage of the Resource Recovery Act of 1970.

FINDINGS AND CONCLUSIONS

Solid waste threatens to become the number one environmental problem in cost if not public concern.

Many major urban areas are, or soon will be, no longer able to use landfill and incineration for waste disposal because landfill space is being exhausted and incineration is being restricted due to resulting air pollution.

Although the thrust of the Federal Government's solid waste management activities was redirected from disposal to resource recovery by the 1970 act, progress has been slow. Several major unresolved issues hindered the development of resource recovery.

The Federal role in assisting States and local communities to establish resource recovery systems needs to be expanded.

Implementation of the
Resource Recovery Act

The Environmental Protection Agency was slow in implementing the resource recovery provisions of the 1970 act, generally, because of delays in becoming effectively organized. The Agency has since made improvements.

A major provision of the act provided for Federal grants to finance the *demonstration* of resource recovery systems. In the fall of 1972--2 years after the act was passed--grants of about \$20.4 million were awarded for four resource recovery demonstration projects to

- Lowell, Massachusetts;
- San Diego County, California;
- Baltimore, Maryland; and
- the State of Delaware.

These were the only demonstration grants awarded under the 1970 act.

The first of the four projects is expected to begin operations in 1975--the last in 1979. (See pp. 9 to 11.)

The fourth and largest grant--\$9 million--was awarded to the State of Delaware and was for a project which would principally produce humus, an agricultural-horticultural product used in growing plants and crops. Its principal use in this instance was for mushrooms.

The project had been rejected twice previously by the Environmental Protection Agency because

--it was considered to be uneconomical,

--purchase commitments were not obtainable for the humus, and

--it appeared the system would have little applicability nationwide.

These reasons were in accordance with criteria established by the Agency as a requisite for grants. Subsequently, the project was approved when additional funds were made available.

EPA officials told GAO that the project was approved because it would demonstrate technology different from that being demonstrated by other funded projects. The Delaware project ran into problems with the health aspects of humus production because of anticipated high levels of mercury and lead concentrations in the humus. The Environmental Protection Agency thereupon encouraged the State to change the project to principally an energy recovery project. As of early January 1975, an amended grant agreement was being finalized.

Agency officials told GAO that due to inflation the total cost of the Delaware project had increased to over \$17 million. To insure the State of 75 percent Federal funding, the officials are supporting Delaware's attempt to receive a grant of approximately \$4 million from the Environmental Protection Agency's waste water treatment construction grant program to cover the sewage-sludge portion of the project. Thus the Environmental Protection Agency will be providing about \$13 million in Federal funds for the Delaware project.

Similar systems are operating or are planned. For example, Bridgeport, Connecticut, is planning to construct a system without Federal funds where waste will be burned as fuel in oil-fired boilers--as is to be done in the Delaware project. The Bridgeport system is expected to be operating in 1977, 2 years before the Delaware project. (See pp. 11 to 15.)

The Environmental Protection Agency should make every effort to arrange with the parties involved in the Bridgeport project for an evaluation of their system. Such an arrangement would provide the Agency with necessary data at an earlier date and at substantially less cost than the Delaware project. The information obtained could then be used to assist other communities throughout the Nation in solving their solid waste and energy problems. (See pp. 22 and 26.)

The Environmental Protection Agency had funded--before the 1970 act--two successful

resource recovery demonstration projects:

- St. Louis and a local utility are cooperating to demonstrate the feasibility of burning shredded residential waste as a supplementary fuel to produce electricity in coal-fed boilers.
- In Franklin, Ohio, a wet-materials recovery process is being used to recover fiber for use in roofing materials. The system also is capable of producing energy and is to be used in a larger community where a 2,000 ton per day plant is to produce steam for electricity.
(See pp. 17 to 22.)

Other provisions of the act are discussed on pages 15 and 16.

Major issues confronting resource recovery

Three specific issues affecting the economics of resource recovery involve the Federal Government. These are

- possible discrimination in freight rates, a major cost element for recovered (secondary) materials;
- Federal procurement policy toward products containing recovered and recycled materials; and
- taxes which favor virgin materials over secondary materials. (See p. 29.)

Both the Environmental Protection Agency and the National Commission on Materials Policy have taken the position that

discrimination in favor of virgin materials over secondary materials appears to exist in railroad freight rates.

There are also at least two formal complaints concerning possible discrimination in ocean shipping rates. There is disagreement, however, about whether such discrimination exists and about what constitutes discrimination.

The Interstate Commerce Commission and the Federal Maritime Commission are responsible for railroad and ship freight rates, respectively, and are looking into the alleged discrimination.
(See pp. 29 to 35.)

Federal regulations in the past favored the purchase of products containing virgin materials. However, the President in March 1970 directed Federal agencies to undertake measures needed to direct their policies, plans, and programs to meet national environmental goals. For details of Federal Government efforts in this area see pages 35 to 37.

Some tax benefits, principally depletion allowances, are applicable to the virgin-materials industry and not to the secondary-materials industry. In its second annual resource recovery report to the Congress, the Environmental Protection Agency recommended that consideration be given to reevaluating such tax provisions.
(See pp. 37 to 39.)

Policies directed at regulating the volume of sales or physical characteristics are discussed on pages 39 to 41.

Resolution of these issues will continue to require a cooperative

effort on the part of the Environmental Protection Agency and Federal agencies responsible for these matters. (See p. 41.)

Solid waste as energy

Until recently little attention, if any, was given to the production of energy from solid waste such as trash, garbage or junk. Once processed, these wastes can either be fed directly into boilers and used to supplement primary fuel sources or they can be converted into other forms of energy including oil.

In 1974 energy recovery projects were under consideration, being planned, or under construction in at least 18 communities, and an additional 20 were making preliminary evaluations.

The price of and demand for imported raw materials has increased dramatically and the United States' reliance on foreign sources of raw materials is steadily increasing. Resource recovery systems which use organic waste to generate energy and recover and recycle inorganic waste--primarily metals and glass--can help make the United States more self-sufficient.

Resource recovery systems provide assistance in four important ways. These systems

- reduce air pollution;
- dispose of waste without using quantities of scarce land, particularly in urban areas;

--generate energy; and

--recover material resources, particularly the nonrenewables like iron and aluminum.

In addition, resource recovery and recycling help to conserve energy because in virtually every instance the use of secondary materials in production requires less energy than does virgin materials. The National Commission on Materials Policy estimated that about 2 percent of the Nation's energy demand could be saved by recycling available steel, aluminum, and paper waste.

Approximately 80 percent of the total annual municipal waste is combustible and could be used to generate energy if recovery were practiced in all major urban areas.

The energy produced would be equivalent to:

- About 1.5 percent of the Nation's total energy consumption.
- The Nation's entire energy consumption for residential and commercial lighting.
- More than one-half of the 1972 direct oil imports from the Middle East.
- Almost one-third of the energy that will be delivered by the Alaskan pipeline.

The Environmental Protection Agency should continue to promote development of materials-energy recovery systems. (See pp. 43 to 47.)

State and local assistance

The Environmental Protection Agency has provided some assistance to State and local governments under 3 solid waste programs--planning grants, the Mission 5,000 project (objective of closing 5,000 open dumps which was attained) and major technical assistance.

Some of the States GAO visited have already taken steps to provide local governments with State-financed assistance. New York State has begun financial assistance to local governments for resource recovery projects with the award of \$21 million to New York City and \$9 million to Monroe County. Connecticut has established a comprehensive statewide resource recovery plan with the principal element being the processing of solid waste into fuel. Under the plan the 10 facilities to be constructed throughout the State during a 10-year period are to process about 84 percent of the State's waste. The first facility is being constructed in Bridgeport. (See pp. 49 to 56.)

The National League of Cities, the United States Conference of Mayors, and the Council of State Governments all have pointed to a need for more Federal assistance. All the State officials GAO talked to believed that Federal financial and non-financial assistance is warranted. (See pp. 56 to 60.)

RECOMMENDATION

The Administrator of the Environmental Protection Agency should provide expanded assistance to

States and local communities to solve their solid waste problems through establishment of resource recovery systems. (See p. 60.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

The Environmental Protection Agency stated that, although it accepted responsibility for the early delays in implementing the resource recovery program, it felt the program currently has a strong technical base, is well organized, and is moving ahead positively. (See p. 26.)

The Agency also stated that it completely agreed with GAO's recommendation to provide expanded assistance to States and local communities. (See p. 61.)

GAO questioned the need for spending \$9 million on the Delaware project and suggested that EPA attempt to obtain the data from the Bridgeport project necessary to evaluate the burning of solid waste in oil-fired boilers.

In commenting on this matter, EPA maintained its position that funding for the Delaware project was justified. The State of Delaware took a similar position. (See p. 26.)

EPA stated the value of the project to be the demonstration of the (1) burning of solid waste in oil-fired boilers, (2) composting of sewage sludge with solid waste to produce a pathogen-free humus, and (3) maximum recovery to reduce landfilling to a minimum. An EPA official told GAO that the purpose of the humus recovery was to demonstrate the marketability of

humus and that the technology had been sufficiently demonstrated. (See pp. 26 and 27.)

Connecticut's resource recovery project at Bridgeport will use solid waste as supplementary fuel in oil-fired boilers and is expected to become operational about 2 years before the Delaware project.

Connecticut officials told GAO that they would be receptive to entering into an agreement whereby the Environmental Protection Agency could obtain the data necessary to assess the technical and economic feasibility of such a system. (See p. 27.)

Company officials at the composting pilot plant for the Delaware project told GAO that they believed the marketability of the compost has been demonstrated. (See pp. 27 and 28.)

GAO believes that the maximum recovery of energy and material

and minimum landfilling has already been demonstrated at resource recovery operations in St. Louis, Missouri, and Franklin, Ohio, and will be demonstrated at other facilities before operation of the Delaware project. (See p. 28.)

MATTERS FOR CONSIDERATION BY
THE CONGRESS

Information contained in this report will be useful to the Congress in determining the dimensions of future legislation concerning solid waste disposal, recovery of resources from solid wastes, conservation of resources, and energy development.

The Congress will also be interested in the observations presented in this report regarding EPA's decision to finance a \$9 million demonstration project before determining that the necessary economical and technical data cannot be obtained from another source.

[This report is printed on recycled paper.]

CHAPTER 1

RESOURCE RECOVERY: WHAT IT IS AND WHY IT IS IMPORTANT

Resource recovery is the recovery of materials and energy from solid waste. In this report we discuss the Environmental Protection Agency's (EPA's) actions to implement the Resource Recovery Act of 1970 (42 U.S.C. 3251), the benefits of resource recovery and the major issues confronting it, and States' and cities' activities in this area and their views on actions needed to increase resource recovery. The EPA organization responsible for implementing the act is the Office of Solid Waste Management Programs.

THE SOLID WASTE PROBLEM

Solid waste can be defined as any waste that does not go "up the stack" or "down the drain." It is the residue of production and consumption--the most conspicuous examples being (1) the contents of the household garbage can which includes bottles, cans, and paper, (2) automobiles and appliances that have served their useful life, and (3) general litter. Solid waste also includes wastes from agriculture, animals, and mineral processing.

The volume of solid waste is huge and rapidly increasing. EPA estimated that in 1973 it amounted to over 4 billion tons--up almost 1 billion tons since 1967. Underlying this increase are some basic economic factors: rising population, increasing affluence, and trends towards convenience packaging and disposable products. Also, increasingly stringent air and water pollution control measures cause wastes that previously were burned or dumped into our Nation's waters to accumulate or to be disposed of in other ways.

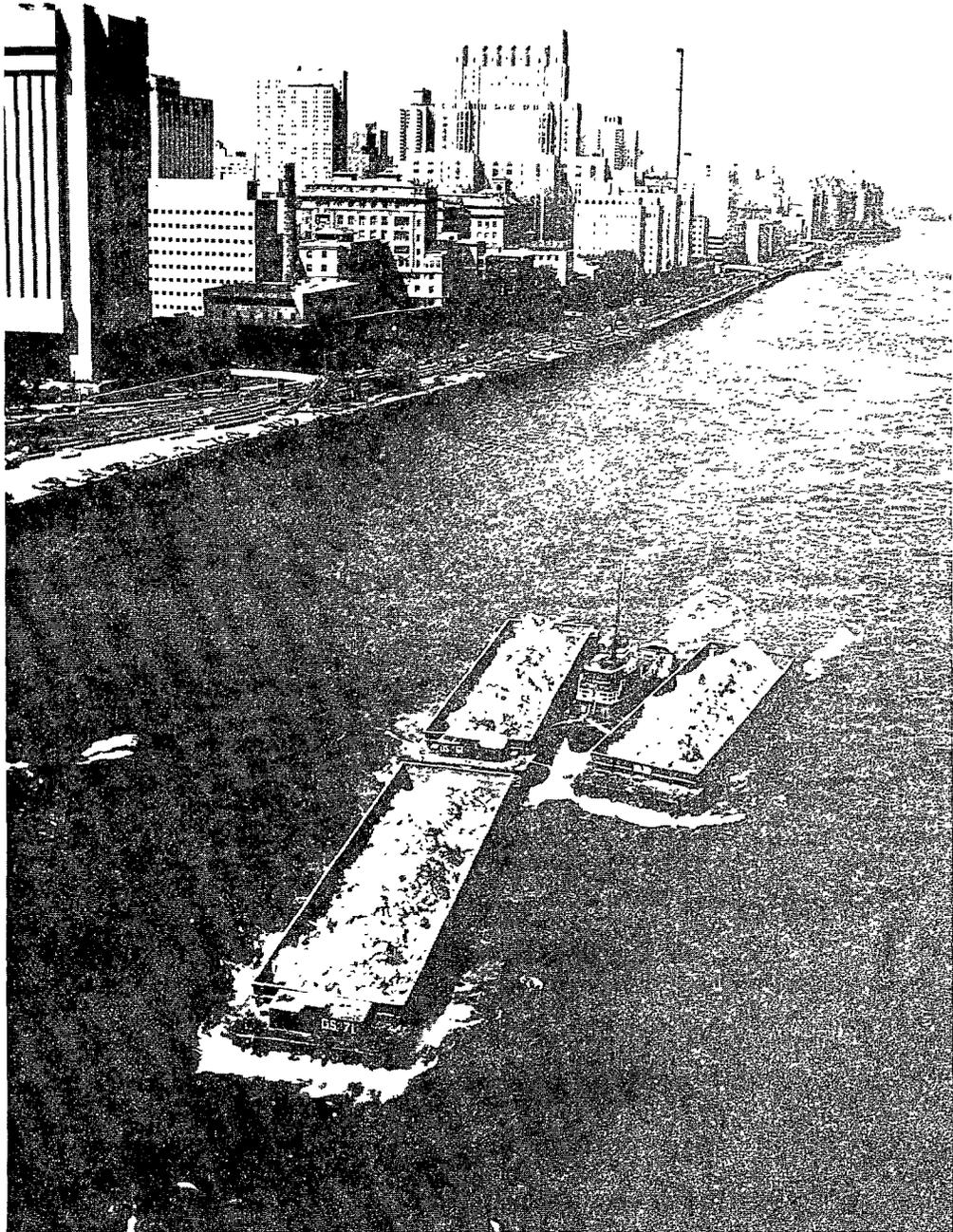
Although waste collected from homes and businesses--known as postconsumer and municipal waste--amounted to only 134 million tons in 1973, its management requires large and continuous efforts because it is highly visible, is generated in areas with limited storage or disposal space, and, if not efficiently managed, presents a threat to public health. In our review we emphasized this category of waste because of its impact on people and the environment and also because of its potential for conversion into useful materials and energy. (See photographs on pp. 2 and 3 showing municipal disposal.)

Presently, most industrial wastes (wastes resulting from industrial operations and scrap derived from products or structures which have served their useful life) are already being recycled. Any significant increase in the supply



Solid waste disposal outside New York City. Note Empire State Building in background.

CREDIT: The Record, Hackensack, New Jersey



New York City garbage being towed to sea from the East River.

CREDIT: EPA-Documerica, Gary E. Miller

of secondary materials is expected to come from mixed municipal refuse.

Many of our Nation's larger cities are already spending more for solid waste management than for air and water pollution control; solid waste management often ranks as the third largest expenditure, funded solely from local revenues. EPA estimated that in 1973 the Nation was spending about \$3.35 billion a year to collect and dispose of municipal solid waste--an average of \$26 per ton. EPA also estimated that by 1985 these costs would increase by at least 50 percent.

The most common method of disposing of solid waste in the United States today is by landfill. Incinerators have long played a significant role in extending the life of landfills because they can consume up to 95 percent of waste input by volume. Ultimately, about 90 percent of all collected wastes are disposed of in some sort of land disposal operation, ranging from open dumps to sophisticated sanitary landfills.

Major urban areas, such as New York City where it costs almost \$43 a ton to collect and dispose of solid waste, are rapidly running out of nearby landfill spaces. Also, many cities may be required to shut down their incinerators in the future because they are not appropriately equipped to meet air pollution control standards; some already have done so.

THE MATERIAL RESOURCES PROBLEM

The United States, with about 7 percent of the world's population, consumes almost half of the world's industrial materials. In an April 1972 report, the National Commission on Materials Policy, which was established by the Resource Recovery Act of 1970, stated that it was becoming increasingly evident that the gap between our Nation's materials requirements and the remaining easily accessible world supplies was widening. The Commission stated that as a result, our Nation's reliance on foreign sources of raw materials was steadily increasing. A 1973 Department of the Interior report noted that our Nation's trade deficit for such materials--which in 1972 was \$6 billion--could grow to nearly \$100 billion a year by the year 2000.

According to the Department of Interior's report, in 1972 the United States imported all of its requirements for platinum, mica, chromium and strontium; more than 75 percent of its cobalt, tantalum, aluminum, manganese, fluorine, titanium, asbestos and tin; and more than 50 percent of its bismuth, nickel, columbium, antimony, gold, potassium, mercury, and zinc. The Commission stated that, as our

Nation's needs continue to grow and as per capita consumption of materials in other countries increases at an even faster rate than ours, it will become increasingly difficult for the United States to fill its ever growing needs by importing.

RESOURCE RECOVERY AND RECYCLING

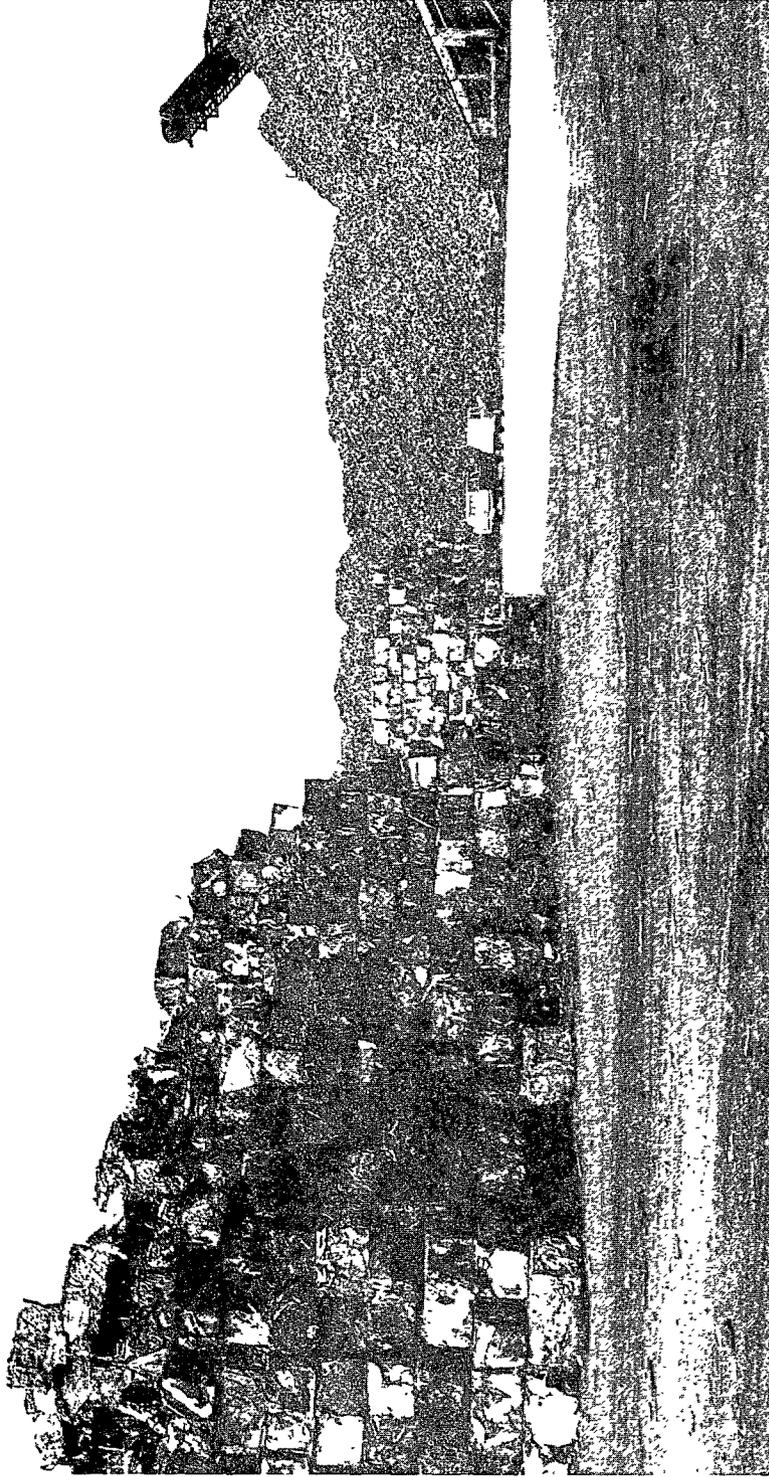
Resource recovery is simply the recovery of useful materials and energy from solid waste. Recycling involves using recovered resources. Examples of recycling are using waste paper in making new paper, crushed glass in making new glass, and scrap iron in making steel. (See pp. 6 and 7 for photographs of scrap and a product made from it.) Recycling also involves using recovered materials for other purposes, such as to produce steam to generate electricity or to produce gases and oil for fuel.

The two primary advantages of resource recovery and recycling are (1) reducing the volume of wastes otherwise requiring disposal and (2), more importantly, conserving scarce natural resources. Other advantages included:

- Reduced energy requirements and reduced environmental impact in the making of new goods because generally the use of secondary materials in production generates less air pollution, water pollution, and mining and process wastes and requires less energy than does the use of virgin materials.
- Alleviating balance of payments problems and dependency on foreign sources of supply by reducing the volume of materials that are imported.
- Reduced scenic blight, land pollution, and health hazards that result from improper disposal methods.
- Reduced cost of waste disposal and related problems.

Resource recovery systems are of two basic types. One is referred to as a front-end or a materials-recovery system which separates the inorganic from the organic portion of wastes; the inorganic portion is further separated into its major components, ferrous and nonferrous metals and glass. (Ferrous metals are those that contain iron and therefore can be magnetically separated.)

The second type of recovery system is called a back-end system, designed to use the organic portion of wastes primarily through energy recovery. By using both systems almost total resource recovery can be achieved.



Scrap bundles on left, shredded scrap on right.

CREDIT: Institute of Scrap Iron and Steel



Concrete being poured on top of steel rods made from shredded cars.

CREDIT: EPA-Documerica, Bill Shrout

LEGISLATION

The Solid Waste Disposal Act (Act) (42 U.S.C. 3251), the first major Federal legislation to deal with the solid waste problem, authorized a program to develop an efficient means of collecting and disposing of the millions of tons of solid waste generated by our society each year. The Resource Recovery Act of 1970, enacted on October 26, 1970, amended the Solid Waste Disposal Act to redirect the thrust of waste management from disposal to resource recovery and recycling and provided authority for the program until June 30, 1973. Public Law 93-14, enacted on April 9, 1973, provided a 1-year extension to June 30, 1974. Public Law 93-324, enacted on June 30, 1974, provided appropriations for fiscal year 1975.

The major amendments to the Act were the addition of section 208 which provides for grants to State and local agencies to demonstrate resource recovery systems and the addition of section 205 which requires EPA to conduct studies and investigations of issues relating to resource recovery. The act defined a resource recovery system as a solid waste management system which provides for collecting, separating, recycling, and recovering solid wastes and disposing of non-recoverable waste residues.

CHAPTER 2

PROGRESS IN IMPLEMENTING PROVISIONS OF THE RESOURCE RECOVERY ACT HAS BEEN SLOW

The Solid Waste Disposal Act of 1965 provided for technical and financial assistance to States, local governments, and interstate agencies to plan, develop, establish, and conduct solid waste disposal programs. It also provided the basis for a program of research to develop and apply new and improved methods of solid waste disposal.

Although considerable progress was made in State and local planning under the 1965 act, the Congress believed that additional efforts were needed. In its report on the bill to extend the act, the Senate Committee on Public Works stated that the only long-term solution to the solid waste problem was a shift from the use-and-discard approach to a closed cycle of use, salvage, reprocess, and reuse. The Resource Recovery Act of 1970 was passed to emphasize this approach.

The Resource Recovery Act of 1970 had an initial 3-year authorization. The Congress intended to review the activities carried out under the act after it had been in existence for about 2 years before deciding whether it should be extended in its present form or modified. However, because of delays in becoming effectively organized, EPA was slow in implementing the resource recovery provisions of the act.

EPA has since made improvements in carrying out these provisions. The act was extended from June 30, 1973, and June 30, 1974, to provide additional time for the Congress to determine the future of the program. The act has now been extended to June 30, 1975. New legislation making major modifications to the current program is being developed and is expected to be enacted during the extension period.

DEMONSTRATION GRANTS

Section 208 of the Solid Waste Disposal Act, as amended, provides for grants to finance the demonstration of resource recovery systems. It was not until the fall of 1972--2 years after the act was passed--that EPA awarded grants for demonstration of four resource recovery projects. The technology to be used in two of the projects was ready to be demonstrated at least 1 year earlier, according to officials involved in the projects. The first of these four demonstration projects--which received the only grants awarded under the amended act--is estimated to become operational in 1975 and the last in 1979.

Before the grants were awarded there had been considerable interest in demonstrating resource recovery systems as evidenced by letters of intent to apply for and/or proposals for grants. By June 1971 EPA had received over 80 such letters of intent which by October 1971 had increased to 144.

The Office of Management and Budget (OMB), Executive Office of the President, required EPA to complete state of the art studies before releasing the \$11.5 million initially appropriated for demonstration projects. According to an EPA official, OMB sought assurance that technology was available for demonstrating resource recovery systems.

Upon establishing EPA's resource recovery division in December 1971, six people were assigned to the program, and work on developing procedures and criteria for funding demonstration grants was accelerated. No staff had been exclusively assigned to do this work before. The division director met with OMB officials at that time, and they agreed that the demonstration grant funds would be released on the basis of criteria being developed for funding the demonstration grants.

In March 1972 this work was approved and EPA publicly requested preproposals for resource recovery demonstration systems. The deadline for submitting preproposals was May 8, 1972. On April 4, 1972, OMB released the demonstration grant funds. EPA reviewed 65 preproposals which resulted in EPA's consideration of 17 final proposals. On September 8, 1972, EPA awarded almost all of the \$11.5 million--the total amount appropriated--for three demonstration grants for projects in Lowell, Massachusetts (\$2.4 million); San Diego County, California (\$3 million); and Baltimore, Maryland (\$6 million). When the Congress appropriated an additional \$15 million for the demonstration grant program for fiscal year 1973, EPA selected a fourth project from the final proposals and awarded a \$9 million grant to Delaware on October 26, 1972.

EPA had requested a total of \$4.1 million in demonstration grant funds for fiscal years 1971-73. However, the Congress appropriated \$26.6 million, of which approximately \$20.4 million was obligated for the four demonstration projects.

The Baltimore project is scheduled to be fully operational in 1975 and the waste is to be used to generate steam. At Lowell solid waste incinerator residues--steel, nonferrous metals and glass--are to be recovered and sold beginning in 1976. In 1976 construction is to be completed on a project in San Diego County where wastes are to be processed into oil and used as a supplementary fuel by a

local utility company. A description of these projects is in appendix II.

The Delaware project has had difficulties which required a change in its scope. As of early January 1975 an amended grant agreement was being finalized. Pertinent details of the problems surrounding the project are below.

Delaware project

In response to EPA's March 1972 solicitation for pre-proposals for resource recovery demonstration projects, Delaware submitted an application proposing a project whose principal product was to be humus, an agricultural-horticultural product used in growing plants and crops. Delaware proposed to market the humus principally for use in growing mushrooms. The process was also intended to recover ferrous and nonferrous metals, glass, and carbon and to produce fuel to operate the driers used in producing humus.

In a letter dated June 15, 1972, EPA notified the State not to invest its time and effort in submitting a formal application. EPA took that position primarily because the proposed system was considered economically unfeasible for the area served because (1) purchase commitments were not obtainable for the humus product and (2) the system would have little nationwide applicability due to its limited product marketability. These reasons were in accordance with EPA's criteria for awarding resource recovery demonstration grants.

Nevertheless, Delaware submitted a formal application which EPA reviewed with the 16 other formal applications. EPA ranked the Delaware project 13th in comparison with the other applications. On September 8, 1972, EPA notified the State that it was unable to approve its application basically because of the relatively unattractive economics of the proposed system and because it appeared the system to be demonstrated could not be duplicated in communities throughout the country.

On this same date--September 8, 1972--EPA awarded three resource recovery demonstration grants for projects to Lowell, San Diego County, and Baltimore. The award of these three grants obligated \$11.4 million of the \$11.5 million appropriated for the demonstration grants. On August 22, 1972, a bill had been enacted which appropriated an additional \$15 million for demonstration projects, and in October 1972 OMB released \$9 million in demonstration grant funds.

On October 20, 1972, the Acting Assistant Administrator, Office of Categorical Programs, sent a memorandum informing

the EPA Administrator of the decision to award the grant. The memorandum stated that throughout the history of the project EPA strongly opposed Delaware's pursuit of a resource recovery facility built around the technology of composting for the principal reason that facilities producing compost had a history of failure. The memo also stated that EPA's reasons for turning down the Delaware application had been: (1) the type of facility proposed had no national applicability, (2) the capital and operating costs of the facility were among the highest proposed, and (3) the facility was basically a compost plant making use of technology which was well known and already demonstrated. On October 26, 1972, EPA awarded a \$9 million resource recovery demonstration grant to Delaware for the project which it had previously rejected. The total cost of the project was estimated to be \$13.8 million.

We met with the Deputy Assistant Administrator for Solid Waste Management Programs and the Director of the Resource Recovery Division on November 2, 1972, to obtain the rationale for awarding this grant. These officials told us that they believed the \$11.5 million which had been appropriated in fiscal year 1972 to fund section 208 demonstration projects was sufficient to fund all of the technology which they felt appropriate to demonstrate. They said that, when the additional \$15 million was appropriated, the decision was made to demonstrate technology different from what they were planning to fund under the other three grants which was basically technology for the recovery of materials or energy through some form of combustion. These officials also said, of the final applications received, composting was the only process that was different from the projects being funded. There were only two composting projects submitted and one was too small for demonstration. Therefore, the Delaware project was selected.

A condition to the grant agreement required Delaware to satisfy EPA that no adverse health effects would result from using the humus product in growing mushrooms; no consideration was to be given to funding the project beyond the design stage until this condition was resolved.

In August 1973 EPA informed the State that the Food and Drug Administration of the Department of Health, Education, and Welfare, upon analyzing preliminary data received from Delaware, was particularly alarmed by the high levels of mercury and lead concentrations that would be in the humus. EPA further stated that the use of humus as a mushroom compost ingredient faced many obstacles and its use in any agricultural market may be questionable.

EPA stated that the demonstration of the use of compost as a fuel as suggested by the State was unacceptable and that if the State wanted to market waste as a fuel the system under use by St. Louis which used shredded waste as a fuel (see p. 17) should be considered instead of an expensive composting system.

EPA felt that the State had three options. One option was for the State to further analyze the health aspects of the humus before proceeding any further with the project. The second option was for the State to proceed with the design of the project and conduct comprehensive health-effects testing. Both of these options would require additional expenditures by the State without assurance of subsequent EPA funding.

The third option provided for EPA funding and was accepted. EPA informed the State that it could change the scope of its project to demonstrate a solid waste fuel recovery system similar to the St. Louis project's and EPA could fund the project at 75 percent of the total cost--maximum allowed under the grant program--or \$9 million, whichever was less.

In an April 1974 discussion with EPA's Chief, Grants Operations Branch, Grants Administration Division, we pointed out that the three previous demonstration grants were based on evaluations of competitive proposals and the need to demonstrate previously undemonstrated resource recovery systems. Since the Delaware project had evolved into a project similar to the successful St. Louis project which is being actively considered for adoption by other municipalities, we questioned whether the continued funding of the project would effectively further the objectives of the resource recovery demonstration grant program.

We were informed that EPA planned to go ahead with the funding of the \$9 million demonstration grant to Delaware for the revised project. EPA officials stated that the only significant change in the project was the shift from production of humus to production of energy. In addition, any humus that will be produced will not be used in connection with food products.

EPA officials informed us that due to inflation the total project cost had increased from an estimated \$13.8 million to over \$17 million. To insure 75 percent funding of the project EPA agreed to support Delaware's attempts to obtain an EPA water construction grant of approximately \$4 million to fund the sewage sludge portion of the facility. At the time of the original award, the project's sewage sludge system would have been funded from the \$9 million

demonstration grant. EPA is finalizing an amended grant agreement for the Delaware project containing special conditions which the State must meet to insure Federal funding.

According to EPA grant documents, the estimated cost of the project has increased from \$13.8 to \$17.4 million and we have been advised it probably will go higher. Although EPA's solid waste funding has not increased, the Federal share has by the proposed use of \$4.1 million in municipal waste water treatment construction funds. This brings EPA's total estimated share to \$13.1 million. However, the State's contribution of the eligible costs has decreased from \$4.7 to \$4.4 million. EPA officials said that the State was to pay for all cost overruns. The exception would be the cost attributable to any overruns on the water construction grant, which is to be for the sewage-sludge portion of the facility. Any overruns on that grant, which the State anticipates receiving, would be shared between EPA--75 percent--and the State--25 percent.

The EPA project officer acknowledged that the Delaware project (as amended) was similar to the on-going, EPA funded St. Louis project in that prepared solid waste will be used to supplement fuel in existing steam-electric boilers. However, he stated that a major difference between the two projects was that the boilers in St. Louis burn coal and the boilers in Delaware burn oil. He believes that, because most utilities in the Northeast burn oil and because the Northeast has a critical solid waste disposal problem, an evaluation of such a system would be valuable.

The project officer also believes that the proposed Delaware project will be valuable because it will have the capability of composting sewage sludge with solid waste to produce a pathogen-free humus at a lower cost than that of other available sludge disposal alternatives. Finally, he believes that the project will demonstrate maximum recovery of materials and energy which will reduce the amount of residue to be landfilled.

Connecticut and others are planning to implement systems similar to the Delaware project's where waste fuels will be burned in oil-fired boilers. An example is a planned project for Bridgeport, Connecticut, being designed, constructed, and operated by a private contractor. The Bridgeport system is expected to be operating in 1977, 2 years before the Delaware project. Therefore a question arises whether EPA should proceed further with the Delaware contract at this time in the absence of definite knowledge that appropriate arrangements cannot be made to obtain the pertinent data from the Bridgeport project.

However, EPA is proceeding with the Delaware project without making any effort to determine whether pertinent data on the Bridgeport system could be obtained from the parties involved to enable it to determine the technical and economical feasibility of such systems. We believe that if such an agreement were successful it would provide EPA with an evaluation of the system at an earlier date and at substantially less cost to the Federal Government.

While EPA is finalizing the amended grant agreement for the Delaware project--over 2 years after the original award--Delaware is in the process of preparing a Request for Proposal to select a contractor for the project.

STUDIES AND INVESTIGATIONS

The second major provision of the 1970 act is contained in section 205 which requires EPA to undertake studies of important issues relating to resource recovery and recycling. These issues include

- changes in current product characteristics and production and packing practices which would reduce the amount of solid waste;
- methods of collection, separation, and containerization;
- the use of Federal procurement to develop market demand for recovered resources;
- recommended incentives and disincentives to accelerate the reclamation or recycling of materials from solid wastes;
- the effect of existing public policies, including subsidies and economic incentives and disincentives; and
- the necessity and method of imposing disposal charges or other charges on manufactured goods.

The section also requires EPA to submit an annual report to the President and the Congress on the results of such studies and investigations.

The Resource Recovery Incentives Branch of the Resource Recovery Division--responsible for section 205 studies and investigations--was not established until April 1972. EPA did not provide adequate staff to carry out this section of the act until September 1972, 2 years after enactment.

According to an EPA official, 21 studies have been undertaken which met the requirements of section 205. Two of these studies were initiated before enactment of the law, 2 in fiscal year 1971, 1 in fiscal year 1972, 11 in fiscal year 1973, and 5 in fiscal year 1974. As of January 1975, 17 studies had been completed and 15 final reports had been issued to EPA.

EPA has issued two annual reports. The initial annual report, with primary emphasis on the recovery of materials and energy from mixed municipal wastes and other postconsumer wastes, discussed the many questions surrounding the complex subject of resource recovery. The second report summarized EPA's findings from its studies and contained recommendations on the issues of freight rates, Federal procurements, and taxation policies which give benefits to virgin materials. (These aspects are discussed in Chapter 3 of this report.)

RECOMMENDED GUIDELINES

Under section 209 of the Act, as amended, EPA is required to develop guidelines for solid waste recovery, collection, separation, and disposal systems. Although these guidelines were to be issued to activities outside the Federal Government on an advisory basis, section 211 of the act required that they be obligatory standards for federally operated, licensed, or permitted activities. In its report on the act, the Senate Committee on Public Works stated that it expected such guidelines to be issued promptly for conventional solid waste management techniques such as sanitary landfill, incineration, and dumping.

In April 1973 EPA published proposed guidelines for land disposal of solid waste and thermal processing of solid waste and issued the final version in August 1974. In addition, EPA officials informed us that draft guidelines were being prepared for resource recovery and related methods of collection, separation, and disposal of solid waste. Officials stated that they expected final guidelines to be issued in October 1975.

CONGRESSIONAL CONCERN OVER EPA'S SLOW PROGRESS IN IMPLEMENTING THE 1970 ACT

The act's legislative history shows that the Congress intended to review the program approximately 2 years after enactment before deciding whether the program should be extended as is or modified. The Congress had criticized EPA's slow progress in implementing the 1970 act--particularly with respect to demonstrating resource recovery systems and conducting the studies and investigations required by the act.

During 1971 hearings by the Senate Committee on Appropriations on EPA's fiscal year 1972 budget request, a Committee member stated that the demonstration of resource recovery systems should move ahead more rapidly than at the rate of two projects a year that EPA had proposed. He further stated that such a plan would be "woefully insufficient" in developing the answer for handling our Nation's solid waste. Again in March 1972 when the Senate Committee on Appropriations was holding hearings on EPA's fiscal year 1973 budget request, the same Committee member said that demonstration grants were simply inadequate when the Nation was faced with a \$5 billion a year solid waste cost.

In August 1972 the Subcommittee on Air and Water Pollution, Senate Committee on Public Works, held a hearing on the implementation of the 1970 act. The presiding Committee member pointed out that, although the act was nearly 2 years old and the results of the required studies and investigation were to be reported annually to the Congress, no guidance from EPA had been received on the crucial issues involved. He further stated that effective and progressive action was needed immediately and that delay in these studies as well as in the requesting of necessary funds was inexcusable.

In a September 1972 letter to EPA, the Chairman of the Senate Committee on Public Works stated that he recognized some delay in developing strategies for implementing the 1970 act may have been occasioned by the reorganization of the solid waste program. But he said he could not overemphasize the importance of the reports required under the act as an aid to the Congress and to others in developing solutions to critical solid waste problems. He further stated that it was essential that EPA move more vigorously to implement the policy directives which the Congress adopted in the 1970 act.

OTHER EPA-FUNDED DEMONSTRATION GRANTS

Although EPA was slow to implement the 1970 act, EPA had funded, before enactment of the act, two successful resource recovery demonstration projects now in operation. Municipalities have shown considerable interest in these systems. One project is in St. Louis, Missouri, where shredded waste is being used as a coal supplement by the local electric company; the other is in Franklin, Ohio, where municipal waste is processed into paper fiber which is used by a local roofing manufacturer. Metals are recovered at both projects and glass is also recovered at the Franklin project.

St. Louis project

The St. Louis project originated from a study initiated by the City of St. Louis in 1968 with Federal financial

assistance. This study, completed in 1970, showed that it was feasible to recover energy by burning shredded residential solid waste as supplementary fuel in boilers. The initial demonstration grant was awarded in July 1970 and the project became operational in April 1972. Project costs have amounted to \$3.9 million, of which the Federal share was \$2.6 million.

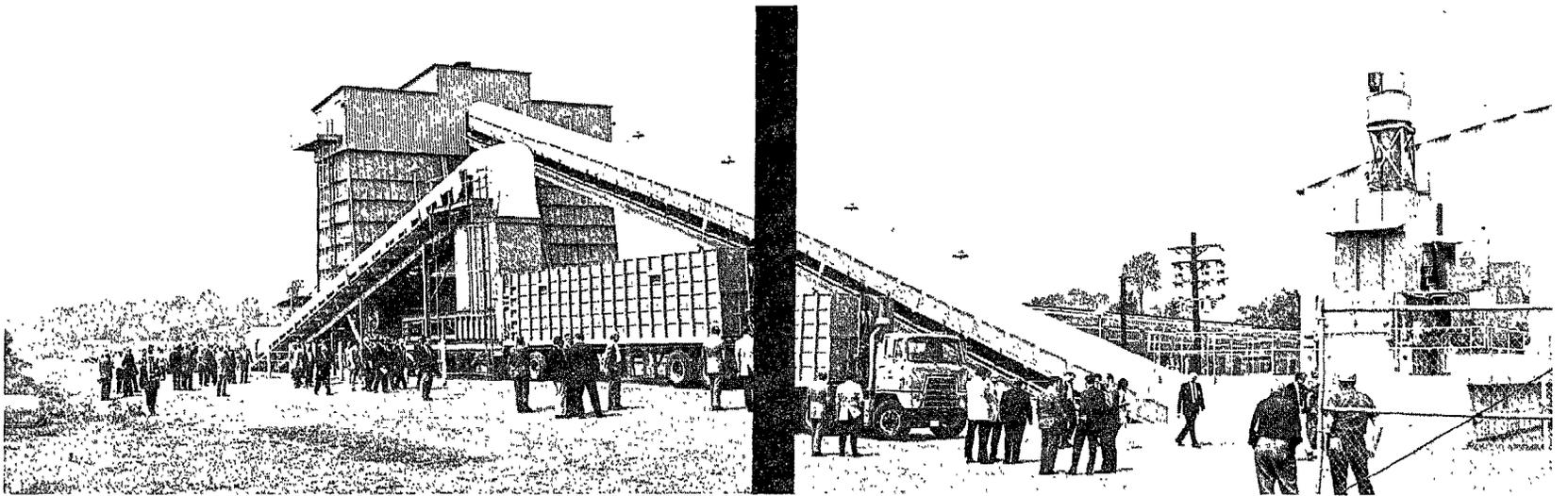
The system consists of a refuse processing plant and, at a local utility company, fuel receiving and firing facilities. (See photograph and diagram on pp. 19 and 20.) The wastes are shredded at the processing plant to a particle size no larger than 2 1/4 by 3 1/4 inches. A magnet then removes the ferrous metals and the remaining wastes are transported by truck to a nearby utility plant where they are used as supplementary fuel in coal-fired boilers to produce electricity. The processed waste has about 45 percent of the energy content of coal by weight.

Although the plant was designed to process 300 tons of waste in an 8-hour shift, it has operated at this capacity only on a few occasions, usually burning an average of 100 tons a day. The primary reason for this is an abrasion problem in the bends of the pipes which feed the waste into the boilers. The problem is caused by pieces of glass and non-ferrous metals in the refuse.

To correct this problem, in May 1973, EPA awarded a grant to assist in procuring additional equipment designed to remove nonmagnetic inert materials from the waste. The heavy ingredients in the waste are to drop through an air classifier and then pass by the magnet. At this point, about two-thirds of the heavy fraction--primarily glass, nonferrous metals, dirt, and wood--is to fall out and be disposed of in a landfill. The remaining one-third is largely ferrous metals which are to be passed through a ring-type shredder mill. Contaminants are to be removed by a vacuum and the remaining non-ferrous metals (consisting almost entirely of aluminum) or particles attached to the ferrous metals are to be separated by passing these metals by a second magnet. The St. Louis project officer believes that both the ferrous and nonferrous metals recovered will be of relatively high quality.

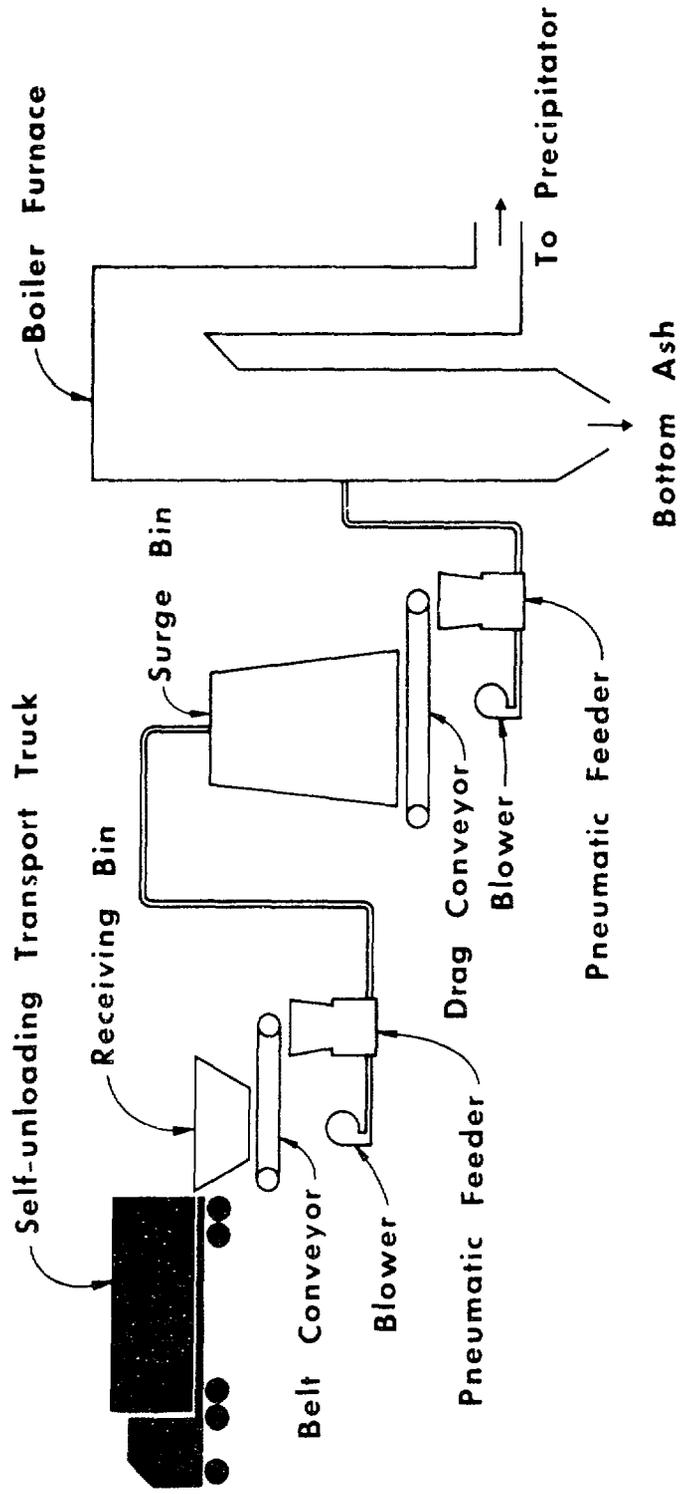
EPA financial assistance has been provided only for the processing and fuel receiving facilities. The utility company has funded all of the equipment and related improvements necessary to burn the shredded waste in its boilers. In return the company receives the processed waste at no cost.

This project is presently helping the city dispose of only a small percent of the approximately 1,000 tons of residential wastes which are collected each day. A city



This composite photograph shows the shredding facilities at St. Louis. The hammer mill where the garbage is shredded is at the right. The shredded garbage is then moved onto a vibrating conveyor where it is fed onto an incline-belt conveyor leading to a storage bin. Magnetic separation is done in the building in the left portion of the photograph and the residue is then conveyed into the packer trucks for transportation to Union Electric's Meramec plant.

CREDIT: city of St. Louis



SCHEMATIC REPRESENTATION OF THE SUPPLEMENTARY REFUSE FUEL RECEIVING AND FIRING FACILITIES AT THE

UNION ELECTRIC MERAMEC PLANT

At the power plant processed refuse is fed pneumatically to center openings of tangential burners in each corner of Meramec furnace.

official told us that, once the system has been fully tested and proven, he hoped that an entire new facility will be built to dispose of all residential refuse. The utility company which is participating in this project has several other powerplants in the area, and on the basis of interest expressed by this company there should be ample markets for the processed waste.

Franklin project

The Franklin project was constructed with the assistance of a Federal solid waste demonstration grant awarded in March 1969. The plant became operational in June 1971. Project costs have amounted to about \$3.1 million, of which the Federal share was about \$2.1 million.

All incoming wastes, except for large bulky items, are mixed with water and pulped into a slurry by a system called a hydrapulper. Heavy objects are ejected from the bottom of the hydrapulper and passed through a magnetic separator which recovers ferrous metals.

An optical sorter is used to separate the glass into three color categories--clear, green, and amber. Glass companies have shown a great deal of interest in the outcome of this aspect of the demonstration. Several of the companies will be evaluating the glass from the project.

The principal product of the system is long paper fiber which is sold to a nearby firm for making roofing materials. The fiber is transported underground, in liquid slurry form, through a pipe directly from the Franklin plant to the firm. At the time of our discussions with city officials, the 1974 sale price for paper fiber was \$60 per ton and \$30 per ton for ferrous metals.

The composition of refuse received at the plant is approximately 30 percent paper (only half of which is long fiber and recovered), 30 percent water, 7 percent ferrous metal, 11 percent glass and aluminum, and 22 percent miscellaneous (dirt, wood, plastic, rubber, rags, food, etc.). Miscellaneous wastes and short paper fiber, amounting to about 37 percent of total incoming waste, are burned in a fluid bed reactor (incinerator device). This reactor reduces these wastes 98 percent by volume and 85 percent by weight. The residues are landfilled.

A unique feature of the plant is that, in addition to recovering useful resources from mixed municipal refuse and disposing of waste residues in an environmentally acceptable manner, it also disposes of municipal sewage sludge. Adjoining the plant is a regional waste-water treatment plant.

The purified effluent from this plant provides the water supply for the solid waste plant, and the sludge from the municipal clarifier is mixed with the nonrecyclable organic wastes of the plant and burned. In turn, the waste water from the solid waste plant is treated in the water treatment plant, and the ash from the solid waste plant is used as a settling agent in the treatment plant's industrial clarifier. (See photographs and diagram on pp. 23, 24, and 25.)

The plant was designed to operate at a capacity of 150 tons per 24 hour day. The plant has been averaging less than 50 tons per day, however, due to a lack of refuse. According to Franklin project officials, the reason for this is that landfill sites in the area have lower disposal fees than the plant. The city of Franklin is the largest single source of refuse--providing about 25 tons a day.

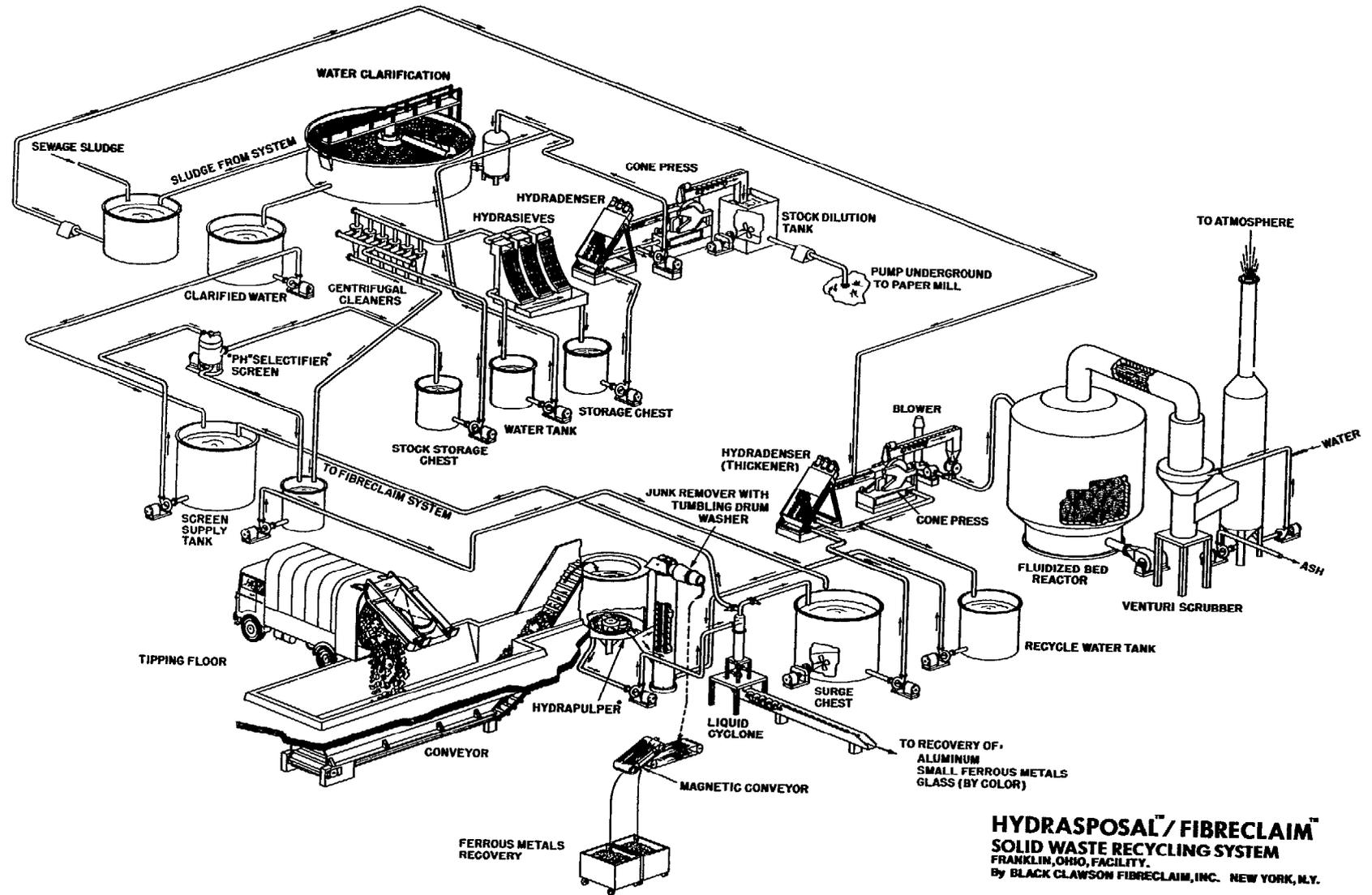
As time passes and landfill sites are either forced to close or the cost to use them increases, the wastes brought to the plant are expected to increase. The plant was designed to accommodate the waste generated by Franklin and the surrounding communities of Carlisle and Springboro through 1990. Operating at full capacity, it is expected that the net operating costs will be about equal to the \$6.50 per ton disposal fee. At present operating levels, the net operating cost is about \$10 to \$11 per ton.

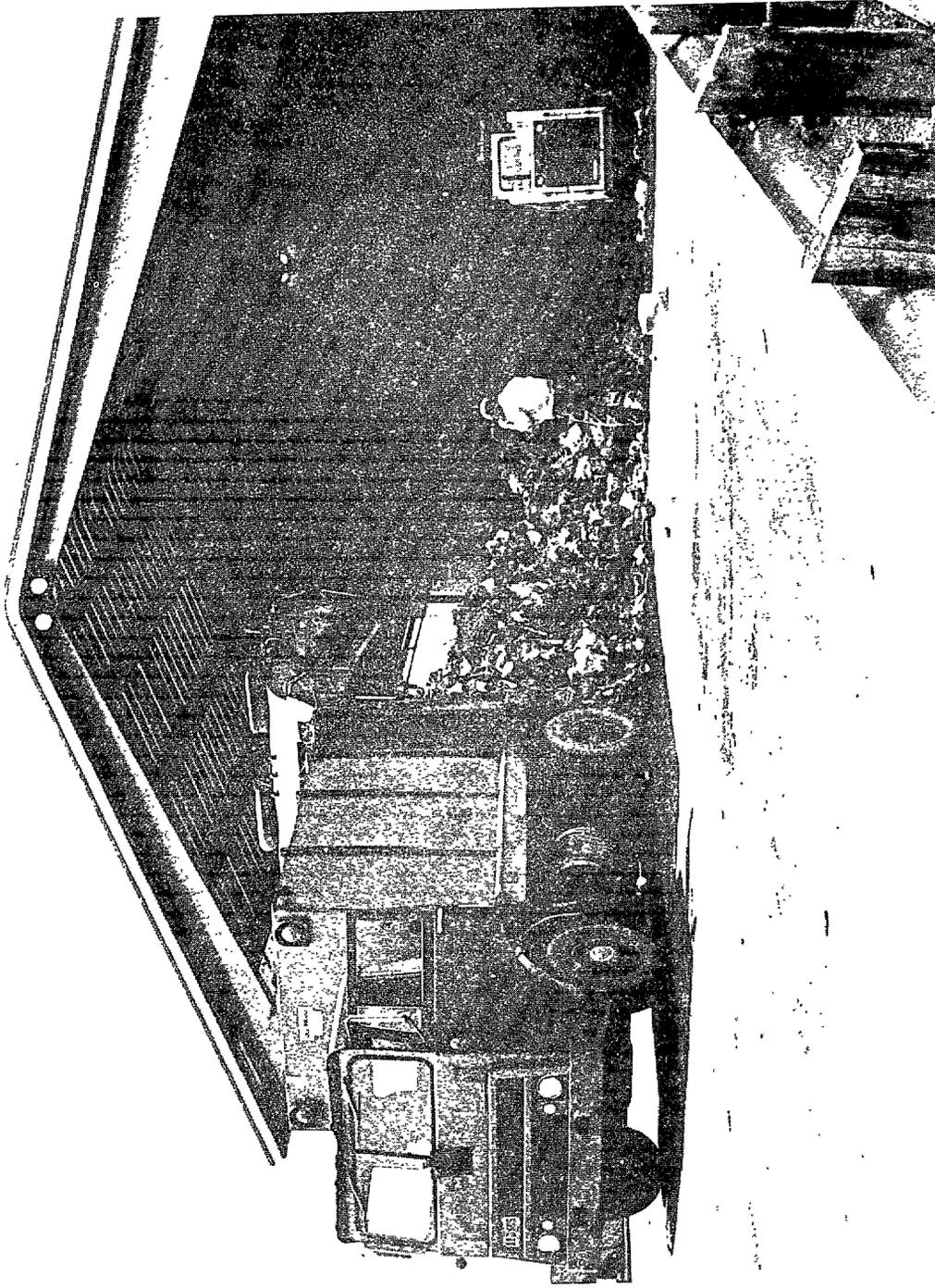
The company which designed and operates the system for Franklin and the city manager believe that the plant has been a technical success from the day it first started operating. The plant has processed 9 tons per hour which shows that it is capable of exceeding the design capacity.

CONCLUSION

Although EPA has been slow in implementing the resource recovery provisions of the amended act, improvements have been made, particularly with respect to the required studies and investigations. The results of the studies should enable EPA to provide the Congress with information which will be helpful in deciding the future Federal role in attacking the problems arising from solid waste. However, it will be some time before resource recovery systems funded under the amended act are demonstrated and the results analyzed. Thus the Nation is somewhat restricted in proceeding with resource recovery systems that will effectively deal with the solid waste problem and at the same time recover material and energy resources.

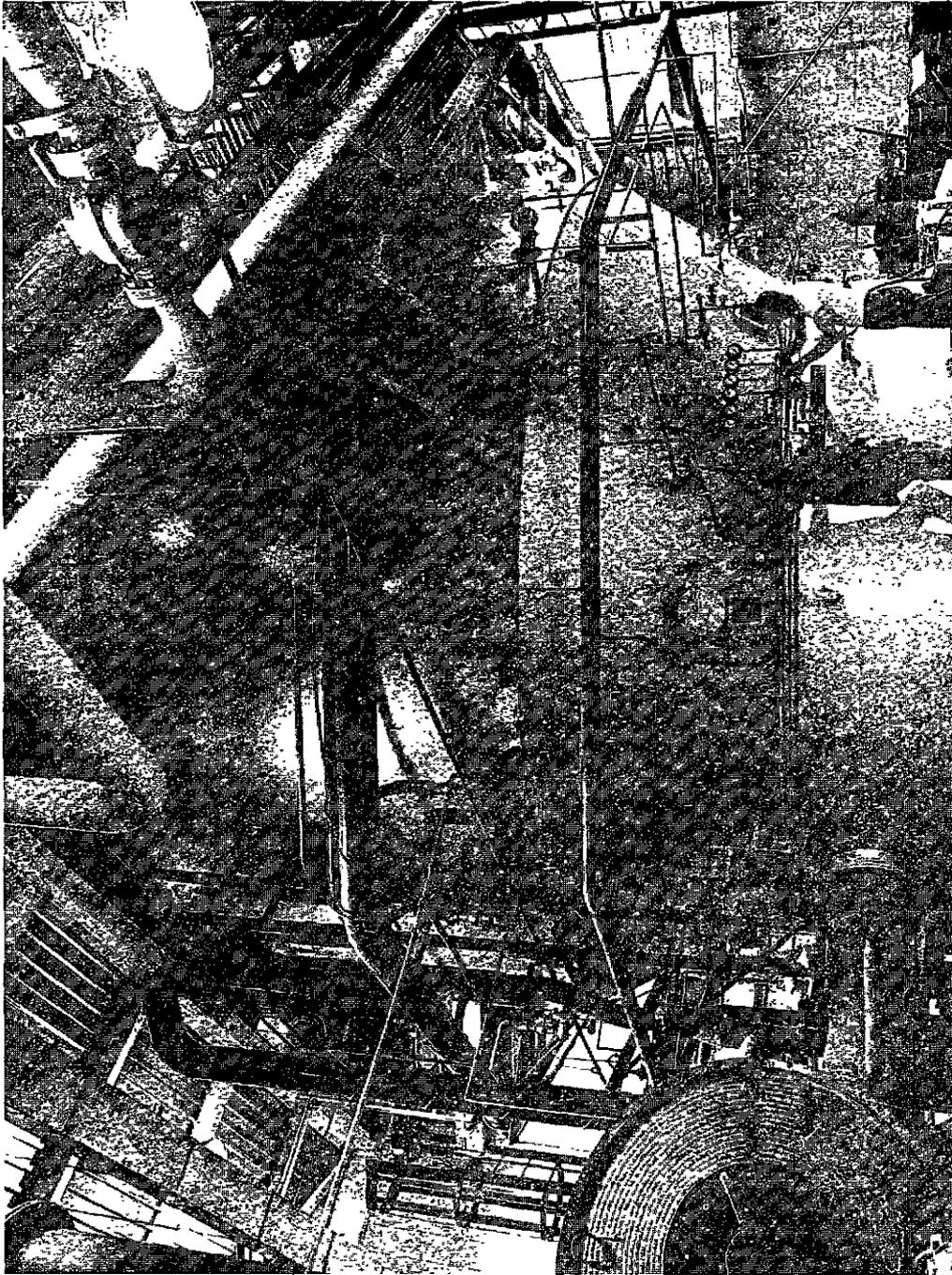
The three initial resource recovery demonstration grants were based on the need to demonstrate previously undemonstrated resource recovery systems. EPA is proceeding with the demon-





Unloading collected waste.

CREDIT: city of Franklin, Ohio



Fluid bed reactor where the organic wastes and sewage sludge are burned at 1400° and 1500° F.

CREDIT: city of Franklin, Ohio

stration grant to Delaware for a project which is similar to a planned system for Bridgeport, Connecticut. Since the Bridgeport system is scheduled to be operating 2 years before the Delaware project, we believe that EPA should contact the parties involved in the Bridgeport project to arrange for obtaining the information necessary to determine the economy and efficiency of such a system. Such an arrangement would provide EPA with the necessary data at an earlier date, and at a substantially lower cost than the Delaware project. The information obtained could then be used to assist other communities throughout the Nation in solving their solid waste and energy problems.

AGENCY COMMENTS

In an October 31, 1974, letter commenting on our report, EPA stated that, while it accepted responsibility for the initial delays in implementing the resource recovery program, it felt the program currently has a strong technical base, is well organized, and is moving ahead positively. (See app. I.)

In commenting on our questions regarding the need for the Delaware Project and our suggestion that EPA attempt to obtain the data from the Bridgeport project necessary to evaluate the burning of solid waste in oil-fired boilers, EPA reiterated its position that the funding was justified. EPA stated that it did not feel that any of the changes to the grant agreement warranted a resolicitation of proposals to award competitively the \$9 million originally awarded to Delaware. The changes cited by EPA were:

- A change in project schedule caused by the 2 years' delay due to negotiations over the Grant Agreement Special Conditions.
- The use of EPA water program funds for a substantial amount of the project costs.
- Modifications in the technology.

EPA added that such changes were essentially routine and typical of any large-scale solid waste demonstration project.

EPA stated that the Delaware project was clearly an extension of the state of the art of resource recovery beyond both the EPA St. Louis demonstration and the State project in Bridgeport, Connecticut. In commenting on this report the State of Delaware took a position similar to EPA's saying that the funding of the project was justified.

EPA stated that the project's value would be to demonstrate the

- burning of solid waste in oil-fired boilers,
- composting of sewage sludge with solid waste to produce a pathogen-free humus, and
- maximum recovery of energy and materials to reduce residue requiring landfilling to a minimum.

EPA stated that the Delaware project will demonstrate the burning of solid waste in a utility company's oil-fired boilers. But the estimated date for this operation is 1979, while the Bridgeport project is estimated to demonstrate this technology in 1977. We have discussed with Connecticut officials the possibility of EPA obtaining data necessary to assess the technical and economic feasibility of such a system. These officials told us that EPA had not contacted them in this regard and that they would be receptive to entering into such an agreement with EPA.

One of EPA's requirements for resource recovery demonstration grants was that there be purchase commitments for at least 50 percent of the saleable materials generated by a resource recovery project. According to EPA documents, the Delaware project will generate 192 tons per day--over 50 percent of the project's output of saleable materials--of shredded waste which will be burned in a local utility company's oil-fired boilers as a supplementary fuel. However, the letter from the utility company shows that it intends to use 100 tons per day of humus--not shredded waste. The solid waste fuel tested in 1972 for the project was humus. Therefore it is questionable that there is a commitment to use the principal product of the Delaware project--192 tons per day of shredded waste as a supplementary fuel.

The second of three major values for the project, as stated by EPA, is that it will demonstrate composting of sewage sludge with solid waste to produce a pathogen-free humus. EPA's project officer said that the purpose of the humus recovery in the Delaware project was to demonstrate the marketability of humus and that the technology had been sufficiently demonstrated.

We discussed the marketability of the humus with officials of the Altoona, Pennsylvania, plant--the pilot plant for the humus system of the Delaware project. The plant at Altoona has a capacity of 50 tons per day. According to these officials, there is no problem in marketing the humus.

They said the inclusion of sewage sludge increases the marketability of the humus because it contains nitrogen, protein, and potash. There are plans to build a new 150 tons per day humus facility at Altoona and letters of intent have been obtained indicating that the plant's entire output will be sold. These officials stated that they could have the new facility operating within 18 months of the time city officials guarantee a supply of waste.

The last value stated by EPA for the project is that it will demonstrate maximum recovery of energy and materials to reduce residue requiring landfilling to a minimum. This is a value of any resource recovery system and has been demonstrated at St. Louis, Missouri, and Franklin, Ohio, and will be demonstrated at other facilities prior to the completion of the Delaware project. The Altoona plant officials told us the amount of material requiring landfill is 5 percent of the plant's input capacity.

According to available information, EPA may well spend over \$13 million and 7 years on a project the value of which has been or will be demonstrated before the project begins operating.

CHAPTER 3

MAJOR ISSUES CONFRONTING RESOURCE RECOVERY, RECYCLING, AND REUSE

Economics is the major element in the success or failure of attaining widespread resource recovery and reuse. Three major issues affecting the economics of resource recovery which involve the Federal Government are (1) the question of discrimination in freight rates, a major cost element for recovered materials, (2) Federal procurement policy toward products containing recovered and recycled materials, and (3) taxes.

Another issue is the use of product controls to promote resource recovery. Product controls may be defined as public policies directed at regulating either the volume of sales or the physical characteristics of products. Resource recovery could be promoted through such policies by providing fiscal incentives for using products containing recovered materials or by requiring containers to be made of certain materials which would be easily (economically and physically) recovered.

We are presenting in this chapter pertinent information on the above issues which we believe should be considered in determining the future Federal role in resource recovery, recycling, and reuse. We believe that these issues need to be resolved through a cooperative effort on the part of EPA and the various Federal agencies responsible for these matters.

FREIGHT RATES

Freight rates represent a major part of the cost of using some secondary material as evidenced by an EPA study which showed the transportation cost to be a significant percentage of the delivered price--31 percent for scrap iron, 37 percent for wastepaper, 44 percent for glass cullet, and 78 percent for scrap rubber. This high transportation cost can be attributed to the fact that secondary materials are generated throughout the Nation and frequently must be transported long distances to locations where they are reprocessed.

The cost of transportation often determines whether recycling can be economical. Virgin materials have an inherent advantage because they are generally transported shorter distances to processing centers. This advantage is compounded when, as stated by EPA, evidence shows that the rate structure discriminates against some secondary materials in favor of virgin materials.

There is, however, disagreement about whether the freight

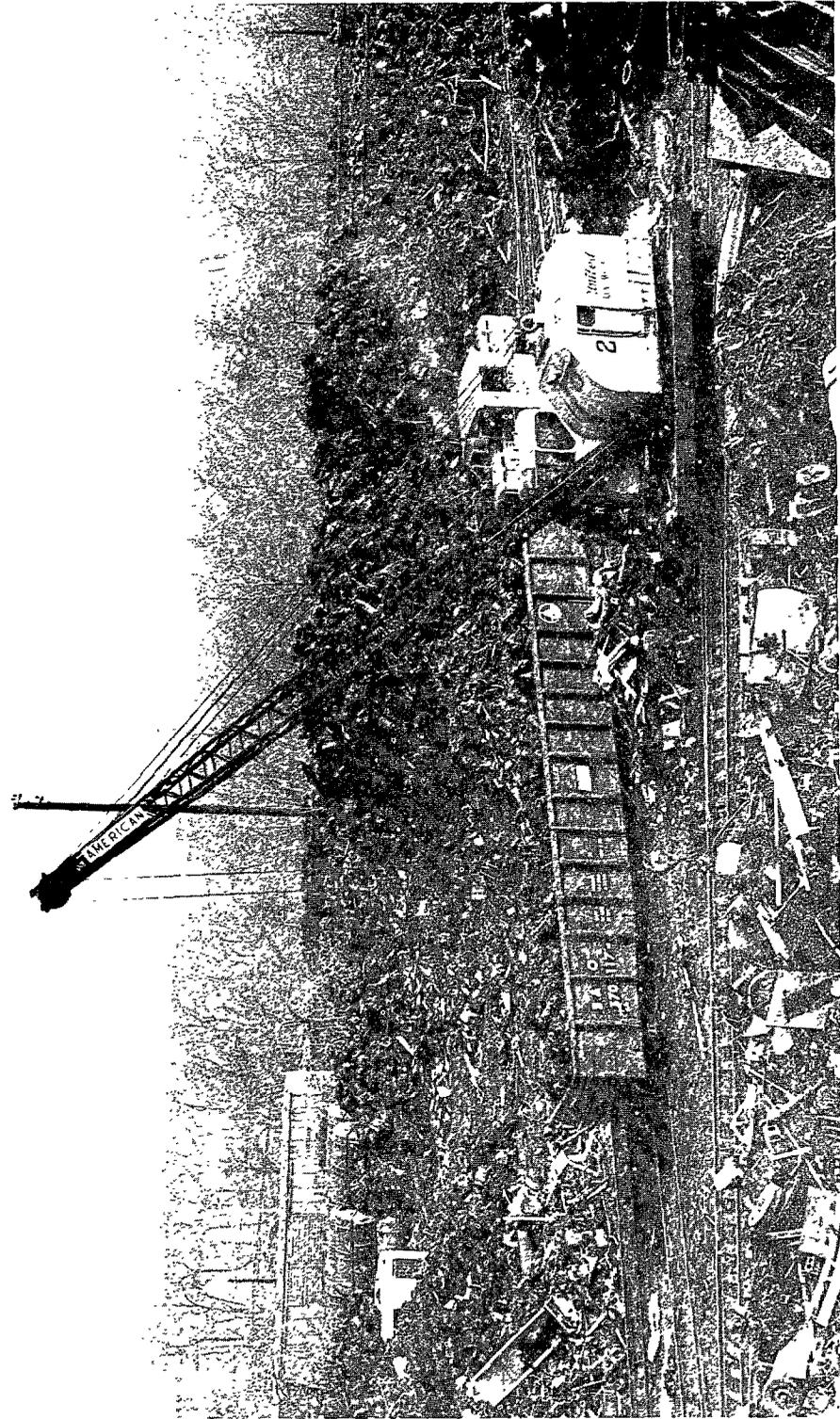
rates charged by the Nation's railroads and steamship companies actually discriminate against secondary materials. Also there is disagreement about what constitutes discrimination.

The Interstate Commerce Commission (ICC) was created, under the Act to Regulate Commerce of 1887 (49 U.S.C. 1), to regulate carriers in interstate surface transportation. ICC is responsible for regulating rates insuring that they are not unreasonable or discriminatory. Part of the exercise of this responsibility arises in the filing of new and changed rates. Tariffs filed by carriers regulated under the act automatically become effective 30 days after they are filed with ICC unless they are questioned by ICC, shippers, or other interested parties and such questioning (protest) results in suspension of the rates for a 7-month period, during which time a full investigation concerning their reasonableness is conducted. In actual practice a very small number of rates are questioned and subject to such an investigation.

The Chairman of ICC has stated that the existing rate structure permits rail carriers to operate with reasonable economy and that it does not unduly discriminate against or hamper the free flow of secondary materials. ICC believes that so-called rate disparities stem from, among other things, differences between the transportation characteristics of primary and secondary materials. For example, scrap is generally less dense than virgin material, requires considerably more handling effort, and is usually tendered and handled in single car rather than multicar lots. (See pp. 31 and 32 for photographs of scrap loading operations.) According to ICC, these characteristics, among others, result in different service costs, which are reflected in the freight rates. ICC believes that in general such differences in rates do not appear to constitute undue discrimination as defined by the Interstate Commerce Act.

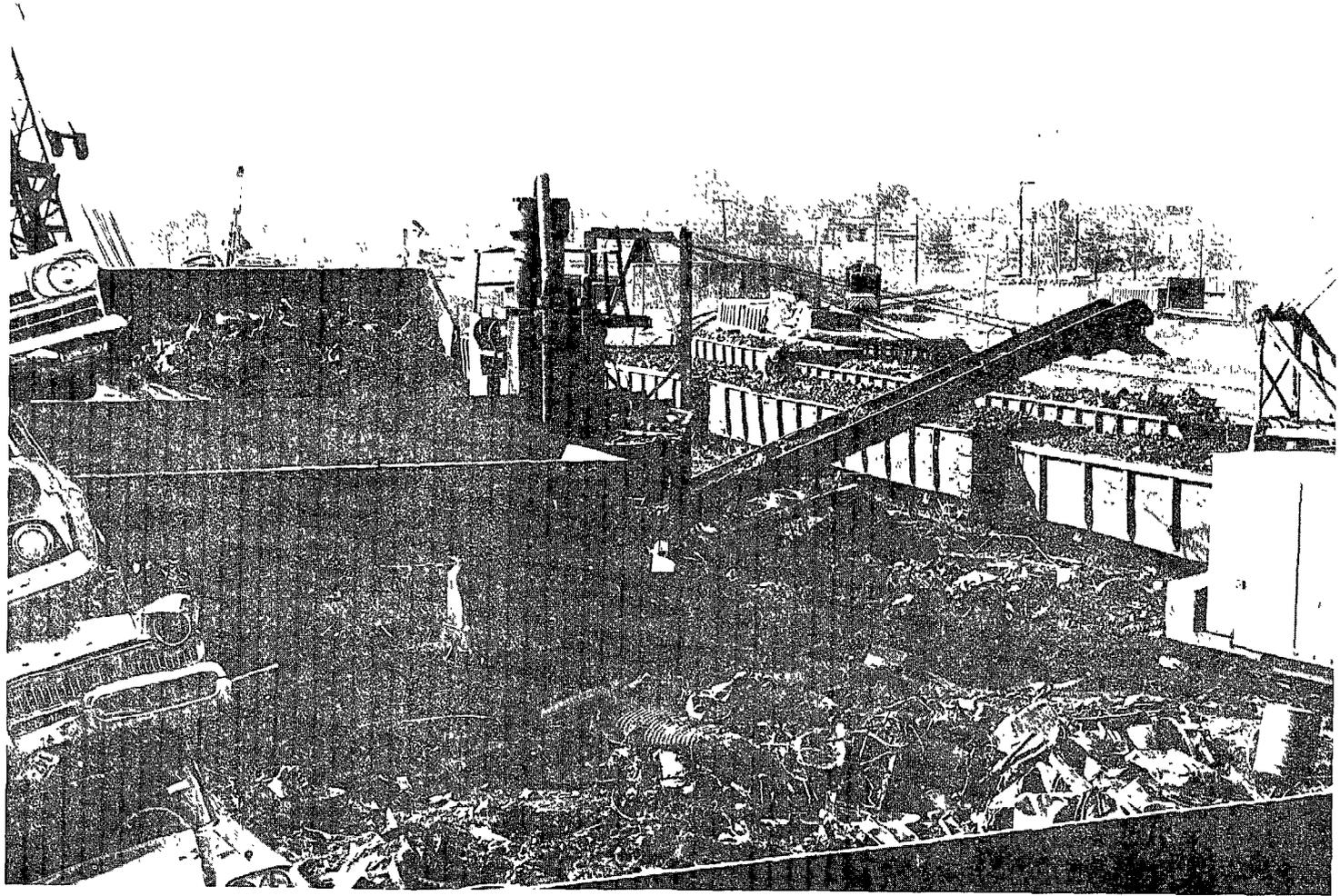
In excess of 300,000 tariffs (each containing many individual rates) are filed each year with ICC; all but a few of which become effective. According to the Chairman of ICC, the sheer volume of the filing enables the agency to check in depth only a small percentage--about 5 percent.

Organizations representing secondary materials industries have on several occasions challenged rates which they felt were discriminatory. One example cited in hearings before the Senate Subcommittee on Environment, Committee on Commerce, in June 1973 involving the intercity movement of scrap showed that the case was still pending after taking almost 2 years to get to the review board stage. According to ICC, much of this process time stems from procedures, appeals, and other



Railroad crane loading freight car with scrap.

CREDIT: Institute of Scrap Iron and Steel



Conveyor belt loading freight cars with scrap.

CREDIT: Institute of Scrap Iron and Steel

actions available to contending parties under the provisions of the Administrative Procedure Act (5 U.S.C. 551).

In addition to individual rate increases, these organizations have consistently protested new general rate increases. The organizations believe that the present discriminatory rates are only being compounded by new general rate increases.

In December 1970 ICC initiated a comprehensive investigation of the entire railroad rate structure in a proceeding known as Ex Parte No. 270. As part of this study, ICC is looking at how its previous actions may have affected the environment. In a November 1971 preliminary report, ICC stated that it will develop detailed information on the relationship between the rates charged and the cost of service both among and within commodity groupings. It will examine alleged cases of economic discrimination to determine the reasons for rate differences and the effect of traffic volume and revenue contributions to rate changes. The Chairman of ICC testified before the Congress in June 1973 that this study will require at least 2 and perhaps 3 more years to complete.

The complexity of the rate setting procedure does not yield itself to being readily understood. In reference to railway freight rates, the National Commission on Materials Policy, which was established under title II of the Resource Recovery Act, stated in its final report of June 1973 that:

"Any discussion of rail rates must be prefaced with the caveat that hard and fast statements here are indefensible. The regulatory structure administered by the ICC consist literally of trillions of posted, but not indexed, rates, many for hauls that never occur. The rate setting system defies analysis. Also the process by which rates are changed is confusing. Carriers or shippers petition the Interstate Commerce Commission for changes, which then are evaluated on an ad hoc basis.

"Decisions are not geared solely to the cost of providing the transportation service. Factors enter that have little to do with economic efficiency, either when rates are set or when they are amended."

The Federal Maritime Commission (FMC) is responsible, under the Shipping Act of 1916 (46 U.S.C. 801), for regulating (1) activities of competing carriers and (2) common carrier treatment of the shipping public. The act requires steamship lines or conferences of steamship lines serving

U.S. domestic commerce and foreign trade as common carriers to file their tariffs with FMC and only those rates on file can be charged. FMC has the authority to disapprove any rate which, after hearings, it finds so unreasonably high or low as to be detrimental to the commerce of the United States.

FMC has two formal proceedings underway on the higher rates charged for the transportation of wastepaper than for virgin woodpulp from the west coast of the United States to Australia and the Far East. The first case arose from a complaint of discriminatory freight rates by a shipper of wastepaper in 1971 while the second case was instituted in 1972 as a result of a complaint by the National Association of Recycling Industries. The association maintained that more equitable or preferential rates would result in increased shipment of wastepaper. The proceeding on the rates to Australia is being held in abeyance at the request of the association, which is the primary complainant, pending initial decision on the rates to the Far East. At the time of our fieldwork testimony was still being received in the Far East proceeding.

FMC has stated that a rate structure which favors woodpulp over wastepaper may have a significant environmental impact. Exporters may be encouraged to ship woodpulp instead of wastepaper in situations where properly recycled wastepaper could serve the same purpose as the woodpulp. This could result in a continuing depletion of our Nation's forests and could have a negative impact on solid waste management.

FMC also has a formal proceeding underway and is receiving preliminary information concerning the movement of nonferrous scrap metal and nonferrous virgin metal from U.S. east coast ports to ports in the Far East. It has been alleged by the National Association of Recycling Industries that the rates on nonferrous scrap metal are unjustly discriminatory when compared with the rates on virgin metal, thereby discouraging these scrap metals from being competitive.

Both EPA and the National Commission on Materials Policy have taken the position that discrimination appears to exist in railroad freight rates. This has reinforced the position long taken by the secondary materials industries and other organizations that inequitable transportation rates do exist which limit the demand for recyclable materials.

An EPA study of transportation rates for competing secondary and virgin materials was undertaken to determine whether the differences found are justified by differences in the cost of moving these materials. It indicated that railroads generally make a proportionately higher profit from

the shipment of ferrous scrap, glass cullet, and reclaimed rubber than from competing virgin materials. Although EPA concluded that these cases were discriminatory, EPA believes that there is not a consistent pattern of discrimination against all secondary materials.

In other studies EPA has concluded that a change in price relationships between virgin and secondary materials can affect the short-term marginal consumption of some secondary materials. Also, these studies indicate that the relative costs of materials affect industry's long-range capital investment decisions. For example, the price of scrap in relation to iron ore would influence a decision whether to buy an open-hearth furnace which can use a maximum of 50 percent scrap or an electric furnace which can use up to 100 percent scrap.

FEDERAL PROCUREMENT

According to EPA, in the past Federal regulations favored the purchase of products containing virgin materials, requiring that in certain cases they be purchased over competing products containing secondary materials. In March 1970 the President directed Federal agencies to "initiate measures needed to direct their policies, plans and programs so as to meet national environmental goals." The General Services Administration (GSA) responded by instituting a program which emphasizes to the maximum extent feasible the procurement of products containing secondary materials.

The GSA program is primarily directed at paper and fiberboard products because they offer potential for resource recovery and recycling. GSA is responsible for 136 specifications for paper-based products which during fiscal year 1973 resulted in procurements totaling \$92.6 million. Under the GSA program the specifications for 86 of these products have been adjusted to require a percentage of reclaimed fibers ranging from 3 to 100 percent. These products include writing paper, roofing materials, toilet tissue, towels, and shipping boxes. These specifications accounted for \$66.5 million or about 72 percent of total procurements of paper-based products. GSA determined that other specifications for paper-based products had very limited potential for being adjusted to require use of secondary materials.

Other GSA efforts in this area include changing product specifications to either require or permit the use of reclaimed materials in the manufacture of thermal insulation, plastic pipe, and pneumatic tires. GSA officials said they believed that their program has increased the public's awareness of the potential of recycling.

In response to a request from the Council on Environmental Quality to participate in a Government-wide program to promote recycling, in June 1971 the Department of Defense requested some of its procuring activities to review the supply classes for which they were responsible to determine those which appeared to offer the greatest potential for using recycled materials. These activities were encouraged to promote recycling where practical. While the response by some of these activities recognized the potential for using secondary materials in the products they purchased, most contended that defense procurements were not susceptible to promoting the use of large amounts of secondary materials.

However, there were areas with apparent potential for recycling. The Defense Supply Agency, which procures motor oils for all civil and military departments in accordance with specifications established by the U.S. Army Materiel Command, recommended in a 1972 study that the Department of Defense

- take steps to acquaint members of the re-refining industry with the various petroleum products procured by the Government that are not restricted to use of virgin base stocks;
- initiate a program to develop specifications for an automobile lubricating oil containing re-refined stocks and, upon completing the specifications, demonstrate the use of the oil at a military installation; and
- initiate a program to determine the physical characteristics of waste oil generated by vehicles operating on unleaded gasoline and low-ash oil and demonstrate the feasibility of using crankcase drainings as a heating oil feedstock.

The study noted that the Defense Supply Agency had already initiated contacts with re-refiners and other interested parties and had provided specification data, bidding instructions, and related guidance.

The Department of the Army was responsible for following through on the remaining recommendations. In a December 19, 1973, letter to the Assistant Secretary of Defense (Health and Environment), it was noted that a plan had been prepared for developing specifications for an automobile engine lubricating oil containing re-refined stocks and for a demonstration project to prove the feasibility of using the oil. It would take approximately 3 years to complete implementation of the plan. In addition, the Army is conducting a program demonstrating the feasibility of using crankcase drainings as a heating oil supplement.

The Department of the Army's tire-retreading program was initiated after World War II, and the present goal is to re-tread 75 percent of the tires used. Significant progress has been made toward achieving this goal; the percentage of tires retreaded from July to December 1973 was 72.2 percent.

EPA has stated that there has not been widespread use of secondary materials on federally purchased products. One reason is a lack of technical data on the performance of products containing secondary materials. According to EPA, another reason is that Federal supply agencies rely heavily on industry in setting product specifications and do not know the extent to which industry can or will produce products with a secondary materials content. Industry in turn bases its response on factors such as whether it has the capacity to use these materials, the extent to which the materials are readily available in a usable form, and whether it can produce products containing them at a reasonable price.

While the Federal Government is the largest single purchaser of many U.S. goods and services, it consumes less than 4 percent of gross domestic output and a similarly small percent of most materials in relation to their total national consumption.

EPA views the use of Federal procurement as an effective means of establishing the technical and economic equivalency of waste-based products. EPA believes that Federal procurement has potential for creating demand for products containing secondary materials and has concluded that the wide circulation by GSA of Federal specifications has tended to encourage State and local governments to duplicate these specifications and thereby promote the widespread use of these materials.

TAXES

The National Commission on Materials Policy has stated that over the years the Federal Government has developed tax policies that encourage extractive industries--the suppliers of virgin materials. The Commission's 1973 report stated that capital gains treatment for profits, depreciation schedules, depletion allowances, and other tax writeoffs for extractive industries favor use of virgin materials. The Commission stated that these allowances are incentives to use these resources instead of secondary materials.

EPA, in its second annual resource recovery report, stated that the various provisions of the Federal tax code benefit the economy's virgin-material production sectors as opposed to the secondary-material sector. According to EPA, some tax provisions, such as accelerated depreciation,

investment tax credits, and deduction of State and local taxes, apply equally to both the virgin-material and secondary-material industries. However, EPA identified several tax provisions, such as depletion allowances, capital gains treatment, and expensing of capital expenditures, that are available only to virgin-material industries and, in effect, subsidize virgin material use. Foreign tax credits also benefit the virgin-materials industry.

As shown in the table below, EPA has estimated that the virgin-material production sector enjoyed a significant benefit of over \$2 billion in 1970 as a result of these tax provisions. The estimate was made for the following virgin materials: timber/woodpulp (which wastepaper could replace); oil, gas, and coal (which energy from recovered solid waste could help replace); iron ore (which steel from obsolete automobiles or metal cans could replace); primary aluminum (which aluminum from discarded beverage containers and other packaging could replace); and sand (which discarded glass could replace).

The estimates of tax benefits are as follows:

<u>Product</u>	<u>Unit value of tax benefit</u>	<u>Total value of tax benefit for 1970</u>
Paper	\$0.899 per ton	\$ 37,750,000
Petroleum	0.350 per barrel	1,350,000,000
Natural gas	0.022 per 1,000 ft.	450,000,000
Iron ore	0.748 per ton	96,640,000
Coal	0.142 per ton	80,590,000
Bauxite (used for aluminum)	1.496 per ton	20,960,000
Sand	0.082 per ton	<u>860,000</u>
Total		<u>\$2,036,800,000</u>

In its second resource recovery report to the Congress, EPA recommended that, in light of the national goal of resource conservation, consideration be given to reevaluating these tax provisions, many of which were instituted in the past when national emphasis was on industrial development through exploitation of raw material supplies.

The American Iron and Steel Institute is a trade association representing about 70 domestic iron and steel producers. An institute official told us that the Federal Government should play a major role in encouraging the steel industry to recover solid waste. Such things as tax incentives, subsidies for shipping scrap from remote places, and low-interest

Government loans to develop better methods of recovery should be considered. He said that incentives would be necessary to "really get the ball rolling."

The National Association of Recycling Industries is a trade association representing approximately 800 members that are dealers, processors, and wholesalers of nonferrous metal, paper, plastics, and textile scrap. Association officials told us there should be a two-part tax incentive effort to equalize the use of virgin and secondary materials. The first part would be a recycling tax deduction or credit extended to manufacturers on the basis of a percentage of the cost of recycled materials purchased. The percentages would vary according to the type of recycled material involved and would be based on the percentage needed to remove the competitive disadvantage a recycled material has because of tax advantages given to the corresponding virgin material.

The second part of the tax change would be to provide a 5-year amortization of recycling facility costs which would promote the building or expansion of recycling facilities.

During Senate hearings on resource conservation and recycling held by the Subcommittee on Environment, Committee on Commerce, the Deputy Assistant Secretary for Tax Policy, Treasury Department, testified that the main objective of the tax system was to raise revenue for general Government expenditures. He said that any additional uses should be few in number and selected only after the most stringent evaluation, otherwise the tax system could become so extensive and so complex that taxpayers would be unduly burdened. The Treasury official said that if tax credits were used too lavishly the Federal Government could be building a bigger and bigger tax administration to collect less and less revenue.

The Assistant Secretary further stated that, as virgin material and energy become scarce and more expensive, an incentive will be created to dispose of more used materials through the recycling process, to use fewer virgin materials, and to conserve the use of energy.

PRODUCT CONTROLS

Product control may be defined as any public policy directed at regulating the volume of sales or physical characteristics of products. Various fiscal and regulatory product control measures have been proposed as a means of increasing the recyclability of products, conserving resources, reducing the burden of solid waste disposal, and including the cost of solid waste disposal in the product cost.

These proposals include (1) a tax based on the weight of consumer goods (for example, a penny-a-pound tax), (2) taxes and/or bans on specific types of plastics, (3) bans on pull-tab beverage cans, (4) bans on cans containing more than one basic metal, (5) restrictions on using copper in automobiles, (6) development of standards for durability of consumer appliances, (7) bans or taxes on throwaway convenience items, (8) environmental degradability standards for certain goods, (9) regulations governing the minimum recycled material content of products--typically paper products--and (10) mandatory deposit requirements for beverage containers.

EPA has considered product controls in two separate but related contexts--resource recovery and source reduction. Resource recovery can involve improving the recyclability of products or increasing secondary material content of products to enhance both technical and economic feasibility of recovery. Source reduction has been defined as the reduction in the amount of solid waste generated by a consumer either by altering the basic design, lifetime, or use pattern of particular consumer goods or by changing the composition of sales to reduce the waste volume.

EPA has identified four major mechanisms to achieve source reduction. These mechanisms are taxes or charges, deposits, bans or quotas, and design regulations. A product tax or charge could be levied on the basis of a product's weight (to provide an incentive for weight reduction), lifetime, or material content. Determining the appropriate level of the charge and predicting effectiveness and impact are complex and difficult tasks. Deposits such as those on beverage containers are designed to encourage product reuse but are only of value when a return and reuse system exists. Bans could be used only if product substitutions are desirable and available. Design regulation could be applied to extending the expected life of a product, designing products for reuse, or decreasing the material and energy consumed in making the product.

Product control approaches for resource recovery could increase the recyclability of products by making it easier--less costly to separate and recover high quality secondary materials--and could establish product specifications requiring the use of secondary material inputs. Controls for recyclability are concerned with eliminating materials or product configurations that inhibit recycling or increase the cost of resource recovery. Products whose recyclability is a particular problem include the bimetallic (steel-aluminum) can; rubber tires with tungsten studs, which do not separate by magnetic means; and aluminum rings around glass bottles. In March 1974 EPA said that there was insufficient information to evaluate the necessity or desirability of product control

measures and that it was studying the subject to obtain this information.

CONCLUSION

There is no simple, complete means available for solving the dual problem of solid waste disposal and resource availability. Resource recovery can provide a primary tool to help alleviate these problems, but even here the question remains as to how this tool can be effectively implemented. The key is economics. We have discussed the subject of freight rates, procurement, taxes, and product controls--all of which affect the success of resource recovery.

There appear to be several actions the Federal Government can take to make secondary materials more attractive for resource recovery. However, still to be answered are:

- Which suggested actions should be taken?
- What effect a combination of such actions would have on secondary materials?
- What would the overall effect on the other aspects of our economy be?

GSA actions requiring a percentage of reclaimed fibers in paper products is a positive step in promoting resource recovery. Such actions help demonstrate to industry and the public the capability of products containing recovered material and the availability of a market for such products.

Product controls can also be used with procurement, tax, and freight rate policies in providing incentives to promote the use of secondary materials. However, the consideration of proposals designed to improve the economic standing of resource recovery should include an evaluation of the potential adverse effects of such actions on other elements of our economy.

Solutions to the problem areas set forth in this chapter will require the continued efforts of EPA together with other concerned Federal agencies. For example, freight rates concern ICC and FMC, Federal procurement policy concerns GSA, and taxes concern the Treasury Department.

AGENCY COMMENTS

In its October 31, 1974, letter commenting on this report, EPA stated that it had made specific recommendations to the Congress on Federal policy issues which include (1) a formal investigation of Federal rate-setting practices to

determine if discrimination against recycled materials exists, (2) a determination in all future rate adjustments that such adjustments do not discriminate against recycled materials, and (3) establishing guidelines for Federal procurement of products containing recycled materials to the maximum extent practicable.

EPA stated that emphasis should be placed on the importance of source reduction or reduction in the consumption of materials and products to conserve resources and reduce waste. According to EPA, its efforts in this area are small but active. In addition, EPA advised us that it testified before the Congress on the need for Federal legislation providing for mandatory deposits on beverage containers to promote reuse and recycling of such containers.

The various aspects of resource recovery are under consideration by the Congress. Over a dozen pieces of legislation have been introduced that deal with resource recovery.

CHAPTER 4

ENERGY RECOVERY FROM SOLID WASTE

Nonrenewable fossil fuels--coal, oil, and natural gas--from domestic and foreign sources provide 96 percent of the economy's total energy. The remaining 4 percent is from water power (hydroelectric power) and nuclear power. The U.S. annual energy consumption is expected to almost double from 1970 to 1985 and to increase by an additional 50 percent from 1985 to 2000. According to Government officials, the Nation's reliance on imported energy sources--estimated to be 50 percent of our oil needs by 1985--could adversely affect our economy and security.

Until recently little consideration was given to using solid waste as a source of energy. As an example of this potential, EPA has a research project underway which if proven successful is expected to supply 5 percent of an average community's electric requirements and at the same time recover metals and glass.

The organic portion of solid waste--which amounts to over half of the total solid waste generated each year--has considerable potential for conversion into energy in various forms, thereby helping to meet our energy needs.

EPA has estimated that municipal waste has approximately 50 percent of the energy value of coal and that approximately 80 percent of the total municipal waste could be used to generate energy.

According to EPA, if energy recovery were practiced in all major urban areas, the energy produced would be equivalent to:

- About 1.5 percent of the Nation's total energy consumption.
- The Nation's entire energy consumption for residential and commercial lighting.
- More than one-half of the 1972 direct oil imports from the Middle East.
- Almost one-third of the energy that will be delivered by the Alaskan pipeline.

Once processed these wastes can either be fired directly into boilers and used to supplement primary fuel sources or they can be converted into other forms of energy, including

oil. In 1974 energy recovery projects were under consideration, being planned, or under construction in at least 18 cities. According to EPA, at least 20 additional cities were making preliminary evaluations of energy recovery systems.

The price of and demand for raw material has increased dramatically and our Nation's reliance on foreign sources of raw material supplies has steadily increased. Resource recovery systems which use organic wastes to generate energy and recover and recycle inorganic wastes--primarily metals and glass--help make our Nation more self-sufficient. Such systems

- reduce air pollution;
- dispose of waste without using up quantities of scarce land, particularly in urban areas;
- generate energy; and
- recover material resources, particularly the nonrenewable type like iron and aluminum.

Resource recovery and recycling also help to conserve energy since in virtually every instance the use of secondary materials in production requires less energy than does the use of virgin materials. For example, only one-fourth as much energy is needed for an electric furnace using 100 percent scrap as for a basic oxygen furnace using primarily virgin iron ore to produce the same amount of steel.

The National Commission on Materials Policy estimated that about 2 percent of the total U.S. energy demand could be saved by recycling available steel, aluminum, and paper waste.

POTENTIAL USE OF SOLID WASTE AS FUEL

The Bureau of Mines, Department of the Interior, performs research pertaining to the processing, use, reuse, and disposal of mineral fuels. The Bureau estimates that the total amount of organic wastes generated annually in the Nation exceeds two billion tons, at least 880 million tons of which are dry organic solids which have potential for conversion into clean energy. Of this 880 million tons, 136.3 million tons are concentrated at locations, such as cities, cattle feedlots, and sawmills, where disposal efforts are presently required. The Bureau estimates that a city and its suburbs with a population of 1 million would generate 1,750 tons per year. A single cattle feedlot with 100,000 head of cattle would produce about 410 tons of dry organic solids per day, or about 150,000 tons per year.

The following table, prepared by the Bureau, shows the estimated amount of dry organic wastes generated and available by source in a year.

<u>Dry organic wastes</u>	<u>Generated</u> (millions of	<u>Available</u> tons per year)
Manure	200	26.0
Urban refuse	129	71.0
Logging and wood manufacturing residues	55	5.0
Agriculture crops and food wastes	390	22.6
Industrial wastes	44	5.2
Municipal sewage solids	12	1.5
Miscellaneous organic wastes	<u>50</u>	<u>5.0</u>
Total	<u>880</u>	<u>136.3</u>

The Bureau has been working on a process to transform organic materials in solid waste into a low-sulphur oil which could be further processed into refined products or used as a fuel to generate electricity without further processing. The Bureau has also considered a method of converting organic wastes into a fuel similar to natural gas. It estimates that this method could produce at least 5 cubic feet of methane gas from each pound of urban refuse which is free of metal and glass.

According to the Bureau, the oil potential from available organic wastes is 170 million barrels a year. This is roughly equivalent to 47 million tons of low-sulfur coal and would have amounted to 3 percent of our Nation's 1971 crude oil demand. The waste, if converted into gas, could have satisfied about 6 percent of our Nation's natural gas demand in 1971.

PROJECTS FEATURING ENERGY RECOVERY

In one of the demonstration projects funded by EPA, St. Louis and a local utility company are cooperating to demonstrate the feasibility of burning shredded residential waste as a supplementary fuel to produce electricity. In Franklin material recovery is being demonstrated by using a wet separation process. The system is also capable of producing energy. The company which designed and built the project has held discussions with another city to construct a 2,000 ton per day plant to recover steam which in turn will power a turbine to produce electrical energy.

EPA is funding projects in Baltimore and San Diego which will demonstrate the recovery of energy through pyrolysis--the conversion of organic matter to gases through intense heat.

In the Baltimore project the gases will be used to produce steam which will be sold to a local utility company for heating purposes in the downtown area. The San Diego project will produce oil to be used as a supplementary fuel by a local utility company. The Baltimore project is scheduled to become fully operational in 1975 and the San Diego project is to be completed in 1976.

Energy recovery systems are being considered, planned, or constructed in at least 18 cities, including Bridgeport (the initial facility of the Connecticut system discussed in chapter 5), Chicago, Ames, Boston, Detroit, Albany, Hempstead, New York, Akron, Memphis (in cooperation with the Tennessee Valley Authority), and Nashville. According to EPA, at least 20 other cities are evaluating the potential of energy recovery systems.

EPA'S ENERGY RECOVERY RESEARCH PROJECT

EPA has sponsored a research project called the Combustion Power Unit (CPU) -400 which is aimed at converting solid waste into usable energy. It began with a feasibility study in June 1967, and contracts awarded in support of this project totaled about \$7.7 million as of the end of June 1974.

The pilot plant, located in Menlo Park, California, has an input capacity of approximately 100 tons per day which, after shredding and separation operations, reduces to about 80 tons of combustible materials. Processes and facilities employed in the pilot plant's operations include:

- A receiving area where municipal wastes are pushed onto a conveyor which carries the wastes directly to shredders.
- An air separation system which takes out high density materials such as metals and glass and directs them to a material recovery module. (Light materials are conveyed to a storage container from which they are fed into the combustion unit.)
- Three separation units to remove particulate matter from the combustion gases before they flow through the 1,000 kilowatt turbine.

It is expected that each full-scale CPU-400 would be capable of consuming 400 tons of solid waste per day--the amount of solid waste generated by a community of 200,000 to 250,000. For larger communities a network of CPU-400 units could be located near load centers to supplement power supplied by local utility companies; the units would be capable of supplying around 5 percent of an average community's electric power requirements.

Several problems, however, have been experienced in the pilot plant testing to date. Deposits in the system's turbine have prevented continuous testing and an improved particulate remover is being developed to correct this problem. The project's contract was amended in June 1974 to provide an additional \$1.2 million. The project is to be completed in March 1976. The following page contains a drawing of the CPU-400 pilot plant.

WASTE OIL AS AN ENERGY SOURCE

Waste oil--automobile and metalworking lubricants, animal, and vegetable oils, and residues from petroleum refining--is a significant energy source having essentially the same energy content as virgin oil. EPA estimates that 50 percent of the automotive lubricating oils and 30 percent of the industrial oils are not consumed during use and end up as waste. This results in an estimated 1.1 billion gallons of lubricant materials being available for recycling into energy or petroleum products.

EPA funded a study to determine the feasibility of using waste crankcase oil as a fuel for solid waste incinerators which currently use heating oil as a fuel when burning wet refuse. Preliminary results indicate that this oil has the required energy content and incineration equipment is available which can use it. Additional work must be done to remove the lead in waste oil before burning because the lead may enter the atmosphere and cause an air pollution problem.

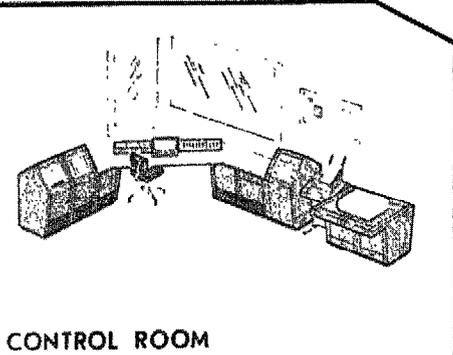
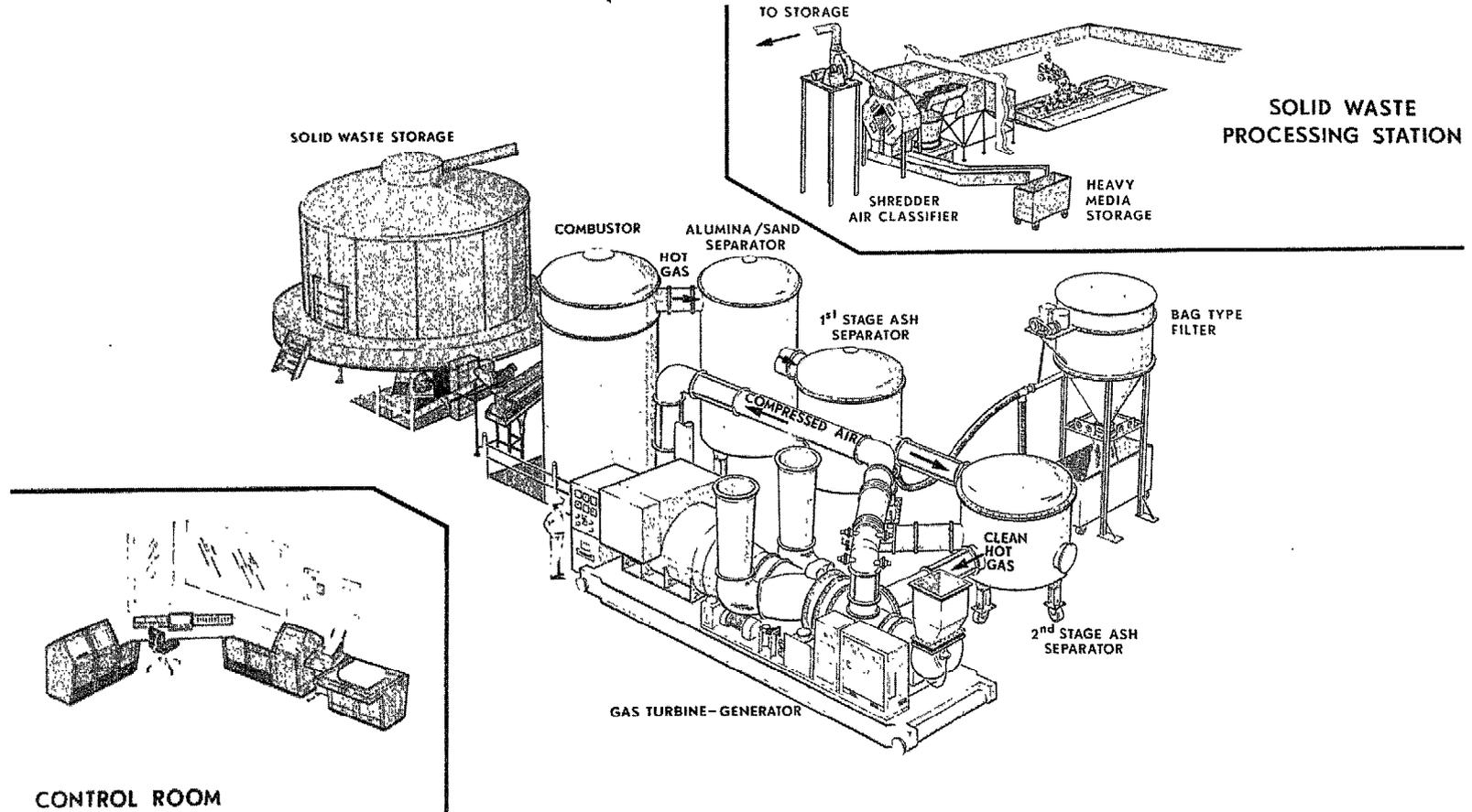
Other research work is being done at the Aberdeen Proving Ground in Maryland where a mixture of virgin fuel and up to 10 percent waste oil is being tested to determine its effect on combustion equipment.

CONCLUSION

Until recently little attention was given to developing a process to produce energy from solid waste, particularly from what is referred to as trash, garbage, or junk. But today such a process is a reality and has the potential to assist in alleviating energy, material resource, and solid waste problems. There is an urgent need to create efficient and economical resource recovery systems of this type throughout the country, particularly in urban areas where the problems are the most critical. We believe that EPA should continue to promote the development of systems that recover metals and glass from solid waste and convert the remaining waste into energy.

CPU-400 PILOT PLANT

48



CHAPTER 5

THE FEDERAL ROLE IN ASSISTING STATES AND LOCALITIES IN ESTABLISHING RESOURCE RECOVERY PROGRAMS

Regardless of how, where, or in what quantities solid waste is generated, local governments usually have to collect, dispose of, or recycle it. The National League of Cities, the United States Conference of Mayors, and the Council of State Governments have pointed to a need for more Federal assistance. EPA's role has been to provide specific assistance to State and local governments primarily through planning grants and technical assistance.

Some of the States we visited have already begun assisting local governments. New York State has awarded \$21 million to New York City and \$9 million to Monroe County for resource recovery projects. Connecticut has established a comprehensive statewide resource recovery plan with the principal element being the processing of solid waste into fuel. Under the plan facilities are to be constructed throughout the State to process about 84 percent of the State's waste.

FEDERAL ASSISTANCE PROVIDED TO STATE AND LOCAL GOVERNMENTS

EPA had three programs directed toward assisting State and local governments in solving their solid waste problems.

Planning grants

The planning grants program provided grants of up to 75 percent of the costs incurred by State, regional, and local government agencies to survey solid waste disposal practices and problems and to develop and revise solid waste disposal plans. These plans were to provide for recycling or recovering materials from wastes whenever possible, and applications for grants were to indicate the feasibility of regional disposal and resource recovery programs. As of July 1974, 49 States, the District of Columbia, Guam, American Samoa, Puerto Rico, and the Virgin Islands had received planning grants under this program, and all had a completed plan or a draft. Also about 40 local and regional planning grants had been awarded--25 of which were to be completed by the end of fiscal year 1973.

EPA recognizes that many of the plans developed under this program were too general and were not implemented. In January 1973 the EPA Administrator expressed disappointment about this program because he believed that there was not

sufficient initiative being demonstrated, particularly at the local level, to solve the problems identified. As a result EPA terminated local-regional planning at the end of fiscal year 1973. We were told that most of the plans were concerned with collecting and disposing of solid waste and that little attention was given to resource recovery.

EPA officials said, however, that support for States with planning grants has served to alert the public to the solid waste problem and to create an interest in the proper management of wastes. They told us that the level of awareness of solid waste problems and actions taken to correct them has increased from virtually nothing in 1966 to where, today, about 46 States have solid waste laws and 40 States require disposal permits or have site-approval programs. In addition, there are 42 States that have rules governing solid waste management and regulatory powers to enforce environmentally sound systems.

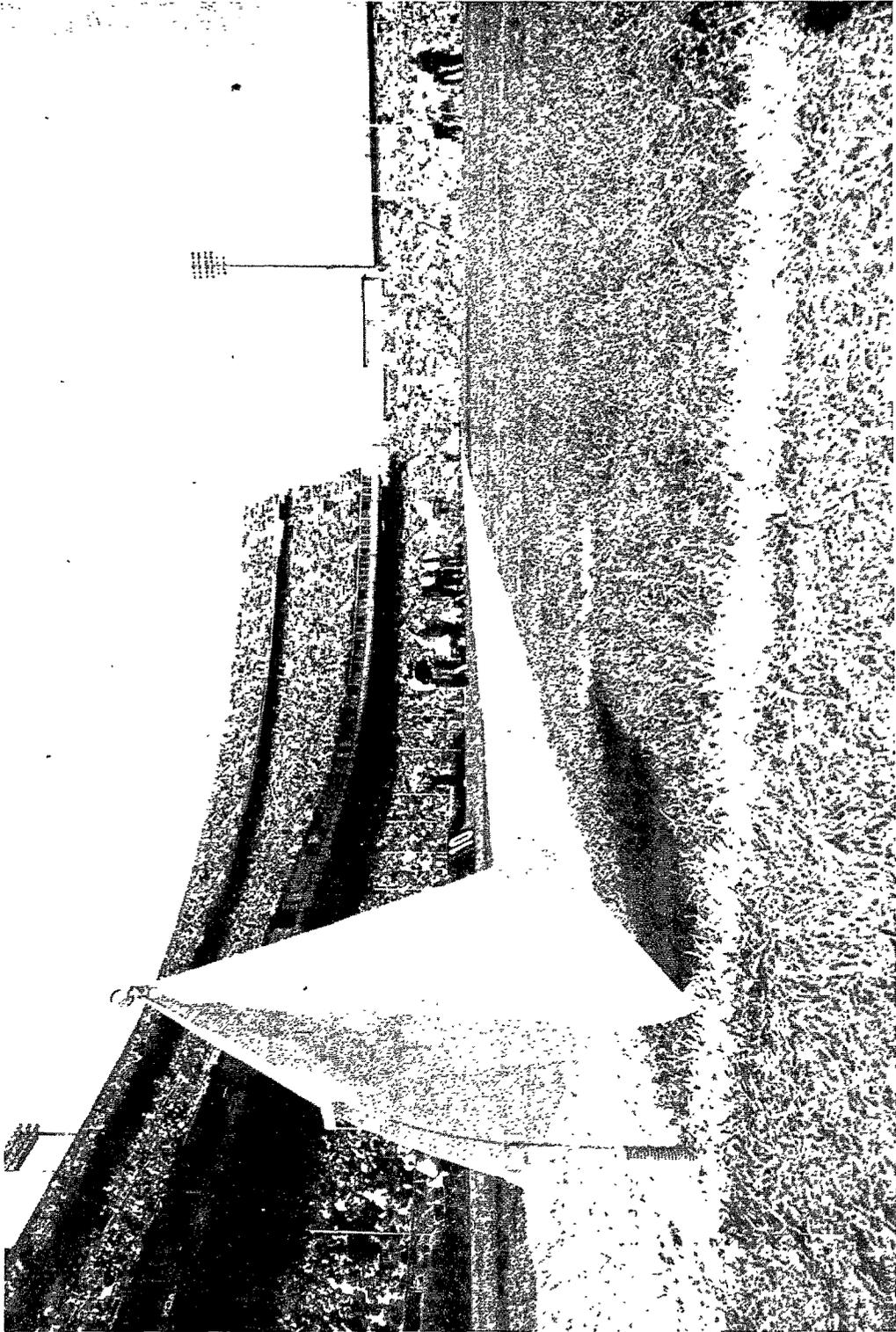
Mission 5000

Mission 5000, an EPA project, had an initial goal of closing or converting to sanitary landfills 5,000 open dumps by June 30, 1972. (See photograph on p. 51 showing the use made of a sanitary landfill.) This goal was not attained, but EPA extended the program because some progress was made. By January 1973, 3,155 dumps had been closed or converted.

Since EPA has no regulatory authority to force the closing of private or municipal dumps, the operators of the dumps were encouraged to close them voluntarily. EPA regional personnel offered technical assistance to facilitate the closing of these dumps and then publicized their success to encourage others to take similar action. By November 1973 EPA reported that 5,529 dumps had been closed, and at the end of 1973 EPA terminated the Mission 5000 project. An EPA official stated that, during the 3 years that the project was operating, probably as many or more open dumps had been added to the national total, so the net result represented no substantial reduction.

Major technical assistance

EPA's major technical assistance program involves efforts to apply existing technology and know-how to increase the effectiveness of local solid waste management practices. In response to requests for assistance, EPA sends a team having technical expertise in engineering, operations research, finance, and management to study and recommend solutions to the problems these communities are facing.



Denver's mile-high stadium was constructed on a sanitary landfill.

CREDIT: EPA-Documerica

EPA has cited its assistance to Akron, Ohio, as an outstanding example of this program's success. Akron was providing garbage collection to its residents, while the collection of trash had to be contracted with a private hauler separately. The cost to the individual residents of having two collection systems was between \$4.50 and \$5 per month. Akron had experimented with making its system more efficient and, consequently, asked EPA to develop a collection plan for the city. EPA recommended a plan of combined collection by the city, and the plan was accepted. The new cost to the city's residents is \$1.93 per month. The productivity of the municipal sanitation crews which had been collecting 2 tons per day (garbage) has increased to 10.7 tons per day (mixed waste). With a city-wide participation rate of about 72 percent, the overall savings to city residents is projected to be \$1.6 million in the first year.

However, not all dollar savings accrue to a city in this manner. In Hot Springs, Arkansas, the savings from improved productivity were used to increase the quality of service and offset the cost of a new incinerator. Portland, Maine, also redesigned its collection routes for maximum efficiency while changing from bimonthly pickup of dry refuse only to once a week combined collection. Even with the higher level of service and an extension of service to households not previously served, Portland has saved \$23,000 a year. A 1974 report by the National Commission on Productivity asserted that

***for the United States as a whole improved collection productivity could mean \$200 million per year in direct savings, forestalled cost increases, expanded service, improved service quality or higher benefits to employees."

The technical assistance program has been used primarily to help municipalities (1) improve their collection productivity and (2) improve their overall managerial decision making. The technical assistance program now is emphasizing assistance requests in the areas of land disposal, leachate control, ground-water protection, special waste disposal, and procurement methods for capital intensive systems. Furthermore, what started as a program directed entirely toward municipal waste management practices has become part of the program strategy of the entire Office of Solid Waste Management so that technical assistance is now available in the areas of resource recovery and hazardous-waste management.

In reviewing this program, the National League of Cities and the U.S. Conference of Mayors in their March 1973 report stated that they found consistent evidence of measurable

impact and, in many instances, immediate savings.

EPA assistance for
resource recovery systems

An EPA official informed us that EPA did not have a large-scale technical assistance program for resource recovery systems. Principally EPA answers inquiries and occasionally provides technical assistance but only to a limited degree because of personnel limits. EPA is planning to provide technical assistance to Dade County, Florida, on a wider scale than previous assistance but does not have the manpower to provide this degree of assistance to more than one community at a time. This official said that before a community makes a commitment to resource recovery, a feasibility study should be made.

In view of the limited nature of the technical assistance provided by EPA to local governments for resource recovery systems, it appears that an expanded technical assistance program would be warranted. Assistance could be provided in a number of ways such as:

- Determining whether a resource recovery system would be appropriate for a particular community (generally a resource recovery system is not appropriate in rural areas).
- Selecting a particular system.
- Obtaining markets for a system's products (probably glass, metals, and energy).
- Getting a number of communities to jointly participate in a system.
- Providing assistance in the initial operating phase of a system.

STATE LEGISLATION AND PROGRAMS
DIRECTED AT RESOURCE RECOVERY

All of the States we visited--California, Colorado, Connecticut, Delaware, New York, and Oregon--were interested in improving solid waste management and had agencies charged with varying degrees of responsibility for solid wastes. Also, each of these States has passed legislation to regulate, control, and assist in managing these wastes. All had demonstrated some interest in resource recovery and most were actively considering it as an alternative to disposal.

These States had all completed statewide solid waste management plans between June 1970 and July 1973. The plans were funded under the Solid Waste Disposal Act of 1965 and and most were in varying stages of implementation.

Examples of programs and legislation in some of the States we visited in our review follow.

Connecticut

Connecticut passed a law in 1971 requiring its Department of Environmental Protection to develop a statewide plan for managing solid wastes. This plan was to provide for a system which was to be:

- Environmentally sound, fostering the recovery of materials and energy.
- Economically feasible, tapping the initiative and resources of industry whenever possible.
- Technologically flexible, welcoming innovation with minimum disruption of services.

According to Connecticut's Director of Solid Waste Management Programs, the plan was completed and approved in July 1973. Approximately \$1 million was spent on designing the plan, half of which was funded by industry. The plan calls for 10 recovery facilities, 45 transfer stations, and 18 landfills to be constructed over the next 10 years. The facilities are expected to cost approximately \$250 million; however, the contractor who prepared the plan estimates that its implementation will save from \$50 to \$100 million by 1985. Other estimated benefits include

- a 70 percent reduction of air pollution from refuse disposal;
- a reduction in landfills from 144 to 18 by 1985; and
- substantial elimination of underground water contamination, due to landfills accepting only inert residues from the recovery facilities.

The Director of Solid Waste Management Programs stated that the Connecticut Resource Recovery Authority, which is responsible for implementation and maintenance of the plan, is in full operation. The authority has acquired the funds necessary to implement the plan through a \$250 million State bond issue.

The authority awarded a contract for the first resource recovery facility. The facility will be built in the Greater Bridgeport area and is expected to be operating by 1977. A second facility is to be located in the Greater Hartford area. According to Connecticut's Director of Solid Waste Management Programs, the authority expects to build 1 new resource recovery facility each year until all 10 have been completed. The refuse handling capacities of these facilities will range from 1,300 to 2,200 tons per day.

New York

Recognizing that changes from traditional solid waste management methods were necessary to conserve resources and protect the environment, New York's Office of Recovery, Recycling, and Reuse was established in 1970 to promote systems for managing waste which would minimize the loss of resources.

New York, in its August 1972 Program Plan for Solid Waste Management, estimated that the ultimate goal for waste management to be reached in stages over the next 10 to 15 years would be about 200 centralized facilities using resource recovery methods. This plan is based on the premise that the State's role in solid waste disposal should be one of regulation, enforcement, and financial assistance.

In November 1972 New York passed the Environmental Quality Bond Act which provides the initial funding necessary to implement these plans. The act allocates \$175 million for municipal solid waste management projects to cover up to 50 percent of the cost of resource recovery systems and 25 percent of the cost of systems which provide for the environmentally sound disposal of wastes. An additional \$100 million was authorized for air quality improvement projects, most of which involve upgrading incinerators to meet clean air standards.

The State has appropriated \$21 million as its share of a project in New York City where shredded waste is to be used as a fuel supplement. Also, \$9 million has been appropriated for a project in Monroe County where paper is to be extracted from solid waste and sold and the remaining waste is to be shredded and used as a fuel supplement.

Oregon

Oregon enacted legislation in 1971 consolidating solid waste management responsibilities in the Department of Environmental Quality and providing for a permit system for establishing and operating solid waste disposal sites. The legislation also authorized the Department of Environmental Quality to acquire disposal sites.

An Oregon Department of Environmental Quality official informed us that the State's Solid Waste Management Action Plan, when completed, will consist of detailed regional plans prepared at the local government level. The official explained that the statewide plan will include such short-range planning objectives as the closing of 124 open dumps; the setting up of programs designed to handle wood residues, automobile hulks, oils and other special wastes; and the construction of 36 new regional processing, recycling, and disposal facilities to accommodate at least 25 percent of total solid wastes collected. Long-range objectives to be accomplished by 1982 will provide for at least 90 percent of total collected wastes to be processed through the major recycling centers.

In 1972 Oregon passed the Minimum Deposit Act, commonly known as the "bottle bill," to control beverage container litter. Under this law beverage containers sold in the State are to have a refund value of not less than 5 cents, and it encourages standardized packaging by setting a lesser refund value of not less than 2 cents on certified beverage containers--those which can be used by more than one manufacturer. It also bans the sale of cans with pull-tab or flip-top openers.

EPA's analysis of the effects of the bottle bill after the first 6 months showed that the beverage container portion of litter decreased by at least 49 percent and the bill resulted in an initial loss of 142 jobs in the can industry. However, new jobs may be created in the bottling industry to offset these losses.

According to a report released October 4, 1973, by the Oregon Environment Council, the State has virtually solved its beverage container litter problem. This report states that for every 100 soft drink and beer cans and bottles which were discarded as litter before the bill went into effect, only 10 are now being discarded as litter--a full 90 percent reduction. Also 7 of the 10 were either purchased before the bill went into effect or were bought outside the State. The report concludes that any additional improvement will come about only as other States adopt similar legislation.

HOW THE STATES VIEW THE FEDERAL ROLE IN RESOURCE RECOVERY

Officials in the States included in our review believed that Federal financial and nonfinancial assistance was warranted. The type of assistance varied but included:

- Providing financial assistance to State and local governments for planning and implementing resource recovery projects.

- Providing technical assistance to State and local governments.
- Coordinating overall research.
- Participating in Statewide planning for resource recovery.
- Continuing the existing program for research and demonstration.
- Concentrating on developing markets for recovered materials and recycled products.

In March 1973 the National League of Cities and the United States Conference of Mayors issued a report entitled "Cities and the Nation's Disposal Crisis." The report stated that almost half of our cities would run out of current disposal capacity in 1 to 5 years and that America's urban areas faced an immediate disposal crisis. The crisis is twofold: the skyrocketing volume of solid waste and the sharp decline of available urban land for disposal sites. The problem is serious throughout the country where in the last 50 years the volume of solid waste per person has doubled; the problem is critical in the cities, where the volume has doubled in only 20 years.

According to the report, cities are already bearing the national burden of increasing disposal costs. Of the total direct solid waste expenditures for Federal, State, and selected large local governments in fiscal year 1971, 98 percent came from local governments. The report further pointed out that the 48 largest cities are spending nearly 50 percent of their environmental budgets for solid waste management, while the federally proposed budget at the time of the report earmarked only 1 percent of the Federal environmental dollar for solid waste. The report highlights were summarized as follows:

- Solid waste management problems are national in scope and interjurisdictional and interstate in character.
- The reduction of solid waste at its sources is a national responsibility.
- Progress in meeting the solid waste challenge requires an expanded Federal role.
- The Federal Government should adjust its discriminatory freight rates, its depletion allowances for virgin materials, and its procurement practices to provide positive incentives for increased use of recycled materials.

--Collection is primarily a local responsibility.

--At the local level many municipalities need to cease open dumping, convert to sanitary landfill practices, and upgrade collection productivity. Others need to consolidate their disposal needs into central multi-jurisdictional landfill operations. Still others are in a position to consider recycling and energy recovery options if they can get financial assistance and see evidence of sure markets.

--States should implement performance guidelines and solid waste management plans in keeping with any Federal regulations and do so in consultation with local governments.

Also in 1973 the Council of State Governments issued a report entitled "The States' Roles in Solid Waste Management." The report stated that, because most local governments are presently incapable of providing for or sustaining improved solid waste collection and disposal services, strong State-level actions will be necessary to assist these governments to improve their capabilities. Effective State actions oriented toward modernizing local governments and stimulating general public responsiveness to such efforts are generally not provided but are needed. Although much technical information for improving these necessary services also will be required, workable solutions will necessitate fundamental long-range efforts with joint participation from the Federal Government and the States.

The report also pointed out that the State governments are obligated to insure that local governments provide for efficient, environmentally sound solid waste services for their inhabitants. The States cannot be satisfied with only a regulatory role; they must provide various forms of aid (administrative, managerial, financial, and technical) necessary to assist and encourage local governments to expand and improve services.

The Council said that State governments must take a positive role in assisting local governments to solve their solid waste management problems and require new administrative and legislative actions directed toward:

--Establishing a State commitment with a strong State policy to develop the means to provide solid waste services in an environmentally safe manner.

--Broader forms of assistance to local governments to improve administrative structures and management capabilities.

- Strengthened, but regionally flexible, regulatory functions to show differing problems and needs in local areas.
- More direct involvement in locating facilities and sites essential for providing this necessary service.
- Considering direct State actions to provide for necessary services in areas where local governments cannot be modernized.

The Council concluded that the States cannot accomplish major changes in existing solid waste management practices without substantive Federal assistance, including:

- A strong, national policy directed toward a commitment to assist the States to develop the means to provide adequate solid waste services in an environmentally safe manner.
- Expanded pure and applied research to be engaged in jointly by the Federal Government and the States to solve existing problems that impede improvement of services. The joint research effort should include environmental, economic, and other forms of research needed to develop solutions within the context of the States' institutional framework.
- The establishment of minimum Federal performance standards or quality standards for the safe disposal of solid waste in a manner that can give direction to the States in their program development efforts.
- A Federal regulatory role limited to the common national problems associated with handling and disposing of very hazardous wastes.
- A national commitment to develop the manpower capabilities needed at all levels of government to administer, manage, and perform necessary services or activities related to these services.

CONCLUSION

The solid waste disposal problem occurs where the waste is generated--in the towns, cities, and counties of America; and it is these local communities that have the burden of solid waste disposal. Resource recovery can help to solve the problems of energy consumption and natural resource conservation, but, most importantly, it can contribute greatly to solving the problem of solid waste disposal.

Some States, notably Connecticut and New York, are helping local communities establish resource recovery systems. But States and local communities are looking to the Federal Government for technical and financial assistance in solving their solid waste problems. EPA should give increased emphasis to the furnishing of resource recovery technical assistance to States and local communities to help provide efficient and economical resource recovery systems throughout the country. Communities need EPA's technical assistance to insure that the system adopted is in accordance with the communities' needs and will have the best opportunity for success. To have a successful effort, EPA should coordinate its activities with other governmental entities that have an interest in this area. The solution to the solid waste problem will require a long-range, cooperative effort of all parties involved.

The Federal Government has provided some technical assistance and funds for planning grants and a few demonstration projects. On the basis of information obtained during our review, State and local governments believe that the Federal Government should, as a minimum, continue to provide assistance in solid waste matters, particularly with respect to resource recovery. However, it appears that the States and local governments believe that the Federal role should be expanded beyond that conducted under the Solid Waste Disposal Act as amended by the Resource Recovery Act of 1970.

RECOMMENDATION TO THE ADMINISTRATOR OF EPA

To enhance the effectiveness of the Federal role in assisting States and local communities to solve their solid waste problems through the establishment of resource recovery systems, we recommend that the Administrator of EPA provide expanded assistance in such ways as:

- Determining whether a resource recovery system would be appropriate for a particular community (generally a resource recovery system is not appropriate in rural areas).
- Selecting a particular system.
- Obtaining markets for a system's products (probably glass, metals, and energy).
- Getting a number of communities to jointly participate in a system.
- Providing assistance in the initial operating phase of a system.

AGENCY COMMENTS

EPA stated in its comments on this report that it completely agreed with our recommendation to provide expanded assistance to States and local communities.

CHAPTER 6

SCOPE OF REVIEW

We reviewed the progress made by EPA in the field of resource recovery and recycling since the passage of the Resource Recovery Act of 1970, the procedures used by EPA in awarding demonstration grants, and resource recovery activities in several States. We also reviewed the legislative history of the Resource Recovery Act of 1970 and important issues confronting resource recovery.

Our review was made at EPA headquarters in Washington, D.C., and at EPA facilities in Cincinnati, Ohio. We held discussions with officials of various Federal agencies, including GSA, Department of the Interior, ICC, FMC, and the Department of Defense. We visited six States--California, Colorado, Connecticut, Delaware, New York, and Oregon--where we met with State, local government, and industry officials and visited various resource recovery and solid waste disposal facilities.

We reviewed documents, reports, records, and files and held discussions with officials of various industry associations and groups interested in resource recovery and recycling.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 31 1974

Mr. Henry Eschwege
Director, Resources and Economic
Development Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Eschwege:

We have reviewed your draft report on resource recovery and recycling and are in complete agreement with your recommendation to provide expanded assistance to states and local communities through the establishment of resource recovery systems. The following comments address the other portions of the report.

Federal Policy Issues

The report does not mention that EPA has made specific recommendations to the Congress on Federal policy issues. In 1973, the Agency proposed the Hazardous Waste Management Act which among other things would require that:

1. A formal investigation of Federal rate-setting practices be carried out to determine if discrimination against recycled materials exists.
2. In all future rate adjustments a determination be made that such adjustments do not discriminate against recycled materials.
3. Guidelines be established for Federal procurement of products containing recycled materials to the maximum extent practicable.

Source Reduction

The report should emphasize the importance of source reduction or the reduction in the consumption of materials and products in order to conserve resources and reduce waste. EPA currently has a small

APPENDIX I

but active effort which includes studying changes in product designs, providing information and assistance to consumers and industry environmental assessment studies and analyzing Federal incentives and regulatory measures. In addition, we have testified before Congress on the need for Federal legislation providing for mandatory deposits on beverage containers in order to promote reuse and recycling of such containers.

Delaware Demonstration Grant

Regarding the resource recovery demonstration project in Delaware, three points are raised in the report:

1. Confusion over the reasons for the original funding of the project.
2. A question as to whether the proposed modifications to the project are consistent with the competitive award of the other three resource recovery grants.
3. An uncertainty of the value of the project in light of its similarity to the on-going St. Louis EPA demonstration project and the similarity to the State-financed facility planned for Bridgeport, Connecticut, that would be available for evaluation two years before the Delaware project.

We have made detailed comments to GAO on this subject in an August 1974 letter. I would just like to summarize our position.

Justification for Funding. The funding of Section 208 demonstration grants followed an orderly process consisting of solicitation for preapplications, receipt of preapplications, solicitation for formal application, evaluation of the formal applications against criteria, and selection of projects.

Of the 17 applications, only three were recommended for funding because no additional funds were available. The Delaware project was not one of these although it did meet the criteria published in the initial solicitation. The rejection of the Delaware application did not indicate a value judgement on the project per se.

In October 1972, the Office of Management and Budget released an additional \$9 million in Section 208 funds. At this point an additional (fourth) demonstration grant application was selected for funding, the Delaware Reclamation Project.

The Delaware grant clearly met all the legal and programmatic requirements for funding, although it was not as attractive as the first three projects selected. However, it was selected from among the 14 projects not funded initially. Of the remaining applications, only three were found to be good candidates at the time when additional funds were released. These three projects were in Delaware; Malden, Massachusetts; and Mount Vernon, New York. Both the Mount Vernon and Malden projects were similar to the Delaware project having high costs; both were energy recovery projects; and both had been initially disapproved for this and other reasons. Malden also presented an additional problem in that, under Section 208, care must be taken to ensure distribution of funds among states, and a project in Lowell, Massachusetts had already been approved.

No formal decision process was followed in selecting the Delaware project, as had been followed in the initial recommended actions, but both programmatically and legally the choice was correct.

Project Modifications. The proposed modifications of this project are:

1. A change in project schedule caused by the two years' delay due to negotiations over the Grant Agreement Special Conditions.
2. The use of EPA Water Program Funds for a substantial amount of the State's share of project costs.
3. Modifications in the technology.

The modification to the technology involves adding an air classifier to the system to separate some combustible material to be used as fuel in electric utility boilers. The remaining combustible material would be composted as originally proposed. The modified plant would produce about 70 tons per day of compost for agricultural markets and 200 tons per day of classified solid fuel.

We do not feel that any of these changes warrant a resolicitation of proposals to award competitively the \$9 million originally awarded to

APPENDIX I

the grantee. Such changes are essentially routine and typical of any large-scale solid waste demonstration project. Schedules, budgets, and specific unit processes must be flexible for these innovative systems.

Value of Project. The value of this project is:

1. It will demonstrate burning of solid waste in oil-fired boilers.
2. It will demonstrate composting of sewage sludge with solid waste to produce a pathogen-free humus.
3. It will demonstrate maximum recovery of energy and materials to reduce residue requiring landfilling to a minimum.

This is clearly an extension of the state-of-the-art of resource recovery beyond both the EPA St. Louis demonstration and the State project in Bridgeport, Connecticut.

While we accept responsibility for the initial delays in the implementation of the resource recovery program, we feel the program currently has a strong technical base, is well organized and is moving ahead positively. Your report reflects this progress and we appreciate having had the opportunity to review it.

Sincerely yours,



Alvin L. Alm
Assistant Administrator
for Planning and Management

DESCRIPTION OF CERTAIN
EPA-FUNDED DEMONSTRATION PROJECTSLOWELL, MASSACHUSETTS

This project will use an incinerator residue recovery process developed by the Bureau of Mines. The principal objective will be to demonstrate that the components of incinerator residue can be separated and economically recovered.

The plant will be designed to handle 250 tons of incinerator residues in 8 hours, using a series of screens, shredders, classifiers, and other equipment. It is expected that the plant will extract annually more than 40,000 tons of products--ferrous and nonferrous metals and glass--from the incinerator residues.

The total cost of the system is about \$4.4 million; the Federal share of the system is approximately \$2.4 million. Design work began in February 1973 and construction of the facility is expected to be completed by March 1976.

EPA believes that the reliability and efficiency of the material separation system must be validated and that the product quality and marketability will have to be demonstrated. Further, the success of the project depends on the availability of a sufficient supply of incinerator residues from Lowell and several neighboring communities to enable the processing plant to run at designed capacity.

SAN DIEGO COUNTY

The San Diego County project is to feature a flash pyrolysis process. (Pyrolysis is the conversion of organic matter to gases through intense heat.) Municipal wastes will be shredded to a 3-inch particle size and then separated into two fractions: (1) a light fraction consisting of paper and plastic and (2) a heavy fraction consisting of glass, metals, wood, and stones. The light materials will be dried and shredded to a very fine particle size (practically a powder) before being pyrolyzed at a temperature of about 900 degrees fahrenheit. An oil-like liquid with a heat value of about 75 percent of that of number 6 fuel oil will be produced and used as a supplementary fuel by a local utility company.

The heavy waste fraction will be processed further to separate ferrous metals and glass. Ferrous metals will be separated by an electromagnet. Glass will be separated as a mixed-color glass cullet by a flotation process.

APPENDIX II

The total cost to construct the 200⁰⁰⁰ tons per day plant is expected to be approximately \$8.9 million, the Federal share will be about \$3.6 million. The revenue from the products produced by the system--oil, ferrous metal, and glass--is expected to amount to \$10.12 per ton, leaving a net cost of \$13.42 per ton to operate the plant. Design work began in April 1973 and the plant was initially expected to be operating by November 1974. Because of various delays, however, construction is not expected to be completed until May 1976.

EPA believes that this system will have national applicability because it will produce a storable, transportable fuel and will require no external fuel to operate. A drawback of the system is that it requires costly shredding of raw waste to a "vacuum cleaner dust" particle size.

BALTIMORE

The Baltimore project is being designed to handle mixed municipal waste. All incoming waste will be shredded to a 4-inch particle size and then conveyed to a rotary pyrolysis furnace. Gases produced by the furnace will be combusted in an afterburner; exhaust gases will pass through waste-heat boilers which will generate 200,000 pounds of steam per hour. This steam will be sold to a local utility company for heating in the downtown area.

Residue from the furnace will be water quenched, and ferrous metals will be separated. Water flotation and screening processes will separate the residue which must be landfilled and the remaining fraction--glassy aggregate--will be sold for use in street construction.

The facility will have a capacity of 1,000 tons per day--about 50 percent of Baltimore's municipal wastes. The total cost to construct the facility is expected to be about \$16.2 million, and the Federal share will be \$6 million. The revenues from the sale of the steam, ferrous metal, and glassy aggregate is expected to be about \$4.35 per ton, leaving a net cost of \$6.15 per ton to operate the plant. The facility has been completed and is expected to be fully operational in 1975.

EPA believes that there is little technological risk involved in this project due to the simplicity of the process. The marketability of the steam is limited, however, because it cannot easily be stored or transported over long distances. EPA recognizes that this system uses over 7 gallons of fuel oil per ton of incoming waste, but this is more than offset by the steam generated which will conserve about 39 gallons of fuel oil per ton of incoming waste.

PRINCIPAL EPA OFFICIALS
RESPONSIBLE FOR ACTIVITIES
DISCUSSED IN THIS REPORT

	<u>Tenure of Office</u>	
	<u>From</u>	<u>To</u>
ADMINISTRATOR:		
Russell E. Train	Sept. 1973	Present
John R. Quarles, Jr. (acting)	Aug. 1973	Sept. 1973
Robert W. Fri (acting)	Apr. 1973	Aug. 1973
William D. Ruckelshaus	Dec. 1970	Apr. 1973
ASSISTANT ADMINISTRATOR FOR AIR AND WASTE MANAGEMENT:		
Roger Strelow	Apr. 1974	Present
Charles Elkins (note a)	Oct. 1973	Apr. 1974
David Dominick (note a)	Jun. 1971	Oct. 1973
DEPUTY ASSISTANT ADMINISTRATOR FOR SOLID WASTE MANAGEMENT PROGRAMS (note b):		
Arsen Darnay	Oct. 1973	Present
Samuel Hale, Jr.	Oct. 1971	Oct. 1973
Hugh Connolly (acting)	Sept. 1971	Oct. 1971
Richard Vaughn	Aug. 1967	Aug. 1971
Leo Weaver	Jan. 1967	Aug. 1967
Wesley Gilbertson	Dec. 1965	Dec. 1966

^aBefore January 1974 the title of this position was Assistant Administrator for Categorical Programs.

^bThe Office of Solid Waste Management Programs was transferred from the Department of Health, Education, and Welfare on December 2, 1970.

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