

**Economic Factors Influencing the Development of
Resource Recovery Facilities in the Continental U.S. and Overseas**

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In the 1970's there was a confluence of economic and social influences which were responsible for creating the resource recovery industry: an industry which we are all here today, in some capacity, to discuss and hopefully to advance.

The waste-to-energy industry did not exist in the U.S. before 1975: so the industry just turned 20 years old. That is quite young for a major industry, making it still possible to have live industry veterans, who can also be historians and maybe even prophets of the future, at conferences such as this one.

It is my opinion that, as with most industries, the waste-to-energy/resource recovery industry is economically driven. It wasn't always so, but, with the ever-advancing global privatization of what were formerly municipal or public services, I believe we've seen the last of the publicly owned and/or subsidized projects. I also happen to think that the privatization movement is a very good thing. The free market brings with it accountability and responsibility, and minimizes political influence as a dominant factor in the determination and implementation of appropriate infrastructure solutions.

Before discussing economic influences, a bit of industry history is appropriate. A major environmental event, which many see as the starting point of our industry, thrust me into this delightfully and painfully complex business. It was Earth Day 1970. Though I am here today to discuss economic issues, I am an engineer, problem-solver and environmentalist first. If I were a pure capitalist, I would not be in this business and here today as an advocate of the resource recovery industry. The economics for success have not been good in this business for the past five years. I don't believe this industry is dead, but it has been in a deep coma for the past five years and economic indicators don't paint a bright picture for the next five years.

The first large-scale public participation in an environmentally focused activity occurred on Earth Day in April 1970 and it, among other things, spawned the environmental movement which has had such an influence on our industry (both positive and negative). It also created a public awareness of environmental issues including the manner in which society manages its wastes. This in turn was communicated to our Congress which, in its wisdom, produced the Resource Conservation and Recovery Act (RCRA) of 1976. This Act had a noble purpose stated as "to promote the protection of health and the environment and to conserve valuable material and energy resources". In other words, the conservation and recovery of resources became part of the law of the land.

In 1973, shortly after the first Earth Day, we experienced our first energy crisis brought on by what was then called the "Arab Oil Embargo". (See Figure 1) There were dramatic increases in oil and gas prices and the environmental community, with newly found power, sought to have renewable energy sources developed to replace our growing dependence on imported and limited supplies of fossil fuels. Congress again responded by passing the Public Utilities Regulatory Policy Act (PURPA) of 1978 which, among other things, would provide a reliable buyer for energy generated from independently produced power from renewable resources.

These two acts were intended to provide communities and private industry with both a ready and financeable market for energy generated from waste, and a national commitment to abandon landfilling as the primary method of waste disposal.

But, back to the history:

I choose 1975 as the date that the waste-to-energy industry began because that is the year that the Saugus, Massachusetts RESCO facility went on-line, accepting waste from Boston metropolitan area communities and supplying steam to General Electric. It was the first privately developed and financed facility to make money at generating energy from waste. It brought the Von Roll mass burn technology to the U.S., to work for the first time on U.S. waste materials. It did not have an easy start-up and did not initially generate electricity. However, after several significant modifications, the RESCO facility became a successful operation and is still operating, over 20 years later.

But, most importantly, RESCO was done privately, with no government subsidies, and included an air pollution control system which met or exceeded all standards in place at the time. The macro economics were good, but not great, and this facility should have been the beginning of elimination of the landfill approach in the U.S.

Certainly there were other energy-from-waste facilities constructed in North America prior to that time. (See Figure 2) They were, however, municipally sponsored projects which did not have to meet the test of the marketplace economics and thus must be considered subsidized or protected projects. The earliest of these is the Hamilton, Ontario Solid Waste Reduction Unit (SWARU) which went into service in 1969 and, after a number of retrofits, is still in service today. It was the first *prepared fuel* waste-to-energy system and the technological “grandfather” of the SEMASS facility. Despite its technological contribution, it was, and still is, publicly owned and that is why I use the free-market Saugus facility to mark the birth of the industry.

The Congress, obviously reacting to concern for the environment and intending to encourage the development of renewable energy sources, thought that the waste-to-energy/resource recovery approach was good national policy. (See Figure 3) But, the regulators apparently did not; and, as regulators can do, they slowed the process by regulating the waste-to-energy industry, if not to death, certainly into the comatose state where it now resides. I have previously stated that the resource recovery industry, along with other industries, is economically driven. Well, how then do regulators impact the industry? Simply by influencing the economics through regulation or de-regulation, as well as slowing any process they are involved in. Time is money when it comes to the development of these complex projects and, just as de-regulation drives the price of a product down, regulation or pending regulation drives the price up.

We cannot, however, lay the blame entirely at the door of the regulatory community.

If there is one thing that we overlooked as an industry that has hurt us more than anything, it is the lack of inclusion of landfills under the original Clean Air Act of 1970. Though we tend to blame the regulators and politically correct environmentalists for that, a large portion of the blame rests with our industry --- in particular, with the large parents of industry players who have a vested interest in protecting the economics of mega-landfills.

But, getting beyond blame, the regulatory community chose to impose incredibly tough air quality standards on waste-to-energy facilities while ignoring the severe environmental impacts (including air impacts) of landfills. They also ignored or postponed air quality upgrades to other energy generation facilities. So, what was intended by Congress as an economic incentive became a severe handicap to our industry. (See Figure 4) Waste-to-energy facilities are the most heavily regulated energy generation facilities in the U.S., while emissions are cleaner than coal, oil and even natural gas in some cases. The trucks bringing waste to the facilities are now a greater source of air pollution than the modern waste-to-energy facility stack gasses. In a feeble attempt to correct this obvious environmental error, the Clean Air Act Amendment of 1990 for the first time brings landfills under the Act but sets no firm standards. In addition, the MACT (Maximum Achievable Control Technology) standards were proposed (and adopted in December 1995) on an industry that represents a great solution, not part of the problem. At least in Europe where tight air quality standards are in place, they apply to all energy generating facilities, and landfills are recognized as the last resort in waste management and price controlled accordingly.

However, I am not advocating price controls or regulation; I am advocating de-regulation and open market solutions with a level playing field. The setting and enforcing of uniform environmental standards should be the only government function. Objective comparative environmental assessment is essential to that function. What are the environmental, social and economic impacts of the disposal alternative, the recycle/landfill alternative, and the resource recovery alternative? That is a legitimate question for government to ask and answer.

Let's look at two Energy Answers facilities for examples of the economics of private sector resource recovery systems. (See Figures 5 & 6) Both the SEMASS and Pittsfield facilities are located in Massachusetts and were built and operated privately, without public subsidy. SEMASS is a 3000 ton/day facility designed, developed, built and operated by EAC and now owned and operated by American Ref-Fuel. Pittsfield is a 240 ton/day modular system acquired and upgraded by EAC in 1993.

In both cases the private sector decision to invest and build was based on the projections that each facility could produce a return to investors of approximately 30%. The mix of expenses and revenues were, and remain, quite different: Pittsfield has a relatively low energy sales component, while SEMASS has somewhat lower tip fees and materials sales revenue. The project economics were a function of local economics, regional economics, technology choices and capital and O & M costs. (See Figure 7)

These projects have operated successfully for 8 and 15 years respectively and have provided a valuable community and environmental service in a tough regulatory environment (Massachusetts). So why can't these economics be duplicated now and what could we as an industry do to improve the project economics for future projects?

First, let's look at the factors influencing the economics and discuss them:

1. Energy prices
2. Waste disposal prices
3. Economics of the particular resource recovery system
 - size
 - local subsidies available
 - technology cost
 - local economics (tipping fees and energy prices)
 - interest rates
4. Regulatory community position and support/lack of support for resource recovery
5. Site selection
6. Public perception of resource recovery vs. landfill/recycle
7. Environmental issues and their appropriate management
 - air pollution control
 - ash management
 - community impacts; traffic, noise, odor
8. Politics

The first two factors are generally out of the direct control of our industry and are the two factors which most critically influence the economics of resource recovery systems. We will look at them a bit more closely since overly aggressive projections of these prices has led to the deteriorating economics of our industry which we have experienced.

First, let's look at energy projections. (See Figures 8 & 9) I chose gas as the fossil fuel to establish the base price for wholesale energy since a large number of gas-fired combustion turbine combined cycle power plants are being built by the non-utility generators both in the U.S. and abroad. Energy prices will in the near term, in effect, be set by the supply and price of natural gas. Supplies right now seem to be abundant but the projection of future pricing is left to each project developer to develop and defend. One warning: as the price of energy escalates, as it undoubtedly will someday, and waste-to-energy becomes more attractive, so may other energy sources such as photo voltaics, biomass and most importantly, coal. This should be factored in to moderate aggressive projections of escalating energy prices.

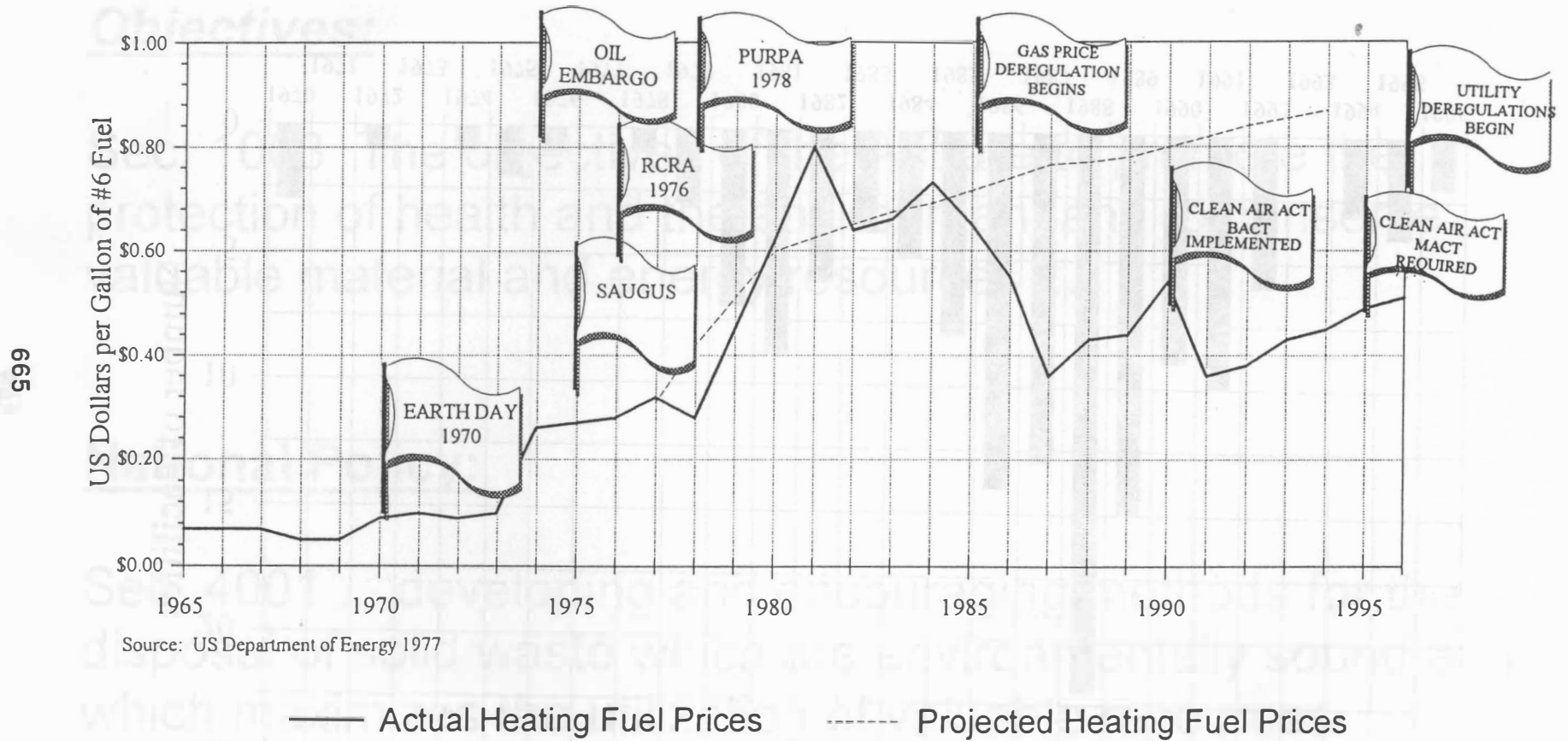
Then, we should discuss the past projections and future of tipping fees (See Figure 10) which in great part will be determined by the treatment of landfilling (and I think it would be appropriate to return to the old term "dump" when a landfill is not being used to productively restore a piece of scarred land). If the government in its wisdom chooses to impose uniform environmental standards and enforce them, then I think that tip fees will rise and therefore make resource recovery relatively more attractive economically. If not, I have seen compelling numbers which suggest that the U.S. has enough permitted landfill capacity to last through the next century, and the law of supply and demand being what it is, I would expect landfilling prices to remain quite low.

With these two factors essentially out of the control of our industry, it is then necessary to find the potential project locations where waste and energy prices are likely to be highest and to focus on the other factors in an attempt to bring facilities into a more competitive position compared with the disposal alternatives.

Therefore, the key to developing good resource recovery project economics in anticipation of competing with the dumping of resources in landfills (dumps) is to: select locations where energy and dumping costs are high; reduce capital and O & M costs through creative design and proper incentives; recover more materials and reduce residue disposal costs; increase energy efficiency; improve environmental performance; educate the public and regulators about the environmental benefits of a resource recovery approach; and don't attach your project to a political sponsor.

NO. 6 Heating Fuel Prices

1965-1996

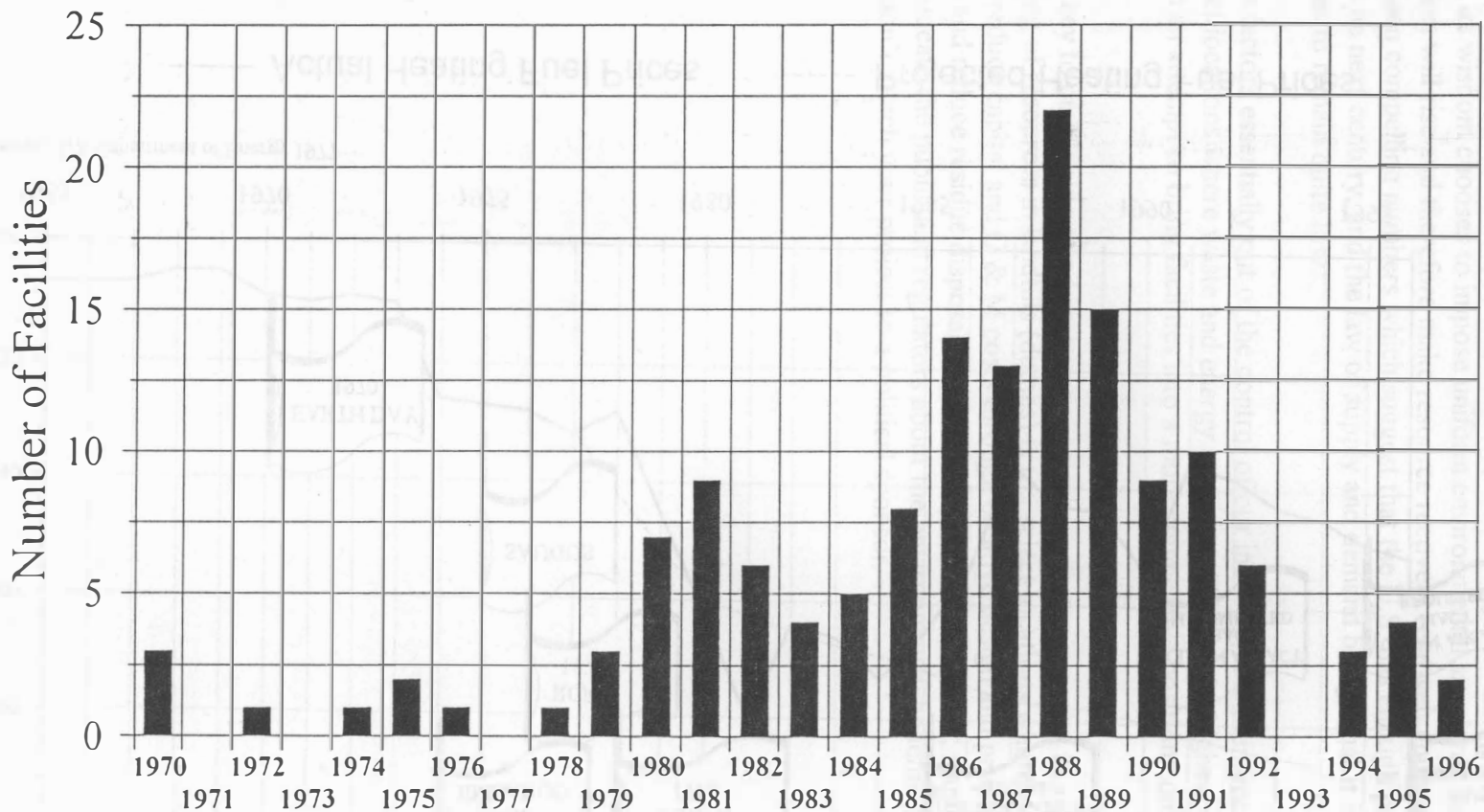


Source: US Department of Energy 1977

Figure #1

Resource Recovery Facility Startups

1970-1996



999

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Figure #2

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 1976

Objectives:

Sec. 1003 The objectives of the Act are to promote the protection of health and the environment and to conserve valuable material and energy resources ...

National Policy:

Sec. 4001 ... developing and encouraging methods for the disposal of solid waste which are environmentally sound and which maximizes the utilization of valuable resources including energy and materials which are recoverable from solid waste and to encourage resource conservation.

Resource Recovery Facilities

Projected versus Actual

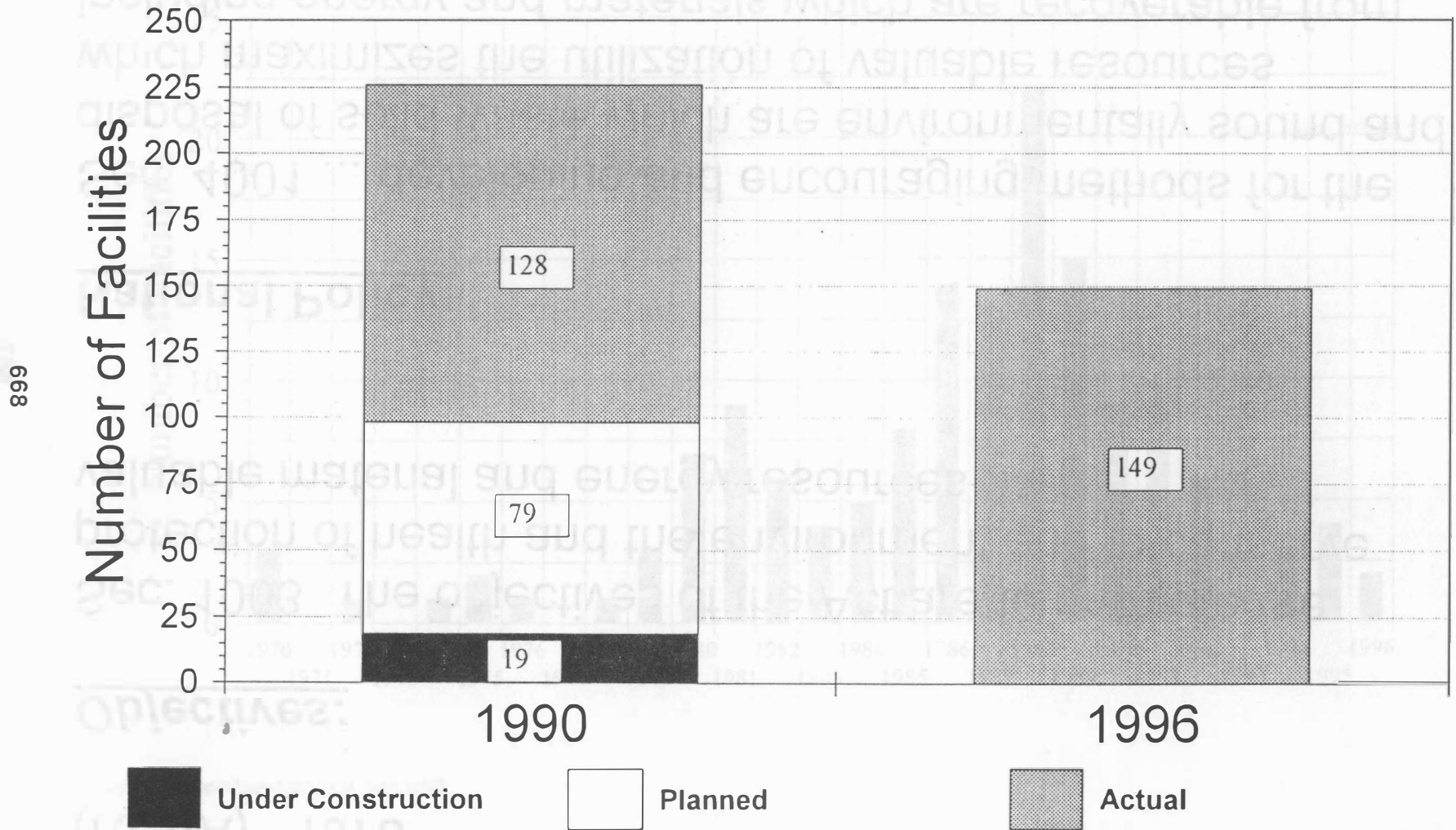


Figure #4

SEMASS Resource Recovery Facility

COST and REVENUE PROJECTIONS

1800 Tons Per Day (average daily throughput)

699

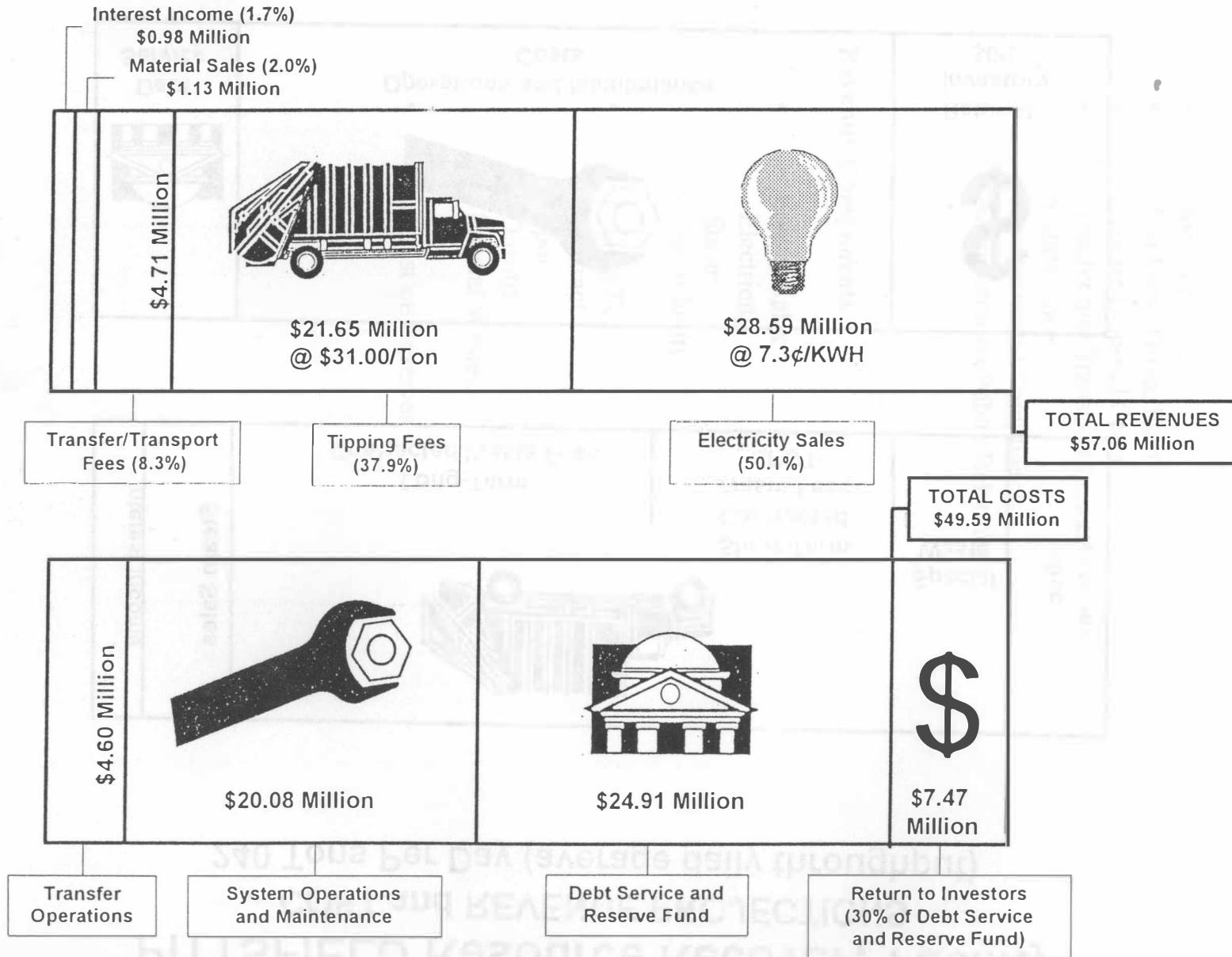


Figure #5

PITTSFIELD Resource Recovery Facility

COST and REVENUE PROJECTIONS

240 Tons Per Day (average daily throughput)

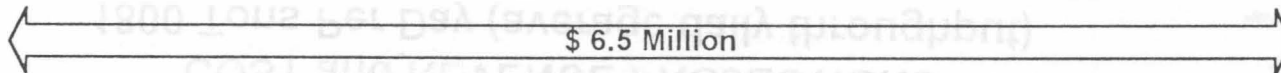
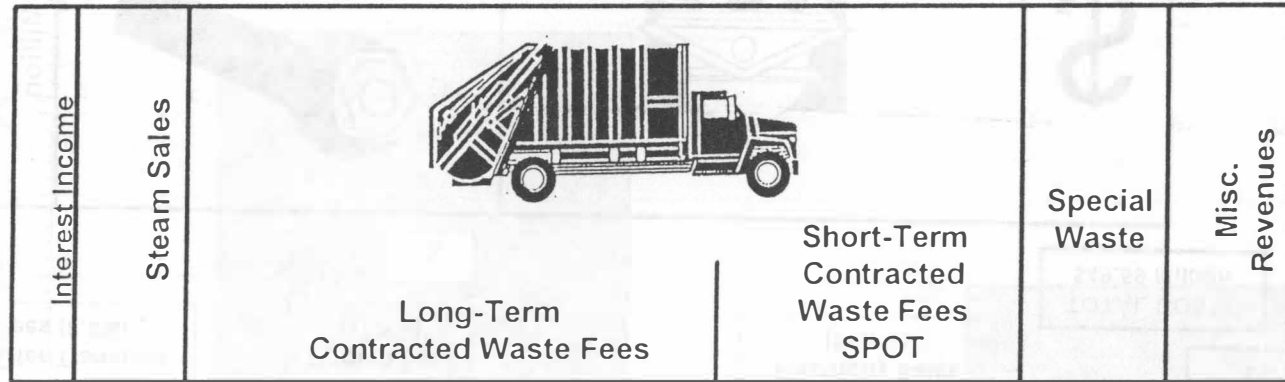


Figure #6

O & M Cost Components

- Operator's Fee
- Host Fees, Taxes, Rent
- Residue Disposal Costs
- Transfer and Transport Costs
- Maintenance
- Environmental Compliance
- Administration/Public Relations

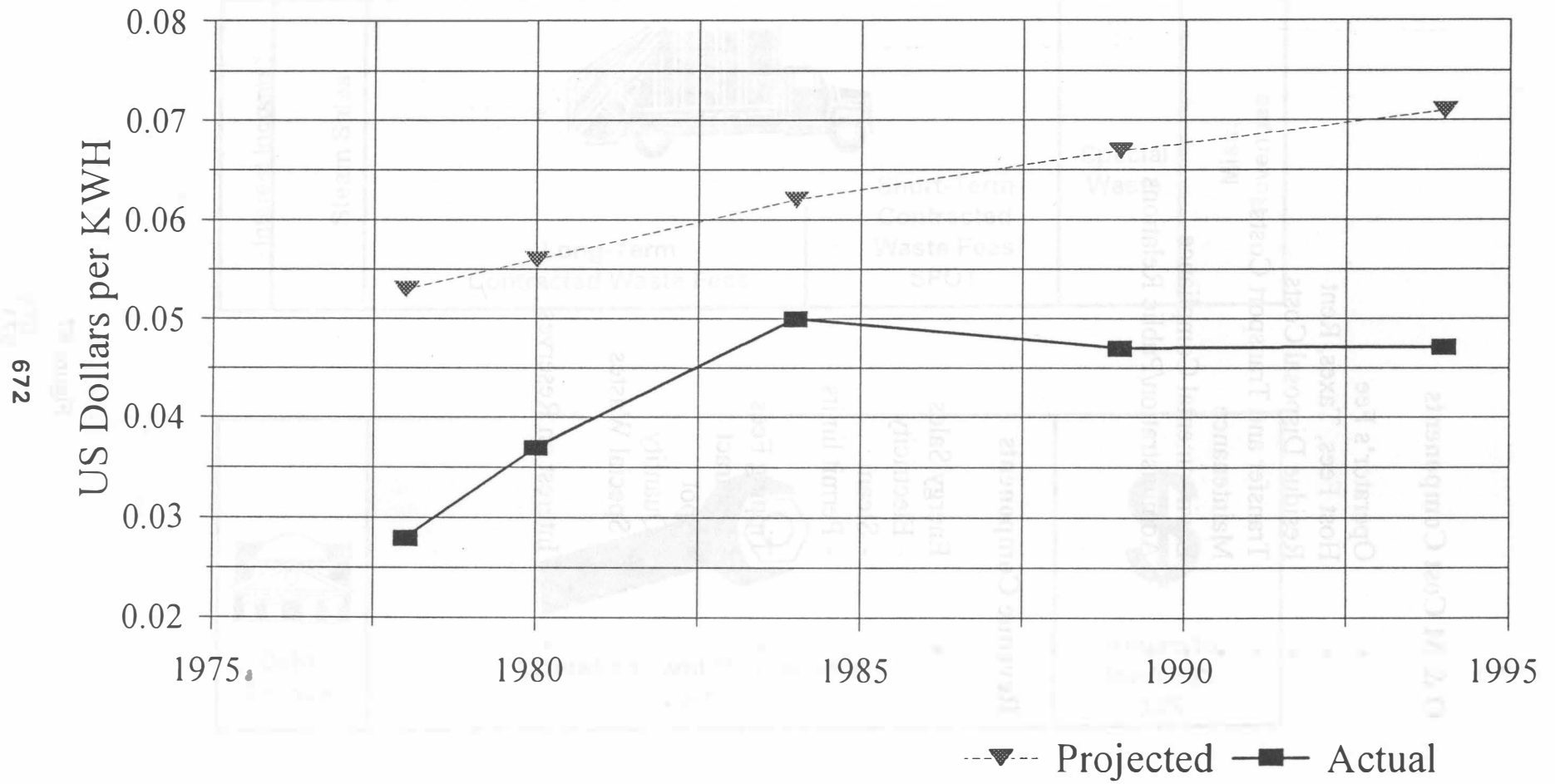
Revenue Components

- Energy Sales
 - Electricity
 - Steam
 - Permit limits
- Tipping Fees
 - Contract
 - Spot
 - Quantity
 - Special Wastes
- Interest on Reserves

Figure #7

Energy Prices

Projected versus Actual

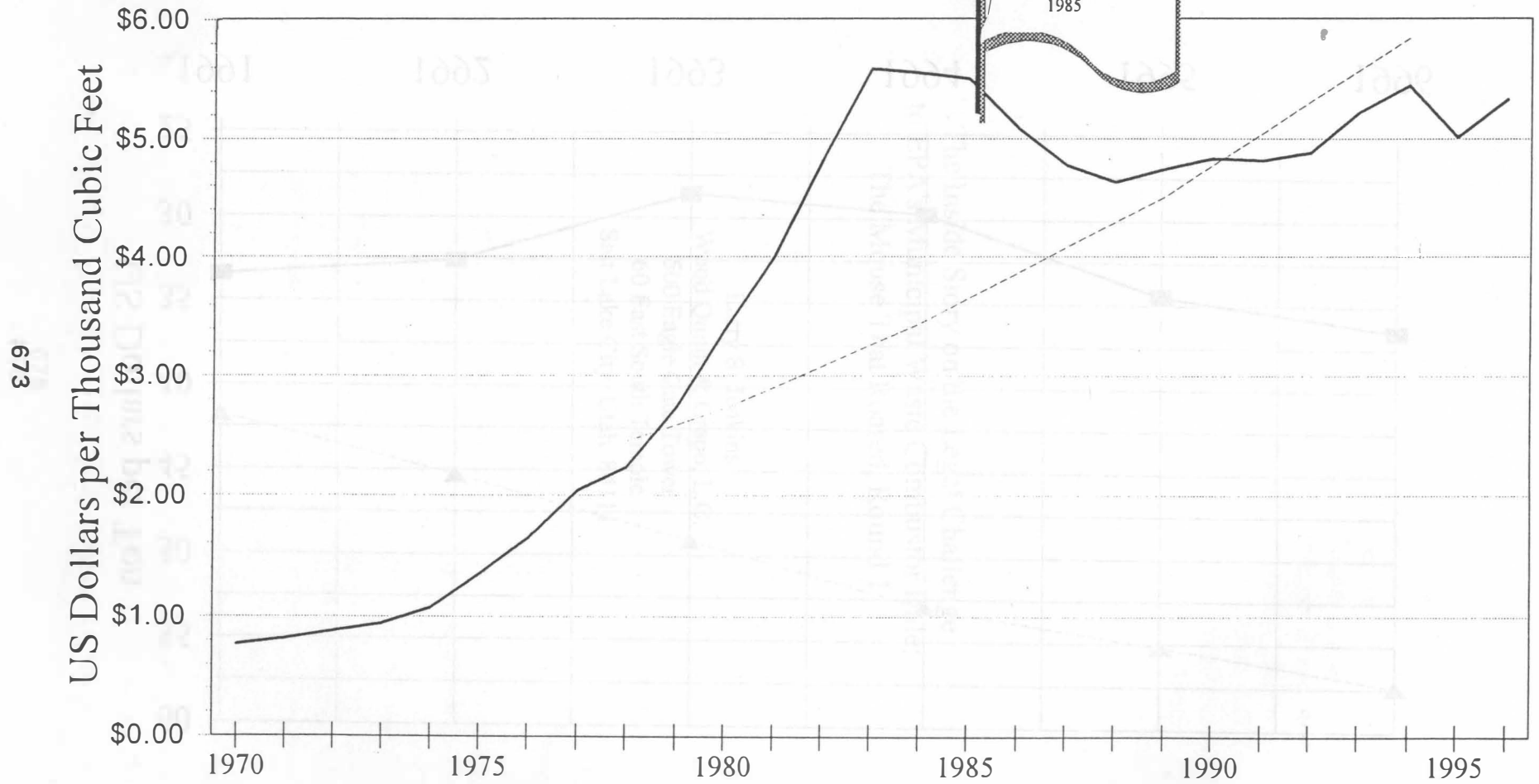


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Figure #8

Commercial Natural Gas Prices

1970-1996

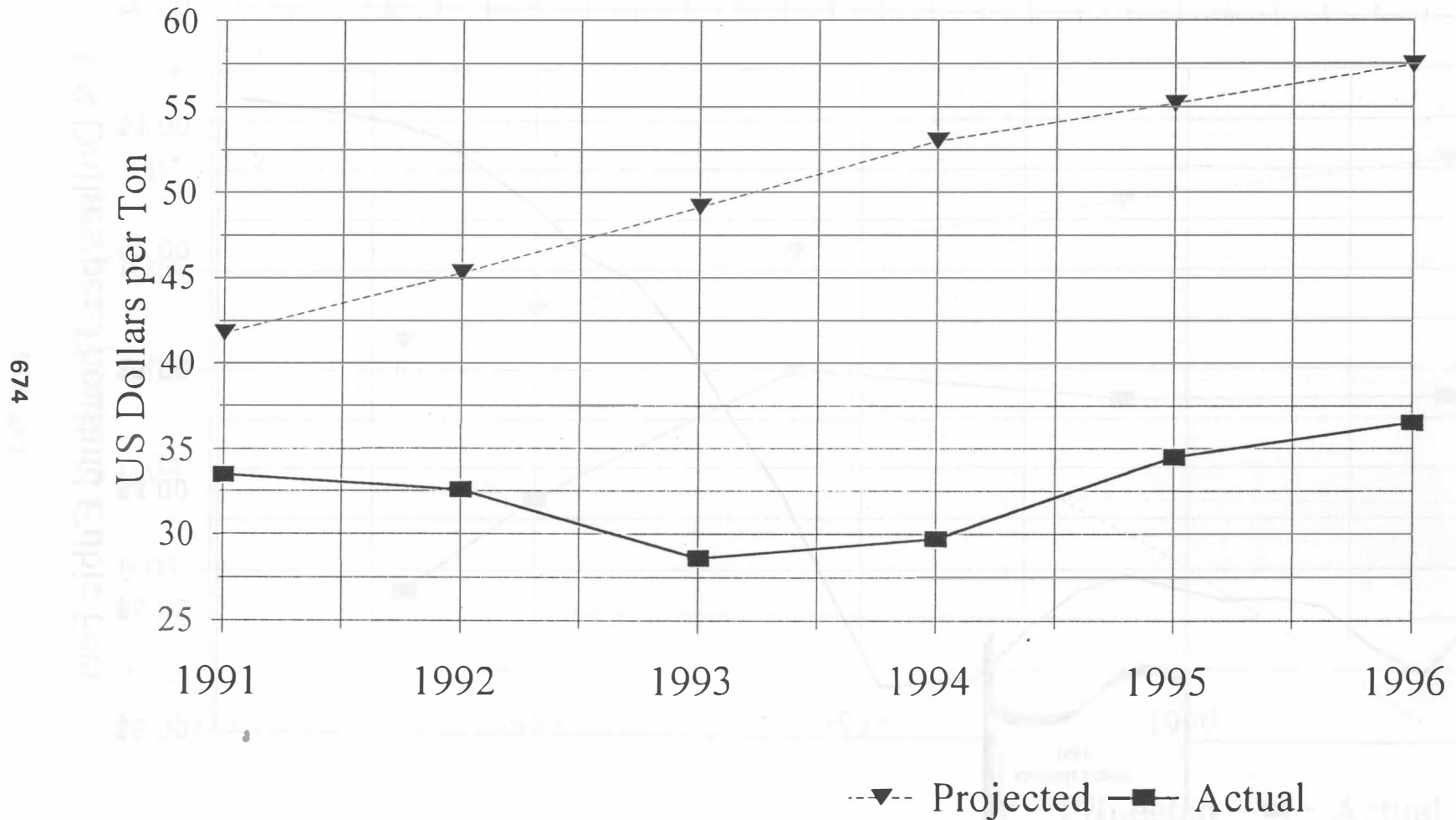


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Figure #9

Projected versus Actual Tip Fees

SEMASS Resource Recovery Facility



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Figure #10