

# THE GREATER BRIDGEPORT REGIONAL RESOURCE RECOVERY PROJECT: A WASTE-TO-ENERGY REINCARNATION

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## ABSTRACT

Since the early 1970s, the Greater Bridgeport, Connecticut, region has been a center of waste-to-energy activity. From the early RDF facility plans, through construction and ultimate failure of the original RDF facility, to the construction of the new, successfully operating facility, the municipalities in the Greater Bridgeport region have experienced most of the problems and have overcome most of the obstacles typically associated with implementing a regional solid waste disposal solution. This paper is a case history that examines the lessons learned from past failures; the process of redeveloping a waste-to-energy facility, including procurement, financing, and environmental permitting; details about the design and construction of the new, 2250 TPD mass-burn facility and other elements of the Greater Bridgeport system; and the current status of the successfully operating system. Conclusions are offered about how the Bridgeport experience can be applied to solid waste management system planning and implementation in other areas.

## INTRODUCTION

This paper describes the redevelopment of the Greater Bridgeport Regional Solid Waste Resource Recovery Project. The history of the transformation

of the failed 1800 ton-per-day (TPD) regional refuse-derived fuel (RDF) facility serving nine municipalities into a 2250 TPD mass-burn facility serving 14 municipalities provides an insight into the key ingredients required for successful implementation of a regional resource recovery project.

## GENERAL BACKGROUND

The Greater Bridgeport region is located along the southwest coastline of Connecticut. The 14 Participating Municipalities that constitute the region encompass an area bordered by New York State to the west, New Haven to the east, Long Island to the south, and other Connecticut communities to the north.

The average annual solid waste generation rate per capita varies within the region, from 0.3 tons per person per year in the smallest community, to 1.2 tons per person per year in one of the larger municipalities. The management of solid waste in the region reflects the diversity of the region. Residential waste collection practices vary, including individual residents transporting their own waste, residents arranging for collection and disposal by local private haulers, and municipal collection. Commercial accounts generally arrange their own collection and disposal directly with private haulers.

## **The Greater Bridgeport Regional Solid Waste Commission**

In 1972, the six original Participating Municipalities (Bridgeport, Fairfield, Easton, Monroe, Trumbull, and Stratford), recognizing that their continued reliance on diminishing landfill capacity did not afford a long-term solution to their waste disposal needs, established the Greater Bridgeport Regional Solid Waste Commission (the Commission) to develop a regional waste-to-energy facility to serve the needs of the six communities. Three additional municipalities (Darien, Greenwich, and Westport) joined the project in 1975.

## **The Connecticut Resources Recovery Authority**

The Connecticut Resources Recovery Authority (the Authority) is a body politic and corporate created in 1973 pursuant to the State Solid Waste Management Services Act (Public Act No. 73-459 of the General Assembly of Connecticut, as amended) and constitutes a public instrumentality and political subdivision of the State charged with the responsibility for implementing solid waste disposal and resource recovery systems and services where necessary and desirable throughout the State.

## **BRIDGEPORT I**

The original Greater Bridgeport Regional Resource Recovery Project (Bridgeport I) was an 1800 TPD RDF facility that processed as-received municipal solid waste, producing a powdered fuel for sale to United Illuminating (UI). The fuel was then to be combusted in an existing UI boiler, with the resultant steam being used to generate electricity. In addition, the waste processing system included equipment for the recovery of ferrous, aluminum, and potentially glass. A brief description of the process follows.

### **System Description**

The solid waste was discharged onto the tipping floor. The solid waste was then conveyed from the tipping floor and storage area to the trommel screen, after which it was reduced to approximately 6 in. (15.2 cm). The material then passed through a magnetic separator, where the ferrous metal was removed. The trommel oversize material was recirculated to the size-reduction equipment, while the remaining material was separated into light and heavy fractions by an air classifier.

The light fraction of the material was subjected to secondary screening and then entered the embrittlement operation. This light fraction was impregnated

with a chemical which embrittled the material for easier grinding to reduce the power requirements for this operation. The embrittled material was simultaneously dried and ground in a ball mill and discharged into a screening operation. The intermediate materials were recirculated and the fine material (the fuel product) was placed in storage.

### **Chronology**

In 1974, the Authority in conjunction with the Commission issued a Request for Proposals (RFP). Combustion Equipment Associates (CEA) was selected. It took over two years to negotiate the contracts, obtain the required permits, and obtain the participation of Occidental Petroleum Company, which provided the financial strength supporting the guarantees made by CEA.

In September 1976, \$53 million in tax-exempt bonds, backed by the Special Capital Reserve Fund, a pledge of the State to replenish any amounts drawn against the Fund, was issued by the Authority. Construction of the facility commenced in the spring of 1977. The first RDF product was not delivered to UI until 1980, almost two years behind schedule. The facility had continued to experience start-up problems including the inability to sustain design level throughput for extended periods. In October 1980, CEA filed for bankruptcy protection.

The failure of the facility to meet its expected throughput rate and the bankruptcy of CEA left the Participating Municipalities without what was to have been a long-term solution to dwindling disposal capacity. A lengthy and protracted settlement process proceeded, with the real possibility that each Participating Municipality would go its own way. However, the Participating Municipalities and the Authority decided to continue to work together to resolve the waste disposal problem. The result of that resolve, almost a decade later, is a successfully operating regional solution to the waste disposal needs of the Participating Municipalities.

## **BRIDGEPORT II**

### **Chronology**

The Authority and the Participating Municipalities determined that the best approach to follow was to redevelop the existing project, capitalizing on those portions of the developed system that were available, namely the site and the transfer stations. The Authority continued to provide waste disposal services to those Participating Municipalities who desired such service

during the interim period. To support this effort, the Authority, in October 1983, acquired the Shelton landfill to provide both interim disposal capacity during the redevelopment period and landfill capacity for this system once the redeveloped project (Bridgeport II) came on-line.

In April 1983, the Authority issued an RFP for redevelopment of the system. The RFP called for a 1500 TPD mass-burn facility to be built on the site of the existing RDF facility. In September 1983, after evaluation of the responses received, the project team selected Signal RESCO, Inc., a predecessor to Wheelabrator Environmental Systems, Inc.

Contract negotiations (involving the Authority, the Participating Municipalities, Signal RESCO, and UI), the permitting process (involving the Connecticut Department of Environmental Protection, the Siting Council, and local agencies), and obtaining approval of the energy contract by the Connecticut Department of Public Utility Control, consumed almost two years. Over the course of that period, the project expanded to include four additional Participating Municipalities: Milford, Norwalk, Weston, and Wilton.

In addition, during that period Signal RESCO agreed to assume operational responsibility for the transfer stations, and the facility was upsized to handle 2250 TPD of acceptable waste. The Participating Municipalities (eight of the original nine, plus the four additional) entered into a Municipal Services Agreement with the Authority in August of 1985, following an extensive review process. All other key project ingredients (i.e., the energy agreements; the required permits, approvals, and licenses necessary to construct; the service agreement between the Authority and Signal RESCO; and the required financing documents) were in place by December 1985. Tax-exempt bonds in the amount of \$227 million were issued on December 20, 1985, to provide a portion of the funds required to design, construct, and acceptance test the facility.

Demolition of the existing facility commenced in January 1986. Signal RESCO fast-tracked the design and construction effort, resulting in the facility burning its first garbage on February 9, 1988. The Acceptance Tests were conducted in May and June of 1988, and the Facility achieved its acceptance date on July 5, 1988, almost six months ahead of the scheduled completion date, January 1, 1989.

### **System Description**

The Bridgeport II facility combusts the delivered acceptable waste in three identical furnaces with a combined nameplate rating of 2250 TPD of acceptable waste having a Btu content of 3800 to 5200 Btu/lb.

The combustion process utilizes mass-burn technology, a proven technology employed by many operating facilities worldwide, to burn acceptable waste with no precombustion processing. The hot combustion gases pass through the boiler sections to produce superheated steam. The steam is then used to drive a turbine-generator set which produces electricity for sale to UI. Each combustion line has its own flue and air pollution control system, consisting of dry scrubber equipment and baghouse filters to remove particulates, sulfur dioxide, hydrogen chloride, and other acid gases from the combustion gases prior to discharging through the common flue stack.

The facility is schematically illustrated in Fig. 1.

### **Current Status**

The Bridgeport II facility went into commercial operation in July 1988 and has since continuously processed waste from the Participating Municipalities (which in 1986 were increased to fourteen by the addition of the towns of Shelton and Orange). The balance of the waste processed is tonnage accepted on a "spot" (i.e., short-term, interruptible contract) basis. The acceptable waste from the Participating Municipalities is delivered either directly to the facility or to one of the seven existing system transfer stations. An eighth transfer station is planned for Shelton.

The Commission (now renamed the Greater Bridgeport Regional Solid Waste Advisory Board) and the Authority, having realized the successful implementation of a major component of the Greater Bridgeport region's overall waste management program, expanded their efforts to encompass managing additional aspects of the waste stream. In June 1987, the Authority acquired a landfill located in Waterbury to help meet the oversized bulky waste disposal needs of the system. In addition, in the summer of 1988, the Board applied for a major grant supporting the implementation of a system-wide recycling program. The Board is aggressively pursuing the implementation of a system-wide recycling program, as evidenced by its recent issuance of an RFQ soliciting qualified proposers to provide intermediate processing of source-separated materials.

### **LESSONS LEARNED**

It has taken almost 20 years to transform the Greater Bridgeport region's recognition of a serious impending waste disposal problem into a successful, working solution. This success, as is obvious, was not achieved without encountering a number of setbacks and detours along the way. The ultimate success of the project, as

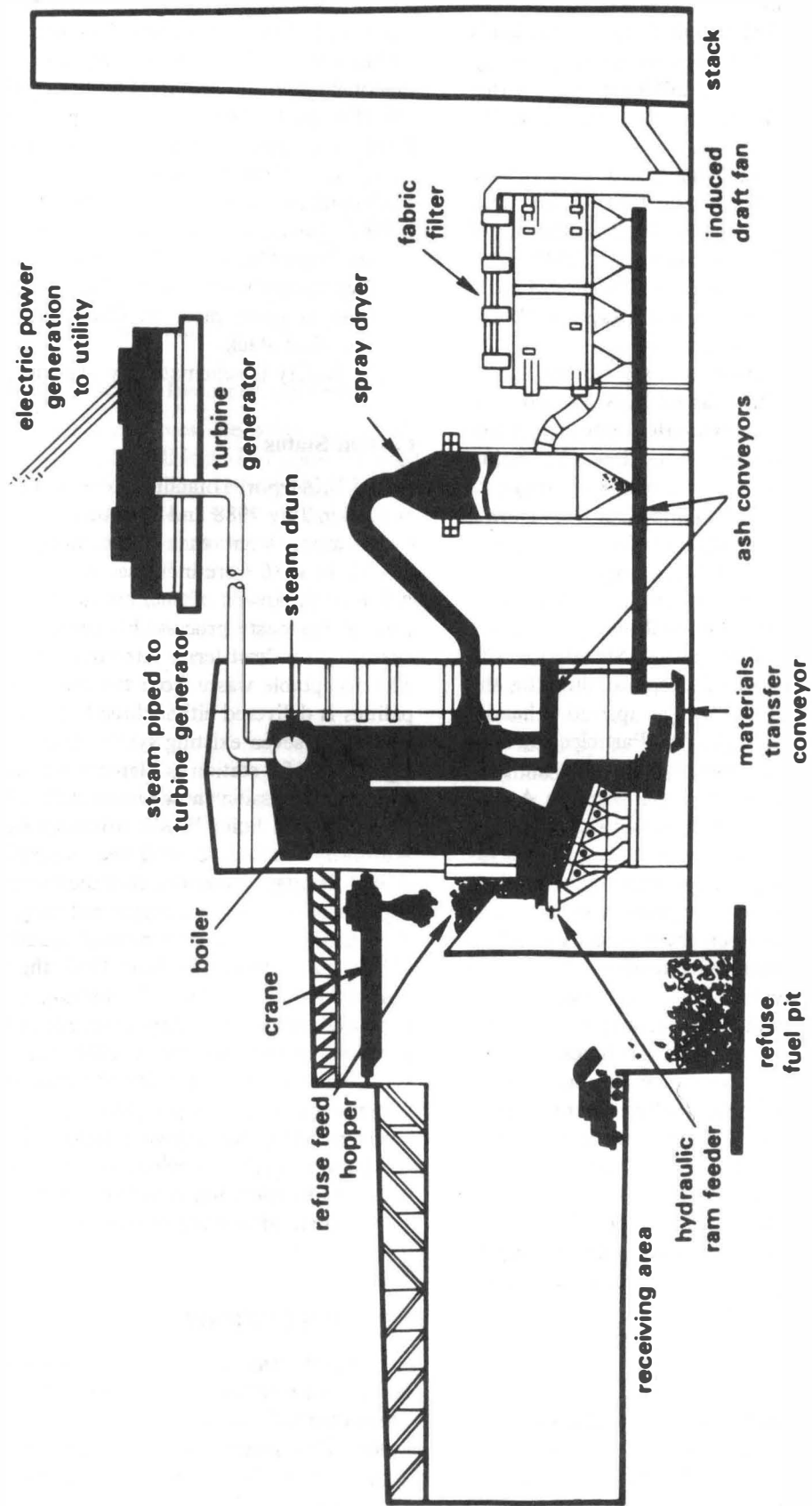


FIG. 1 FACILITY PROCESS FLOW DIAGRAM

with any multi-million dollar undertaking, cannot be attributed to any one factor or key element, but rather is a result of the presence of several key factors. These factors, or ingredients, necessary to implementing a successful project, are:

#### **Municipal Recognition of a Solid Waste Disposal Problem**

Perhaps the most significant ingredient necessary to successfully implement a solid waste management program is the commitment and leadership of elected officials. The awareness of an impending disposal crisis by the political leadership must be conveyed to the general public by a suitable public education program. Absent the recognition by the citizens that a waste disposal problem exists, it is extremely difficult to muster the requisite political force over the lengthy development program required to make such a program happen.

#### **Considering a Resource Recovery Facility as Part of an Integrated Solid Waste Management Program**

Municipal solid waste is a heterogeneous agglomeration of things people discard. An environmentally sound solid waste management program recognizes an integrated approach to solid waste management, a combination of source reduction, recycling, incineration, and landfilling.

#### **An Environmentally Suitable Facility Site**

There are many factors that must be considered in evaluating the suitability of a proposed site for a resource recovery facility. These include, but are not limited to, such criteria as the following:

- (a) Compatibility of proposed facility with existing surrounding activities.
- (b) Prior site utilization.
- (c) Ease of access and geographic proximity to the waste shed.
- (d) Impacts of traffic.

#### **A Willing Host Community**

The host community for a facility must be willing to participate in the project. The political and legal hurdles available to a nonwilling community, while not necessarily insurmountable, are certainly sufficient to delay a project's implementation. The keys to securing a willing host community include:

- (a) Involving the host community early on in the decision-making process, i.e., establishing site evaluation criteria and evaluating alternative sites.
- (b) Educating the public about all aspects of the project.
- (c) Structuring appropriate economic benefits.

#### **A Long-Term Contract for the Sale of Recovered Products**

Before the financial community will invest in a multi-million dollar undertaking such as a resource recovery project, all project revenues and expenses must be identified. A key element to keeping down the disposal costs for a recycling or waste-to-energy facility are the revenues from recovered products (e.g., energy, recyclable materials). The strength of the product purchase contract and its terms will have a direct impact on the financial community's view of the underlying project strength. Absent a long-term commitment from a financially secure entity to purchase the recovered product, the ability to finance the project will depend on the willingness and financial capacity of the remaining project participants to bear the burden should the project prove unable to market its product(s).

#### **A Proven and Environmentally Sound Technology**

The process of implementing a multi-million dollar resource recovery project involves a myriad of reviews by the various boards of the municipalities; the local, State, and federal permitting agencies; the rating agencies; and the investment community. To survive the intense scrutiny that this process represents requires a proven and environmentally sound technology, backed by an experienced contractor who will assume responsibility for its performance and who has sufficient financial strength to support its commitments.

#### **Long-Term Contracts for the Supply of Waste**

Waste is to a resource recovery project what gasoline is to a car. You do not get much mileage from the system without it. Clearly, the ability to develop, finance, and implement a project requires the availability of waste over the project term.

#### **Long-Term Available Landfill Capacity**

A waste-to-energy facility generates approximately 30% by weight ash residue for each ton of waste processed. This residue requires disposal. The successful project will require access to sufficient landfill disposal capacity.

#### **Long-Term Financing at a Reasonable Cost**

The key to obtaining long-term financing at a reasonable cost lies in structuring a project that incorporates the key ingredients discussed earlier in such a fashion as to allocate project risks to the party most able to control and manage those risks, and to back up those obligations with sufficient financial capability to ensure performance.

## **BASIC REQUIREMENTS FOR A SUCCESSFUL REGIONAL PROJECT**

The history of the Bridgeport Project demonstrates that there are three basic requirements that the public sponsor, and especially the municipalities, must demonstrate in order to make such a project successful:

(a) The long-term commitment to make the project work and serve the municipalities.

(b) The political leadership over time to establish the commitment and foster it.

(c) The willingness to negotiate many issues in order to forge a successful, operational project for all parties and, as a corollary, the willingness to use political leadership to defend those decisions.

### **Long-Term Commitment**

The long-term commitment to make a project work implies that the public officials have recognized a problem, have conducted comprehensive studies to determine the best course of action for their communities, and now believe in that course of action. There are no permanent solutions to the solid waste problem, only courses of action to correct existing problems for a 20–25 year time frame. The correction will cause new problems, which also must be dealt with as part of the project. The course of action that public officials decide to follow must include the key factors of successful projects described earlier.

Obtaining these key factors takes considerable time and effort. At this point the problem has been determined, the course of action determined and, if all the points just mentioned have been addressed properly, public officials are able to make the long-term commitment to making the course of action work as a project.

Local government staff must then work with the various state agencies, regional groups, the energy purchaser, prospective vendors, and citizens groups to refine the project by accomplishing the following:

- (a) Establishing municipal goals.
- (b) Allocating project risks.
- (c) Establishing the service requirements.
- (d) Negotiating the contracts.

The Bridgeport project has certainly evidenced long-term commitment from its participants.

The project was conceived in 1970, when public health and public works officials of four communities met to define the solid waste problem. By 1973, they had defined the problem and were investigating regional solutions. By 1974, nine municipalities were involved and a course of action was established: to build a regional waste-to-energy plant in cooperation with the newly formed Connecticut Resources Recov-

ery Authority. An RFP was issued, a vendor chosen, and the goals, risk allocation, service needs, etc., were addressed. Unfortunately, the prime contractor went into bankruptcy, but the municipalities and the Authority had defined the project so as to protect themselves well, and everyone remained committed to it. In the end, the private sector guarantees defeated the total debt of the project, the Authority insured that the solid waste was taken and disposed of every day, and the municipalities were even paid damages. Not only did the region stay together, but a new and bigger project was developed with an additional six municipalities joining, and in 1989, 19 years after the problem was first investigated, the Bridgeport Project is a success.

### **Political Leadership**

All of the determined efforts of the local public health and public works officials, the State permitting agencies, the Authority, and the Regional Solid Waste Commission might have been wasted had the political leadership not been there to help wage the war. The political leadership at the local, regional, and state levels must be willing to stand up and be counted. This leadership, especially the local chief elected official, must believe in the project and defend it against attacks from the public, the political opportunist, the unrealistic environmentalist, and the press. If the project is sound, technically and environmentally, and is affordable to the municipality, it is defensible politically and must be so defended from inception to completion or it very well may fail.

In Bridgeport the political leadership was there throughout multiple crises. There was no history of regional cooperation in Fairfield County. The project includes communities ranging in population from 5000 to 155,000; rural, suburban, and urban communities; towns with a per-capita income in the top 20 nationwide; and a typical blue collar industrial city. Moreover, there is no county government in Connecticut. The elected officials had to defend the concept of regional cooperation from attack by those who viewed such activity as an attack on the sovereignty of the municipality, a common viewpoint in the 1970s. Concurrent with this strong, inherent antiregional-cooperation feeling, came what opponents viewed as the consequences of the Regional Solid Waste Commission:

(a) The bankruptcy of the prime contractor on the project.

(b) The back-up hauler receiving relief from the federal courts on the guarantee to provide service if the prime contractor did not.

(c) The abandonment of the project by the guarantor.

The municipalities were left with no waste-to-energy facility, no landfill, and no hauler. However, the political leadership was committed: the municipal chief executives, Regional Advisory Board, the Authority, and the State of Connecticut continued to work together and defend the project against all detractors. The end results were impressive:

(a) The guarantor defeased 100% of the Authority bonds.

(b) A new landfill was purchased for the project.

(c) The Authority contracted directly with a hauler to handle the region's waste.

(d) The municipalities received cash from the vendors for damages.

(e) A new RFP was issued, a vendor selected, and a new facility constructed.

(f) The Bridgeport Project today is a major success story.

Once again, this could not have happened without the long-term commitment of all parties and without the determined political leadership, especially at the municipal level, to implement the desired course of action. There was much public clamor to abolish the Authority, abandon the large regional approach, and throw out the rascals who would continue to do otherwise.

Local officials stayed together, defended the project, asked for redevelopment, testified before the State Legislature on behalf of the Authority and, perhaps most significant politically, waged and won a bitter battle to change the State law providing local zoning approval of a landfill in a municipality outside the project area. That was a battle that required immense commitment and fortitude. The rewards were a very successful project with minimum public risk exposure at a very affordable cost, and re-election of every mayor or other chief elected official who supported the resource recovery project.

### **The Willingness To Negotiate**

This is a factor that must be understood by regional project planners from the beginning. A good deal is one that works for everyone; a good deal is one in which no party is completely satisfied.

(a) The private vendors must make a good profit commensurate with their assumption of risk. (That helps ensure that the company will stay with the deal until the end of its contract.)

(b) The energy purchaser must protect its costs, especially if it is a public utility.

(c) The bondholders' interests must be protected.

(d) The State permitting agencies must see to it that environmental laws and interests are protected.

(e) The Bonding Authority must ensure that the bonds are repaid and protect governments' credit.

(f) Most important, the municipalities must ensure that they receive the services they need and the technology they desire at a price their citizens can afford.

In order to successfully negotiate, the municipal officials must determine what services and what risks are sacred to them, and which ones are desirable if they are affordable. Only the municipal officials can determine what is affordable to their citizenry because they are paying the bill; no one else. The Bridgeport Project communities had many such decisions to make, and none of them were easy. For example:

(a) The municipal decision to support baghouse/scrubber air emission control technology at municipal cost before it was required.

(b) The decision to negotiate with the electric utility for a power purchase rate below what State law mandated in order to avoid a long, costly, and risky court fight.

(c) The decision to pursue very limited revenue sharing with the vendor in order to have the vendor accept considerable economic risk.

(d) The decision to accept change-in-law risk because it was too expensive to pay the vendor to accept it.

In the end, the long-term commitment, political leadership, and willingness to negotiate paid off for the 14 Bridgeport-area communities: the Project service fee is one of the lowest in New England; a single vendor runs the transfer stations, does the hauling, burns the waste, and hauls the ash to a landfill; the results of the environmental tests on the facility's air emissions are among the best in the world; and the ash passes the toxicity tests.

In summary, the municipalities of a region or of a county are the most important part of any regional resource recovery project, whether publicly or privately owned. They are the customers, and it is their long-term agreement to deliver the waste and to pay the bill which allows for contracts to be signed, bonds to be sold, and the facility to be constructed. They have the most to gain and the most to lose. It is up to them and their commitment and their political leadership to obtain the project their communities need and desire and are willing and able to pay for. In any case, they will get the deal they deserve. It is up to them.

**Keywords:** Economics; Full Service; Mass Burn; Performance; Planning; Political; Problems; Regional