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IMPLEMENTATION OF THE TAUNTON, MASSACHUSETTS REGIONAL SOLID WASTE MANAGEMENT FACILITY

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1. INTRODUCTION

Taunton, Massachusetts (City) is a city of 55,000 people located in Southeast Massachusetts, approximately 35 miles from Boston. Currently it hosts a regional landfill that will reach capacity in 2013. Beginning in 2005, the City began the process of searching for a solid waste management technology to replace the landfill. The focus for the search has been on conversion technologies capable of recovering materials and producing electricity or fuels, and maximizing diversion of waste from landfilling. Technologies being considered include both traditional and emerging technologies; e.g., composting, co-composting, thermal gasification, aerobic and anaerobic digestion, hydrolysis and mechanical means of waste separation into useful products. Landfilling and traditional waste-to-energy technology are not being considered.

The City has completed a comprehensive siting study and selected and purchased a 36-acre parcel of land for facility use. The site is zoned industrial, is located in an existing industrial park and has direct access from major highway systems. The City has prepared and released a detailed Request for Qualifications and Proposals (RFQP) to seek the services of a company to finance, design, build and operate the solid waste management facility (SWMF), which can be sized up to 1800 tons per day (TPD). The RFQP was released in June 2008. More than 70 participants attended a pre-proposal information meeting in July 2008. Sixteen companies submitted expressions of interest in September 2008. Full technical and price proposals are due in June 2009.

This paper describes the conversion technologies being considered, the status of the proposal process and next steps in project implementation. This paper is not meant to provide

detailed technical information regarding the proposing technologies, but rather to describe the procurement process and the challenges in accomplishing a successful procurement with new technologies, with a daunting regulatory permitting hurdle in Massachusetts, and with high City expectations. Project challenges, including the current State moratorium on incineration, waste aggregation efforts, financing issues and developing a protective contract for the City while using new technology, are included in the discussion.

2. TECHNOLOGY AND SITE CONSIDERATIONS

The SWMF will recycle and/or convert post-recycled, municipal solid waste or other acceptable waste, recover recyclables and produce marketable products, such as electricity, fuel or compost. The facility may have front-end processing to remove or recover recyclables and other materials and prepare the waste for conversion, and/or back-end processing and recovery of recyclables and marketable products. It may include composting, co-composting, aerobic and anaerobic digestion, other biological processes, acid hydrolysis, physical separation and conversion processes, chemical processes and thermal gasification processes. For thermal gasification processes, the system must be capable of pre-cleaning gases produced prior to on-site combustion and/or capturing the gas to make a fuel. As stated above, the SWMF does not include conventional incineration, waste-to-energy or landfill systems.

The size of the SWMF is to be selected by the proposer. The City has stated that a range of facility sizes, from 100 to 1,800 TPD, is acceptable. It was further established that if a proposer chose to build a smaller facility initially, and then expand the facility in stages, that was acceptable, provided that the proposed facility was fully built out within 10 years of

the start of operation of the initial facility. That allowed proposers utilizing a new or emerging technology the opportunity to develop a larger facility based on the design, construction and operations experience gained from developing and operating the initial facility. As with conventional solid waste processing facilities, the SWMF is to meet all applicable environmental design and performance requirements, and to incorporate traditional industry practices of totally enclosing and providing negative pressure on waste receiving, handling and processing areas as well as product storage and loading areas to control odors, minimizing process water use, reusing process wastewater to eliminate or minimize process wastewater discharge, and eliminating objectionable odor and noise beyond the facility property line. In addition, the SWMF is to have a visitor and public education center. Buildings are to be designed and constructed to meet LEED certification requirements. From an architectural standpoint, the SWMF is to have a modern, high-tech appearance that allows the facility to be compatible with its surroundings and to incorporate a buffer zone with native plantings and other treatments to minimize visual impacts.

Because the City is considering not only traditional technologies that meet the needs cited above, but also new and/or emerging technologies that satisfy these needs, it has established minimum qualification criteria. These include the requirement that the proposed technology must have been demonstrated at a minimum of one facility of similar size as that proposed or with a minimum unit size of 25 TPD, and shall have been in operation, for at least six months, processing mixed municipal solid waste. There are also minimum requirements for the companies proposing, including capabilities and experience in the permitting, design, construction and operation of municipal solid waste management facilities.

As mentioned in the previous section of this paper, the site is approximately 36 acres, zoned industrial and located in an existing industrial park. The site is directly accessible from major highways through the industrial park; hence, it is not necessary for trucks accessing the site to travel through residential areas. An active rail line runs adjacent to the site, and a rail spur from that line runs to the site. Of the 36 acres, approximately half are useable for locating waste processing facilities due to wetlands on portions of the site and Massachusetts permitting (i.e., site assignment) requirements. Interconnection to the electrical grid is accessible through a major, existing substation approximately a half mile distant. The potential for steam use in the industrial park is being assessed to determine the potential for a combined heat and power system. The site is adjoined by industrial uses on three sides and separated from the nearest residential area by an active rail line on the remaining side. Challenges exist in effectively utilizing the site acreage and in mitigating any potential impacts to the residential area.

3. ROLE OF TAUNTON AND THE CONTRACTOR

Key contractor services will include: processing City waste; aggregating and processing regional waste; permitting, financing, design, construction and operation of the SWMF; marketing products from the facility; and disposing of any residue generated by the SWMF. If the facility is not operating and capable of accepting City waste by June 30, 2013, the contractor will be responsible for providing transfer and disposal of City waste until such time as the SWMF is operational. In addition, the contractor shall be responsible for operating the City's drop-off facility for those residents without curbside pick up or who choose to take their waste and recyclables to the drop-off facility.

The City will provide and lease the site to the contractor, provide City waste, and support the contractor in its efforts to aggregate regional waste for the facility, permit and finance the facility, and to find and negotiate product market agreements. During the course of the contract, the City will conduct design review and construction monitoring activities, review start-up and acceptance testing and monitor facility operations.

4. BUSINESS PRINCIPLES

In return for offering a site and a supportive community for facility development and implementation, the City is requesting that host community benefits be provided to the extent practical. To that end, it has established goals and a priority for such benefits. Key benefits requested include: free disposal for City waste (approximately 75 TPD); a State-mandated payment in lieu of taxes for regional waste accepted (current mandated rate for 2008 was \$3.04 per ton); a rent payment for the site lease (approximately \$18,200 monthly); reimbursement for City project development costs (\$1,750,000) if and when the project is financed; payment of an Environmental Fund (\$1,000,000) if and when the project is financed; and providing for a payment of \$115,000 to the City annually during facility operations to allow for independent review of contractor and facility performance.

In addition to monetary benefits, the City is specifying that the facility and the contractor develop a "showcase facility", provide stringent environmental controls, and maintain neighborhood and community acceptance. It is expected that the facility will afford job opportunities and local and regional economic benefits, as well as provide educational opportunities for interns with the City High School and the University of Massachusetts.

5. KEY TERMS AND CONDITIONS OF CONTRACT

The contractor shall own the facility and be fully responsible for its costs to develop and implement the SWMF and provide the required waste services. The contractor shall lease the facility site from the City. The contract term shall include the time to permit, finance, design and construct the SWMF, plus a 20-year operating term. The contract may be renewed for

two, five-year terms. At the end of the term, the City shall have the right to purchase the facility for \$1 or to require the contractor to remove the facility and restore the site to useable condition. Contract security shall include a guaranty agreement by the contractor, a construction and performance bond and an operations bond, as well as provision of required insurance, including business interruption insurance to cover the minimum host community benefits negotiated. The contractor shall indemnify the City and its agents against action arising from the contractor's negligence or fault, and performance or non-performance of its contract obligations.

The contract will be structured on a performance-based approach.

6. ALTERNATIVE PROPOSALS

To provide flexibility to the proposal requirements, the RFQP allowed for the preparation of alternative proposals, including those for use of a different site, a larger SWMF size, and for an extended base operating term up to 30 years. Those proposers wishing to submit an alternative proposal must have also submitted a base proposal in conformance with the RFQP requirements described above.

7. PROPOSAL EVALUATION

Expressions of Interest were submitted by 16 companies on September 30, 2008. Table 1 lists those companies and the type of technology represented. As can be seen, primarily anaerobic digestion and thermal conversion systems were presented.

Table 2 provides a brief description of the technologies and their development status.

Proposals are due on June 2, 2009. Four or more proposals are expected, including those offering gasification, anaerobic digestion and other processes. Proposals will be evaluated independently on a technical basis, on a price basis and then on a combined, value basis to determine which proposal best meets the interests of the City. A detailed description of the proposal evaluation process and the evaluation criteria were provided in the RFQP.

8. NEXT STEPS

After selection of a preferred proposer, contract negotiations will ensue. It is anticipated that contract negotiations will be completed by the end of 2009 or early in 2010. Project implementation activities will then include:

- Waste aggregation; i.e., securing adequate waste at a competitive tip fee
- Securing key product sales agreements; e.g., power sale agreement, other key product sales agreements

- Permitting, to include preparation of an Environmental Impact Report, Site Assignment and the necessary air, solid waste and wastewater discharge permits.
- Obtaining project financing
- Facility design, construction, start-up, acceptance testing
- Operation

Table 1. List of Companies Expressing Interest

COMPANY	Technology	Key Products
Anaerobic Digestion		
Arrow Ecology (ArrowBio)	AD	E, NG, C
Ecocorp	AD	NG, C
Organic Waste Systems	AD	E,C
Thermal Conversion		
AdaptiveARC, Inc.	PA	E
Enerkem	GAS	ETH
Green Conversion Systems LLC	Advanced WTE	E
Herhof	MS/Fuel Production	E
International Environmental Solutions	P	E, H
Interstate Waste Technologies	GAS	E
NRG Energy - AlterNRG	PA	E
Plasco Energy Group, Inc.	PA	E
ReEnergy Holdings LLC	GAS, P	E
TLA Pond View	P	F
Waste Management	PA	E, F
Technology Not Identified		
Casella Waste Services		
WeCare Organics LLC		

Technology Key

AD: Anaerobic Digestion P: Pyrolysis
 GAS: High Temperature Gasification PA: Plasma Arc Gasification
 MS: Mechanical Separation

Product Key

C: Compost F: Fuel
 E: Electricity H: Hydrogen
 ETH: Ethanol NG: Natural Gas

Table 2. Technology Description/Development Status

Company and Technology ⁽¹⁾	Development Status
Anaerobic Digestion	
Arrow Ecology (ArrowBio) Two-stage wet anaerobic digestion system, with water-based MSW preparation and separation system	Commercial-scale mixed MSW facility in Tel Aviv, Israel (2003, 150 tpd). First commercial facility in Jacks Gully (Sydney) Australia (2008, 300 tpd, mixed MSW). Other projects awarded and under development.
Ecocorp Dry anaerobic digestion system	Numerous commercial facilities overseas, including at least 3 that process mixed MSW. Oldest MSW installation is in Barcelona, Spain (2001, 900 tpd).

Table 2. Technology Description/Development Status (continued)

Company and Technology ⁽¹⁾	Development Status
Organic Waste Systems Patented DRANCO dry anaerobic digestion system	Approximately 14 commercial plants, primarily operating on source-separated organic waste. Oldest installation is in Brecht, Belgium (1992, 55 tpd). Largest MSW installation is in Vitoria, Spain (2006, 330 tpd).
Thermal Conversion	
AdaptiveARC, Inc. Patented plasma-arc gasification technology called plasmaFILL™	Demonstrated with MSW at a pilot plant in Monterey, Mexico (2005, 100 tpd). Two previous installations (Shell Oil Corporation, 1991 and 1994) for processing refinery waste.
Enerkem Bubbling fluidized bed gasifier, followed by catalytic conversion of syngas to ethanol.	Pilot plant in Sherbrooke, Quebec (2003, 0.2 tph). First commercial-scale industrial demonstration plant, located in Westbury, Quebec, is in start-up (1.5 tph, to process contaminated wood). MSW project under development for Edmonton, Alberta.
Green Conversion Systems LLC Advanced thermal recycling using Fisia Babcock Environment, GmbH energy-from-waste technology	Reference facility for this advanced form of conventional waste-to-energy technology is the Muellverwertung Rugenberger Damm (MVR) facility in Hamburg, Germany (1999, 1,100 tpd).
Herhof Biological drying followed by mechanical separation to produce a prepared fuel (Stabilat)	In commercial operation at 8 locations processing mixed MSW (Germany, Belgium, Italy). Facility capacities range from 230-600 tpd. Oldest installation is in Asslar, Germany (1997, 425 tpd).
International Environmental Solutions Pyrolytic gasification technology called the Advanced Pyrolytic System (APS)	Demonstration facility in Riverside County, CA (Romoland), has been used to process a variety of feedstocks since 2004. The facility has two units - 8 tpd and 50 tpd; a 125-tpd unit is under construction. A permit for 24/7 operation is pending.
Interstate Waste Technologies Thermoselect high-temperature gasification technology	Currently in commercial operation at 7 locations in Japan, processing MSW and/or industrial waste. The oldest operational facility is in Chiba (1999, 330 tpd). The largest facility is in Kurashiki (2005, 612 tpd).
NRG Energy - AlterNRG Westinghouse Plasma Gasification Technology (moving bed gasifier with Westinghouse plasma torch technology)	Operational pilot plant/research facility in Pittsburgh, PA. Two commercial facilities in Japan owned/operated by Hitachi - Mihama-Mikata (2002, 30 tpd) and Utashinai (2003, up to 300 tpd).
Plasco Energy Group, Inc. Patented plasma arc gasification process	MSW demonstration plant in Ottawa, Canada (2007, 110 tpd). Research and development facility in Spain (5 tpd).

(1) Five companies that submitted an Expression of Interest in September 2008 are not listed, because these companies did not identify a specific technology at that time (Casella Waste Services, ReEnergy Holdings, LLC; TLA Pond View; Waste Management; and WeCare Organics, LLC).

9. PROJECT CHALLENGES, PAST AND FUTURE

Challenges to bring the project to its current status have been many, including:

- developing a consensus for the project concept and garnering related support from City elected officials;
- gaining acceptance from City elected officials for the potential use of new and emerging technologies that offer potential benefit, but risk as well, in addition to considering conventional technologies;
- obtaining approval of the City Council for selection and purchase of the site;
- balancing City environmental and host community benefit goals with realistic market conditions in soliciting proposals for a major solid waste management facility;
- preparing an RFQP that recognizes market conditions and offers sufficient incentive to private companies to pursue the project;
- convincing companies in the industry that the project is “real” and warrants the investment in proposal preparation;
- facilitating information exchange to foster teaming arrangements of waste suppliers and technology providers;
- establishing a working relationship with the State Executive Office of Energy and Environmental Affairs, including the Department of Environmental Protection, to garner their support to provide a regulatory pathway that eliminates permitting roadblocks for thermal conversion technology and encourages private proposals; and
- initiating efforts to interest municipalities in sending their waste to the proposed SWMF.

To alleviate the concerns of City officials regarding the use of new and emerging technology, an effort was made to introduce the City to the recent, comprehensive assessments of these technologies completed by New York City, the City and County of Los Angeles and others. Although City officials did understand the potential benefits offered by these technologies, there was concern that they may not work as advertised. Consequently, the City opted for the contractor to privately finance and own the facility and be responsible for resultant debt service. In addition, contract principles developed and made part of the RFQP, required proposers to provide performance guarantees and substantial financial security to back those guarantees. Also, the City maintained the right to terminate the contract for nonperformance, and in such case, maintains the option to require the contractor to remove the facility from the site and restore the site to useable condition.

To date, there has been significant progress made, but many challenges remain. The City has selected and purchased a site, garnered the support of elected officials for consideration of new technologies, issued a comprehensive RFQP and received expressions of interest from qualified companies offering competing technologies. Further, as stated earlier, the City anticipates receiving four or more proposals, including those using gasification, anaerobic digestion and other processes.

Presuming that attractive proposals are received, major issues that remain for the City include: obtaining clarification of the applicability of the State Moratorium on incineration as it may apply to permitting thermal gasification technologies that combust gas on site to generate electricity; and establishing a comprehensive program for securing sufficient waste supply.

The State Moratorium on incineration was imposed with the State Solid Waste Master Plan in the 1990s. It is a policy matter, and not a regulation nor legislation. It was put in place because of fear of emissions, including dioxins, furans and mercury, and because there was concern that such facilities require a long-term commitment of solid waste from municipalities which could preclude such communities from initiating enhanced source reduction and recycling programs. Since that time, waste-to-energy facilities have upgraded and retrofitted new air pollution control equipment. The State has put in place a ban on landfilling and incineration of many recyclables and toxic materials, including wastes containing mercury. The State has found that recycling efforts have leveled off and that new initiatives will be needed for source reduction and recycling to enhance materials recovery and that new disposal capacity will also be needed or additional waste will be exported from the State. In addition, increased interest in the State by the new administration in sources of alternative, renewable energy and passage of the Green Communities Act of 2008 (new State energy bill) have spurred interest in alternative energy. Lastly, interest in climate change and the reduction in greenhouse gas emissions has grown. The combined effect of these issues has caused the DEP to initiate efforts to revise the solid waste master plan. However, such efforts will take at least another six months to a year to be completed and in the interim, the current State Moratorium on incineration continues.

The problem with the Moratorium for the Taunton procurement is in its potential interpretation by DEP. The DEP uses the federal definition of a municipal waste combustor to apply to technologies for purposes of applying the Moratorium. That definition applies to direct combustion of waste as well as to the combustion of gases produced from the waste. Inadvertently, such application by DEP could impact the permitability of advanced waste gasification systems, if such systems would combust the gas on site to generate electricity, a commonly proposed practice. The City has been discussing this issue for two years with DEP, since the City wishes to consider all modern technologies that convert waste to useable products (including thermal conversion technology), that enhances materials recovery and energy production and reduces emissions. The City contends

that gasification is not direct combustion of waste, that such technologies can capture and pre-clean the gas prior to combustion, thereby reducing air emissions, can employ combined-cycle energy recovery systems to increase energy recovery, and can vitrify the residual product to make it more readily acceptable for use as a product in the open environment. Although not currently common practice, the gas produced can be utilized to produce fuels; e.g., natural gas for insertion in the gas pipeline, compressed natural gas for fueling vehicles, hydrogen, methanol, ethanol, and biodiesel. The attributes of these technologies are consistent with the State's goals for solid waste management.

The uncertainty in how DEP may apply the Moratorium for thermal gasification technologies has negatively impacted the City's procurement process. It has discouraged some companies interested in thermal conversion technology from proposing, due to the large investment necessary to prepare a comprehensive and competitive proposal. This uncertainty also resulted in the City delaying the proposal due date several times as it continued to seek clarification on the issue. This uncertainty has limited competition and delayed proposal submission, neither of which is in the City's or the State's best interests.

Another key issue which the project has faced is that of being able to aggregate sufficient waste to allow confidence in adequate sizing of the SWMF to meet project interests. This is not atypical of a "merchant project", but leads to prolonged development time and possibly to a smaller facility than might otherwise have been proposed. To confront this issue, the City RFQP allowed the proposer to start with a smaller facility and to build it out to full, proposed commercial size within 10 years of initiation of operation of the initial facility system. However, there remained the issue of how the waste would be aggregated. Although there is sufficient waste being exported from the State to support a facility as large as 1800 TPD, there is the challenge of being able to get waste generators to commit their waste at an early project stage in time to support project financing. Also, many companies that offer a technology do not provide waste collection services; hence, do not currently have access by contract, nor do they have working relationships with existing municipal customers. To encourage teaming arrangements among technology providers and waste collection companies, the City provided potential proposers with access to contact information for all those companies requesting the RFQP, attending the pre-proposal information meeting and submitting expressions of interest on September 30, 2008.

Immediate challenges and those for the next year or two center on attracting competitive proposals, negotiating a successful contract, securing adequate waste at the needed tip fees, securing necessary product sales agreements, obtaining necessary permits and environmental approvals, and obtaining project financing. Thereafter, conventional tasks for facility design, construction and operation will unfold, but with the challenge of proving the technical, environmental and economic performance of new technology or traditional

technology which has been upgraded with advanced systems. The project path has been identified, but it is not without obstacles and significant challenge. The potential benefits to the City, the State and the contractor have been recognized, but await achievement.