

EVALUATION OF MUNICIPAL SOLID WASTE CONVERSION TECHNOLOGIES

Prepared for
City and County of
Santa Barbara, California
April 4, 2008

Submitted by
Alternative Resources, Inc
1732 Main Street
Concord, MA 01742

in association with
Printed on Recycled Paper 1677

Clements Environmental Corporation

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1.0 INTRODUCTION

1.1 Overview

This report presents an evaluation of municipal solid waste (MSW) conversion technologies, conducted for the City and County of Santa Barbara, California. The evaluation process included the establishment of goals and evaluation criteria; identification of conversion technology suppliers and/or related project developers; issuance of a Request for Information (RFI) to gather key technical, financial and business information; and application of the evaluation criteria to establish a short-list of companies that are best suited for providing a conversion technology project as an alternative to landfilling MSW at the Tajiguas Landfill. The evaluation process has established an interest from technology suppliers and project developers in a conversion technology project for Santa Barbara. Eleven responses to the RFI were received, including responses for three anaerobic digestion technologies, seven thermal processing technologies, and one other technology incorporating biological drying and mechanical sorting. Based on the evaluation presented herein, eight of the technologies are determined to meet the evaluation criteria established by the City and County, and offer the potential for a technically and economically viable conversion

technology project for Santa Barbara. These eight companies, identified in Table 1-1 as the “short-listed” companies, are recommended for further consideration should the City and County decide to continue the procurement process with development and issuance of a Request for Proposals. Table 1-1 is an unranked listing of the short-listed companies, identified in the table alphabetically by technology type.

This report describes the evaluation process for a conversion technology project, and

provides recommendations for consideration. It is organized as follows:

- **Section 1.0:** Provides background information, including identification of the project goals adopted by the City and County of Santa Barbara
- **Section 2.0:** Describes the process used to identify and evaluate conversion technologies
- **Section 3.0:** Provides an introductory summary of the RFI respondents
- **Section 4.0:** Presents the evaluation of the RFI respondents
- **Section 5.0:** Provides a summary of findings and recommendations

Table 1-1. Recommended Short-List of Conversion Technologies

Recommended Short-List

(Unranked - Listed Alphabetically
by Type of Technology)

Anaerobic Digestion

CA Renewable Technologies - CR&R/Arrow
Ecocorp

Thermal Processing

AdaptiveNRG (Plasma Gasification)
International Environmental Solutions (Pyrolysis)
Interstate Waste Technologies (Gasification)
Plasco Energy Group (Plasma Gasification)
Tajiguas Partners - WTE/Entech (Gasification)

Other Technology

Herhof California (Biological Drying/Mechanical Separation/Off-Site Combustion)

1.2 Background

In June 2002, the Santa Barbara County Multi-Jurisdictional Solid Waste Task Group

(MJSWTG) established a Subgroup to evaluate the feasibility of conversion technologies

as an alternative to landfilling post-recycled municipal solid waste (MSW) at the Tajiguas

Landfill. The Subgroup identified and researched technologies; developed and applied

screening parameters and ranking criteria; and evaluated the feasibility of a project for

Santa Barbara County. In September 2003, the Subgroup recommended consideration of a conversion technology facility as part of a long-term solid waste management plan. The Subgroup concluded that there were seven solid waste conversion technologies best suited and capable of providing a feasible alternative to landfilling MSW, and identified these seven companies on a short-list for potential further consideration (see Appendix A). A conversion technology project did not materialize from the 2002-2003 efforts of the MJSWTG and its Subgroup. Since then, changes have occurred in the capabilities and experience of conversion technology companies and their technologies, including those that were identified on the Subgroup's short-list. Some companies are no longer in business, while new companies have emerged. Some companies have changed (or are in the process of changing) their technology platform, based on research and development activities and other industry advances. Still others have developed new partnerships for a team approach to project development. In addition, several large studies have been published by other public jurisdictions that have evaluated numerous advanced conversion technology companies (County of Los Angeles, City of Los Angeles, New York City).

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In recognition of these changes and advancements, the City and County of Santa Barbara contracted with Alternative Resources, Inc. (ARI) to evaluate the current feasibility of a conversion technology project, building on previous work of the MJSWTG and its conversion technology Subgroup as well as recent knowledge from other studies. ARI has worked collaboratively with the City and County to establish project goals and to develop an evaluation and selection process for a conversion technology to potentially be used at the Tajiguas Landfill.

1.3 Project Goals

To support an evaluation of the feasibility of a conversion technology (CT) project and to

focus that evaluation on matters of local importance, the City and County established

specific project goals. These goals, which were reviewed and approved in January 2008

by the City Council and the County Board of Supervisors, are as follows:

Increase Diversion of Post-Recycled MSW for Affected Jurisdictions. Any considered CT must increase the diversion of post-recycled MSW intended for landfill disposal through pre-processing (or post-processing) and/or conversion of post-recycled MSW into beneficial products such as energy, fuels, or other marketable products (e.g., compost, aggregate, metals).

Reduce Environmental Impacts of Landfilling MSW. Any considered CT must limit and/or mitigate environmental impacts of landfilling MSW, including but not limited to water quality and greenhouse gas emissions.

Provide Financial Feasibility and Sustainability. Any considered CT must have

capital and operating costs that result in a feasible, cost-competitive tipping fee, with

long-term financial stability that would limit financial impacts to affected rate payers.

Produce Green Energy and Other Marketable Products. Any considered CT must include a component of green energy and/or fuel production, along with other

marketable products, as applicable, such as recovered metals and compost.

Provide a Humane Work Environment. The project will be dedicated to maintaining humane working conditions, and will not consider any CT that is deemed

to have an unjust or unsafe impact on workers.

Result in a Long-Term Waste Disposal Plan. Any considered CT must result in a

long-term waste disposal alternative for participating jurisdictions within Southern Santa Barbara County (with a 20 year minimum lifespan required).

Notwithstanding the specific goals listed above, the overall objective of a project would be

to divert MSW that is not currently recycled from landfill disposal, by converting the nonrecycled

material into beneficial products such as energy, fuels or other marketable products (e.g., compost, aggregate, metals). Such a project would be implemented as a

supplement to, not a replacement for, recycling efforts.

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2.0 REQUEST FOR INFORMATION (RFI)

An evaluation process was established that consisted of: (1) identifying companies to be

considered; (2) establishing evaluation criteria; (3) compiling information on the capabilities

of the technologies and the experience and qualifications of the project developers, through the issuance of a Request for Information (RFI); and (4) applying the evaluation criteria to determine which companies are best suited and capable of providing a successful, longterm conversion technology project at the Tajiguas Landfill.

2.1 Identification of Conversion Technology Companies

To initiate the evaluation process, a list of twenty-five (25) conversion technology companies was established. The list included: those companies that were previously shortlisted by the MJSWTG and its Subgroup; companies that have been considered in other studies to be among the more advanced of the conversion companies, or selected by other public jurisdictions as qualified for project development activities; and companies for which there have been recent, known advancements for either the technology or the project team.

Table 2-1 lists, alphabetically by type of technology, the 25 companies that were considered for the evaluation.

Table 2-1. Conversion Technology Companies

Anaerobic Digestion Thermal Processing

CA Renewable Technologies (CR&R/Arrow)⁽¹⁾ AdaptiveNRG
Canada Composting (BTA Process) AlterNRG/Westinghouse
Ecocorp⁽¹⁾ Bioengineering Resources, Inc.
Orgaworld Entech Solutions

Organic Waste Systems (DRANCO) Ebara Corporation
Waste Recovery Systems (Valorga)⁽¹⁾ GEM America

Hydrolysis International Environmental Solutions

Arkenol/Blue Fire Ethanol Interstate Waste Technologies
Biofine (Biometrics) Plasco Energy Group
Genahol⁽¹⁾ Primenergy⁽¹⁾
Masada Solena Group

Other Processing Startech Environmental Corporation

Herhof California⁽¹⁾ World Waste Technologies
Waste-to-Energy, Inc.

(1) Conversion technologies included on the previous MJSWTG short-list (2003)

2.2 Evaluation Criteria

In order to complete the evaluation, the City and County adopted eleven (11) evaluation criteria. The criteria were established as minimum screening parameters, with the objective that each technology supplier would be required to meet all of the criteria in order to be further considered for a future procurement. The criteria were structured to assess the

viability of a reasonably-sized, commercial project that meets the established goals (see

Section 1.3). The evaluation criteria are presented below:

1. Any considered CT must be capable of processing a minimum of 100,000 tons per year (tpy) of MSW during the first operating year of the project, and must be capable of increasing capacity up to 220,000 tpy within 10 years of the first operating year of the project.
2. Any considered CT must be capable of operating for a minimum of 20 years.
3. Any considered CT must be compatible with local solid waste management programs, including recycling programs.
4. Any considered CT must be capable of diverting at least 60% by weight of the MSW received for processing from landfill disposal.
5. Any considered CT must have a projected tip fee that limits financial impact to affected ratepayers (i.e., no more than 10% beyond the price the ratepayer would expect for other alternatives).
6. Any considered CT must produce end products that have probable, identifiable or existing markets (including electricity and/or fuel products).
7. Any considered CT must conform to California environmental standards, and must limit and/or mitigate environmental impacts of landfilling MSW.
8. Any considered CT must have been demonstrated at a minimum of one facility of similar size or with a minimum unit size of 50 tons per day (tpd), and shall have been in operation for at least six months (as of February 29, 2008) processing MSW or similar feedstock.
9. Any considered CT must have a project team that has experience designing, building and operating a solid waste management facility, either individually or as a team.
10. The project developer must have bonding ability equal to the estimated cost of facility design and construction, and, during operation, equal to the estimated annual operating cost; must not be in bankruptcy; and must provide a financing plan that reasonably demonstrates that it can offer private project financing, if required.
11. The project developer must not be debarred from contracting in California.

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2.3 Request for Information (RFI)

In order to compile a consistent profile for each technology supplier, specifically addressing

each of the eleven evaluation criteria, a Request for Information (RFI) was prepared and

issued to the 25 companies identified above in Table 2-1. The RFI was issued on February 6, 2008, followed by Addendum No. 1 on February 24, 2008. The Addendum

provided clarifications and answers to questions. RFI responses were initially due on

February 26, 2008, but at the request of several companies, the due date was extended to

March 7, 2008. The RFI and Addendum are provided in Appendix B of this report.

Eleven responses were received, representing 12 of the 25 companies that received the RFI (with two companies submitting in partnership), and representing three of the technology categories (anaerobic digestion, thermal processing, and other).

Three

technology suppliers formally declined to respond to the RFI. Canada Composting (BTA

anaerobic digestion process) declined because its technology is focused on source-separated

organic waste, not post-recycled MSW. Arkenol/Blue Fire Ethanol (concentrated acid hydrolysis) declined because its technology is not yet demonstrated at the 50-tpd

capacity required in the RFI. Ebara Corporation (a thermal gasification/vitrification

technology headquartered in Japan) declined because of the prevalence of current projects

in the Japanese and foreign market. Many of the other companies acknowledged receipt of

the RFI, but did not submit a response.

Table 2-2 identifies the companies that responded to the RFI. An introduction to these

respondents is provided in Section 3.0.

Table 2-2. Identification of RFI Respondents

Anaerobic Digestion Thermal Processing

CA Renewable Technologies (CR&R/Arrow) AdaptiveNRG

Ecocorp Entech Solutions⁽¹⁾

Organic Waste Systems (DRANCO) International Environmental Solutions

Hydrolysis Interstate Waste Technologies

Plasco Energy Group

[No Respondents]

Primenergy

Other Processing World Waste Technologies

Herhof California

Waste-to-Energy, Inc.⁽¹⁾

1. Waste-to-Energy, Inc. and Entech Solutions submitted a joint response as part of a partnership under the name “**Tajiguas Partners**”, and are hereinafter referred to by that partnership name and categorized as a thermal processing/gasification technology for purpose of the evaluation.

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2.4 Application of Evaluation Criteria

Following review of the RFI responses, the evaluation criteria were applied to determine

which companies met the criteria. This evaluation process is presented in Section 4.0.

The outcome of the process was intended to be an un-ranked short-list of companies

determined to be best suited and capable of providing a successful conversion technology project at the Tajiguas Landfill. The findings are presented in Section 5.0. The short-list and the evaluation process leading up to the short-list are not intended to be used to actually make a selection of a preferred conversion technology and/or project developer. Selection should be based on detailed, comparative evaluation and ranking of formal proposals submitted in response to a future procurement (including qualifications, technical proposals and price proposals). Conversion technology companies included on the recommended short-list should be invited to submit proposals under any such procurement.

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3.0 SUMMARY OF RFI RESPONDENTS

As previously discussed, the City and County received eleven responses to its RFI. Each

respondent is briefly introduced below, to provide perspective for the evaluation that follows

in Section 4.0.

3.1 Anaerobic Digestion

3.1.1 California Renewable Technologies (CART)

California Renewable Technologies, Inc. (CART) is comprised of CR&R, Inc., a solid waste

management and recycling company in Southern California, and Arrow Ecology and

Engineering Overseas, Ltd., the provider of the ArrowBio anaerobic digestion technology.

CART is joined by other key team members, including Investec Bank that offers full project

financing and a Siemens turnkey energy plant.

The ArrowBio process consists of a front-end, water-based, separation/preparation system

which uses gravitational separation in water to recover recyclables (metal, glass, rigid and

film plastic) and to remove non-processible materials (stones, grit). This front-end system

also solubilizes biodegradable organics and size-reduces fine particulates in preparation for

digestion. The digestion process is a two-stage system that is commonly used for industrial

wastewater treatment. The products of digestion are water, digestate (compost), and

biogas. The biogas consists predominantly of methane, and can be used to generate electricity or can be converted to compressed or liquefied natural gas to fuel vehicles.

The ArrowBio process has been demonstrated at a 150-tpd commercial-scale facility in

Tel Aviv, Israel, which has been in operation processing MSW since 2003. A 300-tpd

facility is under construction in Sydney, Australia, and is expected by Arrow to be fully

operational by the end of 2008.

For Santa Barbara, CART has suggested an initial facility capacity of 100,000 tpy with

future expansion to 220,000 tpy. CART expects the 6-acre area will be sufficient for full

project build-out. CART estimates a diversion rate of approximately 76%, and a first-year

tipping fee on the order of \$50 to \$60 per ton.

3.1.2 Ecocorp

Ecocorp is a privately-held U.S. company based in Arlington, VA. Its team consists of its

European anaerobic digestion technology providers and partners comprised of Strabag/Linde in Germany and SWECO in Sweden. The Ecocorp team also includes

United States-based technology component providers and German companies with U.S.

subsidiaries.

Ecocorp's anaerobic digestion technology is modular design. It is a dry system with the

prepared feedstock having a solids content of greater than 30%. It is a thermophilic (i.e.,

high temperature) digestion system with operating temperatures ranging from 120-130°F.

The technology requires the MSW to be pre-processed to separate the biodegradable

fraction of MSW for processing. Pre-processing is achieved using semi-automated MRF

technology, which allows for the recovery of recyclables. The primary products of digestion

are biogas and a digestate. The methane-based biogas is upgraded to pipeline-quality

natural gas by removing CO₂ (which is also considered a product). The digestate is

aerated to produce a stable organic fertilizer.

Ecocorp's anaerobic digestion technology has been demonstrated at numerous commercial

facilities overseas, including at least 3 facilities that process MSW (located in Spain, Portugal and Italy). The facility in Barcelona, Spain processes 330,000 tpy of MSW and has been operational since 2001 (7 years). For Santa Barbara, Ecocorp has suggested a 220,000-tpy facility which would require approximately 5.5 acres. Ecocorp expects a diversion rate of approximately 69%, and the estimated first-year tipping fee is approximately \$40 per ton.

3.1.3 Organic Waste Systems (OWS)

OWS, a Belgium company, is the provider of the DRANCO dry anaerobic digestion technology. OWS appears to be a design/build (DB) company, with an interest in designing, building and starting up plants. OWS does not appear to be a full-service project developer, and has not established a working team in the U.S. In several countries (France, Japan, Spain), OWS works with a license partner, but does not yet have a licensee in the U.S.

The DRANCO technology is a one-step digestion process with the different digestion process steps taking place within the same reactor. The process is thermophilic (i.e., operates at temperatures ranging from 120-130°F) and is semi-dry to very dry (40% total solids). OWS describes the technology as being ideal for waste streams containing a lot of organic material such as biowaste (kitchen and garden waste), dewatered sludge, and organic industrial waste. For a standard installation processing MSW, OWS assumes that the client would pre-treat the waste and deliver just the organic fraction suitable for digestion. OWS could provide a front-end MRF, or could team with someone to do so. The DRANCO technology produces biogas which can be used to generate electricity or cleaned to natural gas quality. The technology also produces digestate, which must be aerobically "cured" (stabilized) to produce a final compost product. OWS did not suggest a particular project for Santa Barbara. It provided only general corporate, technology, and cost information.

3.2 Thermal Processing

3.2.1 AdaptiveNRG

AdaptiveNRG, a technology supplier with reported operating capabilities, offers a patented plasma-arc gasification technology it calls plasmaFILL™. AdaptiveNRG has not yet identified a project team for Santa Barbara; however, it has standing banking relationships with several banks (including Bank of America).

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AdaptiveNRG's technology is portable and modular, and is offered in three standard configurations. It can accept waste without presorting, but acknowledges the benefits of and ability to add front-end recovery of recyclables to its system. The technology uses electricity and high pressure air to create plasma, with temperatures reaching 2,300-3,300°F. These high temperatures promote rapid and complete gasification of feed materials resulting in a synthesis gas ("syngas") that is used to generate electricity. Other products include construction aggregate, agricultural fertilizer, potable water and commercial salt.

The plasmaFILL™ technology has been demonstrated at a 100-tpd pilot plant in Monterey, Mexico which has been operated daily since 2005 to process MSW. The demonstration unit is portable and has reportedly been transported for use at several landfills in Mexico.

There were two previous installations of the technology (1991, 1994) at Shell Oil Corporation for processing refinery waste.

For Santa Barbara, AdaptiveNRG has suggested a configuration consisting of eight 100-tpd reactors that would provide for a processing capacity of approximately 220,000 tpy. The layout would fit within the 6-acre area available for project development, inclusive of space for future upgrades if desired. AdaptiveNRG expects to achieve a diversion rate of 95% or more, and estimates a first-year tipping fee on the order of \$50 per ton.

3.2.2 International Environmental Solutions (IES)

IES is a California-based company that offers a thermal pyrolysis technology it calls the IES Advanced Pyrolytic System. IES has formed a team (a joint venture partnership)

consisting of IES, Rainbow Disposal Company (a disposal company with a 50-year history; owner and operator of the Huntington Beach, California MRF and Transfer Station), One Planet Energy LLC (a recently formed company that would structure and arrange project financing), and California-based Brownco Construction Company. IES's system includes feedstock preparation (grinding, drying), a pyrolysis chamber (which converts the feedstock to syngas at approximately 1,500°F under limited oxygen conditions), a thermal oxidizer (which combusts the syngas), and a heat recovery steam generator/steam turbine (to generate electricity). In addition to electricity, the system recovers recyclable materials (metal, glass) and produces a carbon residue (called char) that can reportedly be used in building materials. Additionally, IES is researching the potential to produce hydrogen, but expects it will be several years before this possibility might be realized.

The IES Advanced Pyrolytic System has been demonstrated with a 50-tpd pilot plant located in Romoland, California (Riverside County). The pilot plant has operated intermittently since 2004 for purpose of testing, and has processed various types of waste including in excess of 6,000 tons of post-MRF MSW.

For Santa Barbara, IES has suggested a 220,000-tpy facility consisting of 3 processing trains. The facility would require approximately 5 acres. IES expects to achieve a diversion rate of 85-95% and estimates a first-year tipping fee of \$56 per ton.

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3.2.3 Interstate Waste Technologies (IWT)

IWT, represented in the United States out of Middlebury, Virginia and Malvern, Pennsylvania, is the sole North American licensee of the Thermosteel high-temperature gasification technology. IWT's development partner is Interstate Business Corporation (IBC), a housing and real estate development and ownership company that would serve as guarantor. Other key team members include several well-established and experienced companies: Burns & Roe (Design Engineer), SNC Lavalin (engineering, procurement and construction contractor), and Morgan Stanley (financial advisor). IWT is currently

negotiating with two major U.S. facility operators, but also offers operating capabilities through its technology supplier and Japanese-based sister company (Thermoselect/JFE). The core components of IWT's application of the Thermoselect technology include a feed chamber, gasification reactor, synthesis gas cleanup, and electricity generation. Preprocessing is not required. Waste is fed to the high-temperature reactor where it is combined with limited amounts of pure oxygen and natural gas, at temperatures as high as 2,000°F, forming a synthesis gas. The gas is cooled and cleaned, and used in a combined cycle gas turbine to generate electricity. The process also generates a silica-based, sandlike aggregate and recovers metals, among other secondary products. The Thermoselect technology has been demonstrated in numerous applications and is currently in commercial operation at seven locations in Japan. The oldest facility (Chiba) has operated for almost nine years. The largest facility (Kurashiki), which has been in operation since 2005, processes approximately 190,000 tpy of MSW, industrial waste and incinerator ash. For Santa Barbara, IWT has suggested a 220,000-tpy facility consisting of 2 units. The facility could fit on the 6-acre site at the landfill, but IWT would prefer two additional acres and would be willing to incur cost to reclaim additional property at the site. IWT expects to achieve 100% diversion, and states it will guarantee to produce marketable products and sell those products. IWT estimates a first-year tipping fee of \$71 per ton, which could be lowered by amortizing debt over a longer (30-year) period.

3.2.4 Plasco Energy Group

Plasco Energy Group, a privately-held Canadian company, is the developer of the Plasco Conversion System, a patented process using plasma arc gasification technology. Plasco's team includes Hatch Ltd, a well-established engineering company with five offices in California, and PCL Construction Services, a Canadian firm which has had a presence in

the U.S. market (including California) for over 30 years and has served as construction contractor for Plasco's demonstration facility in Ottawa, Canada. Following front-end waste preparation (which includes shredding and metal recovery), the waste is fed to the converter chamber where material is gasified. The gasified product is refined in a secondary chamber with the application of plasma torches. For improved system performance, Plasco feeds a supplemental waste stream along with MSW, which it calls Consistent Carbon Feed (CCF). The CCF is a waste with a known, consistent energy content (such as tires) and is used to control the quality of the syngas. The syngas is 3-4 cleaned and then combusted in Jenbacher gas engines to generate electricity. The system also produces a construction aggregate and other marketable byproducts. Plasco has recently demonstrated its technology with MSW at a 110-tpd commercial-scale demonstration facility in Ottawa Canada. The facility has been operating since July 2007. For Santa Barbara, Plasco has suggested an initial processing capacity of 150,000 tpy, consisting of four units identical to the one at the Ottawa facility. This configuration could be constructed on the available 6-acre site. Plasco could expand to 220,000 tpy with the addition of two units, but would require approximately two additional acres to do so. Plasco expects to achieve a diversion rate of greater than 99% and estimates a first-year tipping fee in the range of \$65-\$90 per ton.

3.2.5 Primenergy

Primenergy is a United States-based company with principal offices in Tulsa, Oklahoma. Its primary business is engineering, procurement and construction (EPC) of turnkey, biomass-fueled energy conversion and recovery facilities. It offers a proprietary gasification technology supplied by Heater Specialists, LLC, a sister company. Primenergy's role in projects is as EPC contractor. It is not a project developer, but reports to have business

relationships with two unnamed multi-national, multi-billion dollar corporations that could lead the project and provide for funding. The conversion system requires pre-processing of MSW which would be achieved with a traditional MRF. This processing recovers recyclables and produces an engineered fuel referred to as Refuse Derived Fuel or RDF. The RDF is fed to a gasifier which converts the material into syngas that is used to generate electricity. The process generates an ash that may be marketable as a rotary kiln fuel or that may require landfill disposal. Primenergy has eight installations of its gasifier; seven are in the U.S. and one is in Italy. None of the installations processes MSW. Primenergy has a 30-tpd demonstration plant in Tulsa, Oklahoma that has tested RDF. For Santa Barbara, Primenergy suggests a 220,000 tpy facility consisting of two MRF processing lines and two gasification/thermal trains. The MRF and the gasification facility would each require 6 acres, for a total project need of 12 acres. Primenergy expects to achieve a diversion rate of approximately 78% and estimates a first-year tipping fee of \$55 per ton.

3.2.6 Tajiguas Partners

Tajiguas Partners is a consortium of four companies: Waste to Energy LLC (WTE) who would be the lead project developer; Burbank Recycling, Inc. (BRI) and Bedford Enterprises, Inc. (BEI) who would provide front-end MRF equipment; and Entech Solutions who would provide the gasification technology for conversion of MRF residuals. WTE, BRI and BEI are all California-based companies with existing working relationships. Entech is a well-established Australian-based company with world-wide installation of its proprietary gasification technology.

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The front-end MRF technology will be designed to process inbound MSW using a combination of mechanical and manual separating techniques (i.e., a “dirty MRF”). It will be designed to accommodate future processing and recycling of construction and demolition (C&D) materials and single-stream residential and commercial recycling

materials. The front-end system is intended to maximize the recovery of recyclables and prepare the waste for gasification. The gasification system is considered a low-temperature thermal process (operating at approximately 1,500° F) with the introduction of very limited air. The process converts the waste to syngas, which can be combusted to generate electricity. Alternately, with the use of the project team's technology advancements (i.e., patent-pending bioreactor systems, non-heat drying system, heat exchange technologies, CO₂ sequestration technologies), the syngas may be converted to biological and biochemical biofuels. The Entech gasifier produces a bottom ash which may be marketable as a building material or road aggregate, or disposed in a landfill. The MRF technology has been well established, including in California. The Entech gasifier is also well established (overseas); Entech has supplied approximately 169 gasifier units over the past 22 years. Their reference facility is a 67-tpd installation in Malaysia that has been operating commercially since 1998 (10 years) processing MSW. For Santa Barbara, Tajiguas Partners has suggested a dirty MRF and gasification facility with an initial capacity of 220,000 tpy, readily expandable to a larger capacity to accommodate other waste and processing (e.g., future single-stream recycling line). Tajiguas Partners expects to achieve a diversion rate of over 95% and estimates a first-year tipping fee with the range of \$56-\$100 per ton, depending on final and actual project definition.

3.2.7 World Waste Technologies

World Waste Technologies is a California-based company focused on developing MSW conversion facilities. The company was formed in 2003 and has since been successful in raising equity financing and developing its first demonstration facility. World Waste is a project developer, not a technology supplier. For the past year, it has focused its efforts on utilizing its MSW processing experience for the production of renewable energy through gasification. World Waste reports that it has been working for nearly a year with RRT, a

U.S.-based provided of services and products for solid waste processing systems and recycling facilities. It also represents that it has access to a number of gasification technologies through partnerships and joint development agreements. World Waste's experience with MSW processing is best represented by its demonstration facility in Anaheim, California. This facility is the only one of its kind to be permitted in California, so it establishes a precedent for future projects. The facility was designed with two 250-tpd autoclave trains (500-tpd total capacity) geared to recover paper fiber from MRF residue. The autoclave technology utilizes a mechanical system of steam, pressure, and agitation to separate the waste into sterilized organic and inorganic materials. The organic fraction would then be converted (e.g., gasified to generate electricity).

3-6
World Waste suggests that it would work with RRT to develop a traditional front-end processing and recycling system for Santa Barbara, followed by gasification. The gasification technology proposed by World Waste is in operation at a 5-tpd pilot scale in Sherbrooke, Ontario. A full-scale (40 tpd) facility is scheduled to be operational in the third quarter of 2008.

World Waste proposes two, 100,000-tpy gasification trains, and states the two unit configuration can be constructed on 6 acres. World Waste expects a diversion rate well above 60% and a first-year tipping fee below \$100 per ton.

3.3 Other Conversion Technology

3.3.1 Herhof California

The Herhof team is composed substantially of European firms with extensive experience in public/private partnerships and the development of MSW and other infrastructure projects.

Herhof California would be the project developer. Herhof California's owners include

Helector, S.A., which owns Herhof GmbH (the exclusive licensee of the technology). Other

development partners include Finarfin LLC and Dongell Lawrence Finney LLP (Californiabased

legal and regulatory advisory firms); Kamehameha Environmental LLC (a Nevadabased

company established to facilitate technology development in selected locations, including California); and Gary Stanley (a California-based economic development consult).

The conversion technology offered is called the Herhof Stabilat technology. The system

includes biological drying, followed by several mechanical separation steps.

Drying is

achieved in a Herhof Box System which utilizes an aerobic degradation process similar in

concept to composting. It differs from composting in that the objective is not to maximize

degradation of organic material, but only to degrade the waste enough to generate

biological heat to dry the waste. The drying facilitates mechanical separation which

recovers recyclables, removes inerts, and generates a prepared fuel it calls Stabilat. The

Stabilat fuel would be sold as a substitute clean fuel for coal-fired power plants and cement

kilns, or, alternately, could be gasified with conversion of the resulting syngas to methanol.

The Herhof Stabilat technology is in commercial operation at numerous installations.

Seven comparable reference facilities have been identified. The reference facility suggested by Herhof as the best demonstration of the technology is a 350-tpd (90,000 tpy)

commercial facility in Osnabruck, Germany. This facility has been operational since

February 2006 processing MSW.

For Santa Barbara, Herhof has suggested a 220,000-tpy facility consisting of 13 biological

drying boxes and two mechanical processing lines. The facility could be constructed on the

available 6-acre site. Herhof expects to achieve a diversion rate of approximately 70% or

higher. Based on a planning-level analysis, and subject to final selection and configuration

of sorting technology as well as sale prices for products, Herhof estimates a first-year

tipping fee of less than \$100 per ton.

3-7

4-1

4.0 EVALUATION OF CONVERSION TECHNOLOGIES

As previously described, eleven evaluation criteria were established for the purpose of

Based on information available, eight respondents meet Criterion 1. As summarized below,

three respondents do not meet Criterion 1:

- **Organic Waste Systems – Anaerobic Digestion.** OWS did not propose a project

capacity for Santa Barbara, but provided general information supporting their ability

to process between 100,000 tpy and 220,000 tpy of the sorted organic fraction of MSW. Although pre-processing is required, OWS did not specify a technology, indicating local firms typically provide that part of the project when required. OWS stated, however, that it could provide pre-processing. Based on the information submitted in response to the RFI and on ARI's previous review of OWS for New York City, its process is applied most often to source-separated organic waste, and

its experience in processing mixed MSW (including necessary front-end processing

and the generation of marketable compost from mixed MSW) is limited. As a result,

OWS's ability to develop a large-scale plant processing mixed MSW (including 4-2

necessary pre-processing) is uncertain. OWS reported that a 100,000 tpy digestion

facility would require 5-7.5 acres. Based on the information provided and ARI's evaluation of OWS for New York City, this area is believed to be for the digestion process only. Full project development, including pre-processing and other project

components, would likely require 10-15 acres for 100,000 tpy and 20 acres or more

for full development at 220,000 tpy. While not clear based on information provided,

it appears unlikely that OWS could develop a project of the required capacity within

the available acreage.

- **Primenergy – Thermal Gasification.** Primenergy proposed a 220,000 tpy project

consisting of a front-end MRF followed by two gasification trains. The MRF technology has not yet been selected so it could not be evaluated. The gasification

technology is in operation commercially and at a scale comparable to that suggested

for Santa Barbara, but not for MSW. Primenergy has a 550 tpd (200,000 tpy) reference facility in Arkansas, but the facility processes rice hulls. Primenergy's gasification technology has been tested at only a small-scale (30 tpd) pilot installation, for an unspecified amount of RDF. This is below the capacity required

to demonstrate the technology (see Criterion #8). Based on the limited experience of the technology with MSW, its ability to operate at 220,000 tpy is uncertain and Criterion 1 is not determined to be met. In addition, Primenergy has specified that the project will require a total of 12 acres – 6 acres each for the MRF and gasification facility, which is double the acreage currently available for a project. Although the two components could be physically separate, this would not be an ideal arrangement and would still require additional land.

• **World Waste Technologies – Thermal Gasification.** World Waste has stated that its technology platform is capable of accommodating up to 250,000 tpy of MSW, using two gasification trains. World Waste further stated that the project configuration would fit within the 6-acre site. The gasification technology proposed by World Waste is not yet in commercial operation, and has been tested at only a small-scale (5 tpd) pilot plant, for an unspecified type of waste. This is below the capacity required to demonstrate the technology (see Criterion #8). Based on the limited experience of the technology, its ability to operate at 220,000 tpy is uncertain and Criterion 1 is not determined to be met.

4-3

Table 4-2. Criterion 1 – Processing Capacity

Criterion 1: Any considered CT must be capable of processing a minimum of 100,000 tons per year (tpy) of MSW during the first operating year of the project, and must be capable of increasing capacity up to 220,000 tpy within 10 years of the first operating year of the project.

Project Developer and/or

Technology Supplier

(Listed Alphabetically by
Type of Technology)

Initial Processing

Capacity

Future Processing

Capacity

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

(CART)

- CR&R Incorporated

- Arrow Ecology and

Engineering

[Anaerobic Digestion]

• 100,000 tpy

• 2-line plant at 150 tpd each line

(300 tpd total); 2-shift operation

with 13.5 productive hours per

day

• Similar reference facility in

Sydney, Australia (MSW, 2-line plant at 100,000 tpy) is under construction; smaller reference facility operational in Tel Aviv, Israel (MSW, 1-line plant at 50,000 tpy)

- Initial project requires 3.5 acres; front-end and back-end of system do not have to be contiguous; initial site layout would be designed to facilitate future expansion

- 220,000 tpy

- Expanded by modular design

- Potential for economies of scale at expanded capacity

- CART expects the full build-out can be constructed on the 6-acre site

Yes

Ecocorp

[Anaerobic Digestion]

- 220,000 tpy

- Number and capacity of units not specified; availability not specified

- Comparable reference facility (Barcelona, Spain) processes 330,000 tpy of MSW

- Project requires 5.5 acres, including a 30,000 sf industrial building (for pre-processing and post-processing)

Same as initial capacity

Yes

4-4

Project Developer and/or

Technology Supplier Initial Processing Future Processing Criterion

(Listed Alphabetically by

Type of Technology)

Capacity Capacity Met?

Organic Waste Systems (OWS)

[Anaerobic Digestion]

- Capacity not proposed

- Example provided of an anaerobic digestion facility (excluding pre-processing) that could digest the sorted, organic

fraction of up to 200,000 tpy of incoming MSW; no details for pre-processing

- Experience is predominantly with source-separated organic waste
 - Reference facility (Vitoria, Spain) processes 120,000 tpy of mixed waste; comparability of waste to MSW unknown
 - 100,000 tpy digestion process requires 5-7.5 acres; full project would likely require twice as much space; acreage not specified for 220,000 tpy facility
- Capacity not proposed
No

Thermal Processing AdaptiveNRG

[Thermal – Plasma Gasification]

- 219,000 tpy
 - Eight (8) standard size, 100-tpd reactors (model sb2000), 6 of which are processing at all times (600 tpd total capacity)
 - Modular design, but multiplereactor projects not previously installed
 - Required footprint is approximately 6 acres, inclusive of space for future upgrades to larger capacity if desired (i.e., addition of supplemental reactors and power generators)
- Same as initial capacity
Yes⁽²⁾

International Environmental Solutions (IES)

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

- 220,000 tpy
- 3 processing trains, designed to process 125 tpd dry waste each or 200 tpd as-received MSW
- Multiple-unit facility not previously installed
- Existing reference facility in Romoland, CA, has a capacity of 50 tpd; 125-tpd system is under

development

- Project requires approximately 5 acres

Same as initial capacity, unless

Santa Barbara chooses to start

smaller and expand to

220,000 tpy

Yes⁽²⁾

4-5

Project Developer and/or

Technology Supplier Initial Processing Future Processing Criterion

(Listed Alphabetically by

Type of Technology)

Capacity Capacity Met?

Interstate Waste Technologies

(IWT)

[Thermal – Gasification]

- 220,000 tpy
- 2 units at 352 tpd each (704 tpd total), 85.6% guaranteed availability

- Comparable reference facility

(Kurashiki, Japan) processes

190,000 tpy of MSW

- Project requires minimum of 6 acres, but 8 acres would be preferred; IWT willing to incur cost to reclaim additional property at the site or purchase additional land adjacent to the site

Same as initial

capacity

Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

- 150,000 tpy
- 4 units at 110 tpd each
- Multiple-unit facility not previously installed
- Reference facility in Ottawa, Canada, consists of 1 unit of the same capacity (110 tpd)
- Project requires 6 acres
- 220,000 tpy
- Addition of 2 units (110 tpd each)
- Will require 2 additional acres or a separate site with 4 acres

Yes⁽²⁾

Primenergy LLC

[Thermal – Gasification]

- 220,000 tpy
 - 2 MRF processing lines (specific MRF technology not yet selected)
 - 2 gasification/thermal trains
 - Reference facility in Stuttgart, Arkansas (3 units, 550 tpd total), processes rice hulls, but not MSW; limited MSW experience – demonstration unit in Tulsa, Oklahoma (1 unit, 30 tpd) has tested RDF
 - MRF and gasification facility would each require 6 acres (for a total of 12 acres). Although facilities could be physically separated, requires double the available acreage
- Same as initial capacity
- No

Tajiguas Partners

- Waste to Energy, LLC
- Entech Solutions
- Burbank Recycling
- Bedford Enterprises

[Thermal – Gasification]

- 220,000 tpy
- Initial facility design for expansion to larger MRF capacity
- Site layout provided showing suitability of 6-acre area
- Suitable reference facilities
- Potential future expansion of MRF capacity to manage C&D and singlestream recyclables (to be installed within footprint of initial project design)

Yes

4-6

Project Developer and/or

Technology Supplier Initial Processing Future Processing Criterion

(Listed Alphabetically by Type of Technology)

Capacity Capacity Met?

World Waste Technologies

[Thermal – Gasification]

- up to 250,000 tpy
 - 2 refuse derived fuel processing (RDF) lines and one thermal processing line (gasifier, turbine/generator, air pollution control); no details provided
 - 500-tpd facility (2 lines) commissioned in Anaheim, CA in 2006 (RDF processing to biomass feedstock; no gasification); however, this is not the proposed front-end system
 - Limited experience for gasification technology; largest existing installation is a 5-tpd pilot unit
 - Approximately 6 acres required for project development
- Same as initial capacity
No

Other Technology

Herhof California⁽¹⁾

[Other – Biological
Drying/Mechanical Separation/
Combustion Off-site]

- 220,000 tpy
 - 13 biological drying boxes (350-ton capacity each) and 2 mechanical processing lines
 - Comparable reference facilities (7) in Germany, Italy and Belgium ranging from 85,000 to 155,000 tpy MSW; 220,000 tpy facility (Germany) scheduled to be complete in 2008
 - 6-acre site is suitable for project development
- Same as initial capacity
Yes

1. Herhof recommended consideration of a 360,000 tpy processing facility in combination with an industrial power station to use the fuel on-site for electricity generation, but did not provide details as part of the response; additional details would be provided if this was a possible option for Santa Barbara.
2. Criterion determined to be met based on project configuration stated by respondent (AdaptiveNRG, IES, Plasco); some uncertainty of full-scale build-out, due to lack of technology experience at higher capacity and

with multiple processing units.

4-7

4.2 Criterion 2 – Operating Term

The City and County of Santa Barbara are seeking a long-term waste disposal alternative

for participating jurisdictions within Southern Santa Barbara County. Criterion 2 considered

the potential life of the project. Specifically, Criterion 2 is as follows:

Criterion 2: Any considered CT must be capable of operating for a minimum of 20 years.

Table 4-3 provides a summary of the operating term expected by each of the respondents.

As summarized in the table, all eleven respondents expect an operating life of at least 20

years, with many proposing to design, construct and operate the facility to achieve a project

life in excess of 20 years. None of the proposed technologies have been in operation long

enough to demonstrate a 20-year life, but many have demonstrated operation for 5-10

years and some longer. Also, several respondents have related facilities (e.g., processing

other types of waste) that have operated for longer periods of time (in one case, for 20+

years). Three of the respondents (IES, Plasco Energy and World Waste) have technologies that are less demonstrated, so the ability of these technologies to achieve a

20-year life is less certain.

Nonetheless, all eleven respondents expect a design life of at least 20 years and, assuming

implementation of the following factors, are determined to be able to meet evaluation

Criterion 2:

- Use of industry-based design and construction standards
- Implementation of routine, preventive and predictive maintenance practices
- Use of “off-the-shelf” equipment, as applicable, with long documented history
- Redundancy of key design components

4-8

Table 4-3. Criterion 2 – Operating Term

Criterion 2: Any considered CT must be capable of operating for a minimum of 20 years.

Project Developer and/or

Technology Supplier

(Listed Alphabetically by

Type of Technology)

Proposed Project Operating Term and/or Project

Developer’s Projected Useful Life of Technology

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated
- Arrow Ecology and Engineering

[Anaerobic Digestion]

- Project Developer expects useful life of over 20 years with proper maintenance
- Equipment designed for heavy-duty industrial application
- Process is not a high-temperature or corrosive atmosphere
- Implementation of routine, preventive, and predictive maintenance
- Oldest installation (Tel Aviv, Israel – MSW) operational since 2003

Yes

Ecocorp

[Anaerobic Digestion]

- Design economic life of 25 years; longer life achievable with proper maintenance
- Oldest installation still operational (Berlstedt, Germany – manure) developed in 1986 (22 years); oldest MSW installation operational for 7 years (Barcelona, Spain – 2001)

Yes

Organic Waste Systems

[Anaerobic Digestion]

- Plants designed to be operated for more than 20 years
- Oldest installation (Brecht, Belgium – biowaste, waste water) operational since 1992

Yes

Thermal Processing

AdaptiveNRG

[Thermal – Plasma Gasification]

- Facility to have minimum lifespan of 20 years
- Portable, pilot reactor (model sb10, up to 100 tpd) in daily use in Monterrey, Mexico since 2005 for demonstration purposes
- Early reactor models built for Shell Oil Corporation in 1991 and 1994, with 10-year lifespan

Yes

International Environmental

Solutions

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

- 80-85% of equipment “off-the-shelf” components with long, documented histories
- Life-span of retort, the major component of the thermal converter, not yet demonstrated for 10 years, but Project

Developer expects to have 15-20 year life under normal conditions

Yes⁽¹⁾

4-9

Project Developer and/or

Technology Supplier Proposed Project Operating Term and/or Project Criterion

(Listed Alphabetically by

Type of Technology)

Developer's Projected Useful Life of Technology Met?

Interstate Waste Technologies

[Thermal – Gasification]

- Proposed project term of 25 or 30 years
- Project to be designed, constructed and operated for a useful life of at least 30 years
- Design incorporates redundancy
- O&M budget includes annual allowance for equipment repair and replacement over 30 years
- Oldest reference facility (Chiba, Japan – MSW, industrial waste) has been in continuous operation for 9 years; Project Developer expects reference facility to operate for at least 20 more years.

Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

- Proposed project term of 20 years
- >95% of equipment “off-the-shelf” components with long, documented histories
- Implementation of routine, preventive, predictive, and reactive maintenance
- Life-span of reaction chamber not yet demonstrated

Yes⁽²⁾

Primenergy LLC

[Thermal – Gasification]

- Design standards employed for system life expectancy in excess of 20 years
- Operating costs include sinking fund reserve (1% of capital) for major equipment turnaround every five years
- Similar equipment installation (Stuttgart, Arkansas – rice hulls) has been in operation since December 1996 (approximately 11 years)

Yes

Tajiguas Partners

- Waste to Energy, LLC
- Entech Solutions
- Burbank Recycling
- Bedford Enterprises

[Thermal – Gasification]

- WTE's research and development company (BioEnergy Development) has a cooperative R&D agreement with USDA that provides for technology upgrade and processing for at least 20 years
- Similar equipment installation (Malaysia – MSW) has been in operation since 1998 (10 years)

Yes

World Waste Technologies

[Thermal – Gasification]

- Facility to be designed and constructed to operate beyond a 20-year life

Yes⁽²⁾

Other Technology

Herhof California

[Other – Biological Drying/
Mechanical Separation/ Combustion
Off-site]

- Design incorporates redundancy
- First Herhof Stabilat plant (Albar, Germany) started commercial operation in 1997; contractual period is 15 years
- First Herhof composting plant (Asslar, Germany) started commercial operation in 1987 and is still operating; biological drying process is based on this technology

Yes

1. Criterion determined to be met, but with uncertainty as disclosed by the technology supplier (IES).
2. Criterion determined to be met based on design life stated by respondent (Plasco, World Waste); insufficient information to support further review.

4-10

4.3 Criterion 3 – Compatibility with Solid Waste Programs

Implementation of a conversion technology project at the Tajiguas Landfill is intended to be compatible with local solid waste management programs, including recycling programs.

Criterion 3 considered compatibility. Specifically, Criterion 3 is as follows:

Criterion 3: Any considered CT must be compatible with local solid waste management programs, including recycling programs.

Respondents were requested to describe how their technology could supplement recycling

activities, and, specifically, how it could be incorporated into an integrated, municipal solid

waste management program that has, as one of its priorities, recycling and/or energy and

materials recovery. Respondents were also requested to address technology-specific

feedstock requirements that could be impacted by recycling programs, and flexibility to

manage other potential waste streams (e.g., wastewater sludge).

Table 4-4 provides a summary of information provided by respondents to address

compatibility with local solid waste management programs. As summarized in the table, all

of the respondents offer conversion technologies that meet Criterion 3. The technologies are intended to supplement existing recycling activities to achieve increased diversion from landfill disposal, through the recovery of recyclables remaining in the waste, and generation of energy and other products. The technologies have different degrees of flexibility to accommodate a changing waste stream, with many employing pre-processing to refine the waste to the desired characteristics for conversion. For all of the technologies, a dramatic change in the waste stream would result in changes to the quantity of products and could have an impact on project economics. Most, but not all, of the technologies indicate the ability to process sludge, but generally recommend determination of whether to add this waste stream at the start of facility design. Despite the ability to process sludge, it is not necessarily beneficial to all conversion processes. For example, one thermal gasification technology (Primenergy) indicates the technical ability to process sludge to reduce mass and eliminate odor and biological activity, but with no energy production.

4-11

Table 4-4. Criterion 3 – Compatibility with Solid Waste Management Programs

Criterion 3: *Any considered CT must be compatible with local solid waste management programs, including recycling programs.*

Project Developer and/or

Technology Supplier

(Listed Alphabetically
by Type of Technology)

Summary of Key Statements Provided by Project Developer and/or Technology Supplier – Compatibility with Local Solid Waste Management Programs

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated

- Arrow Ecology and
Engineering

[Anaerobic Digestion]

- Facility will increase current diversion rate by recovering conventional recyclables that remain in the waste (e.g., glass,

metal, plastic, paper)

- The generation of energy and production of soil amendment represent new avenues of recycling
- Implementation of a source separation food waste program would lower the amount of biogas and, correspondingly, the amount of electricity generated
- The technology is flexible and treatment of wastewater could be part of the overall facility; the size of the digester tanks would be increased and other general modifications would be required. Whether to include sludge would need to be determined before the start of facility design

Yes

Ecocorp

[Anaerobic Digestion]

- The proposed process integrates into municipal management programs (existing or planned)
- Recovers materials for reuse (lumber) and recycling (metals, cardboard, some plastic)
- The removal of paper for recycling would reduce the amount of biodegradable material and would reduce the number of digesters and associated equipment; economics would not be impacted based on the quantity of other biodegradable organics
- The technology can accommodate other wastes and in particular wastewater sludge, which may be desirable to the process (i.e., to increase biogas and decrease needs for make-up fresh water)

Yes

Organic Waste Systems

[Anaerobic Digestion]

- Pre-treatment and post-treatment processes can be tailored to project requirements to meet program needs
- Depending on the waste composition, certain amounts of wastewater treatment plant sludge can be added to the MSW for anaerobic digestion

Yes

4-12

Project Developer and/or

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by Type of Technology)

Thermal Processing

AdaptiveNRG

[Thermal – Plasma Gasification]

- Pre-sorting of MSW is not necessary, but the waste acceptance area can be designed to separate recyclables; sorting of aluminum, tin, and white goods will make sense for financial and recycling reasons
- Metals that go into the conversion reactor are recovered postprocessing for recycling
- The technology can process waste high in carbon and low in metals, that is not radioactive in nature: MSW; green waste; C&D; bio-hazardous and medical waste; tires; animal products; low grade coal and petroleum by-products; wastewater, sludge,

and unprocessed liquid waste

- Waste changes will not increase or decrease the efficiency of the reaction process since the waste input stream is conditioned before entering the reaction chamber

Yes

International Environmental Solutions

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

- IES system can be integrated with or located contiguous to a MRF, to maximize the recycling process and optimize the diversion of processed waste
- Glass and metals present in the carbon residue can be recovered and recycled
- Other types of non-hazardous waste can be blended into the system along with MSW (including tires, biosolids, industrial sludges, waste oils and oil filter paper, green and wood waste, auto shredder residue, liquid waste such as paint, and medical waste); no modifications to the system would be required
- Other wastes could be processed separately or blended with MSW; blending is recommended to maximize energy output

Yes

Interstate Waste Technologies

[Thermal – Gasification]

- Facility will accept post-recycled MSW and process it to produce energy and five recycled products
- Technology can process all forms of waste, including solids, liquids and sludges, with heat contents ranging from 3,500-8,000 Btu/lb; this provides flexibility to accommodate changes in the waste composition over time due to changes in recycling programs
- There are no technology-specific feed stock requirements that would be impacted by Santa Barbara's recycling programs
- Technology is designed to process wastewater sludge, and can process a variety of other waste in addition to MSW including commercial and industrial waste, electronic waste, tires and medical waste

Yes

4-13

Project Developer and/or

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by Type of Technology)

Plasco Energy Group

[Thermal – Plasma Gasification]

- Technology is designed for and operating on post-recycled MSW in Ottawa, Canada
- System will have front-end separation capabilities with metals

recovery

- Patented control system can convert variable feedstock into product quality syngas; operation incorporates “Consistent Carbon Feed” (CCF), which is the controlled addition of a separate waste stream with a known, consistent energy content (e.g., tires) to ensure system stability despite variations in MSW feedstock
- Almost any type of waste can be used as a feedstock including MSW, biosolids, tires, plastic, green waste and other organic materials

Yes

Primenergy LLC

[Thermal – Gasification]

- Proposed technology starts with a material recovery facility to recover recyclables and generate an engineered fuel (RDF) for energy generation
- If the organic portion of MSW (including paper, cardboard, plastic, other organic materials) was reduced by recycling programs, the RDF generation rate would drop, which would reduce the production of electricity
- If sludge is contemplated as an additional waste stream, Primenergy recommends a dedicated, separate system; it would result in a reduction in mass and an elimination of odor and biological activity, but with no energy production

Yes

Tajiguas Partners

- Waste to Energy, LLC
- Entech Solutions
- Burbank Recycling
- Bedford Enterprises

[Thermal – Gasification]

- Process designed to first maximize recovery of recyclables (dirty MRF) then convert residual MRF material using gasification
- Facility would be able to assist communities with “cleanup” days, taking in furniture and other large objects for processing (e.g., tree stumps, lumber)
- Gasification system is capable of processing any biomass materials, including the ability to receive, dry and process sludge

Yes

World Waste Technologies

[Thermal – Gasification]

- Process is specifically designed to utilize only the material that is currently destined for landfill
- Process does not require recyclable material as feedstock
- Front-end system processing is designed to remove ferrous metal present in the incoming waste, which will augment current recycling initiatives
- In addition to MSW, process is capable of handling green waste, wood waste and C&D waste

Yes

4-14

Project Developer and/or

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by Type of Technology)

Other Technology

Herhof California

[Other – Biological

Drying/Mechanical

Separation/Combustion Off-site]

- The proposed facility would enhance and augment the existing integrated solid waste management program by increasing diversion rates, creating marketable products, and generating electricity
- Applications in Europe operate under varying waste quantities and compositions, as well as different waste management practices and recycling activities
- Proposed facility will be able to treat a wide range of waste composition, with amount of recovered products dependent on capture through source-separation programs
- Severe changes to waste composition or amount can be accommodated through technical changes to the facility
- The process is able to handle non-hazardous commercial and industrial waste, but it cannot treat wastewater sludge

Yes

4-15

4.4 Criterion 4 – Diversion from Landfill

A primary goal of the project is to increase the diversion of post-recycled MSW intended for

landfill disposal through pre-processing (or post-processing) and/or conversion of postrecycled

MSW into beneficial products such as energy, fuels, or other marketable products

(e.g., compost, aggregate, metals). Criterion 4 established a minimum standard of 60%

diversion:

Criterion 4: Any considered CT must be capable of diverting at least 60% by weight of the MSW received for processing from landfill disposal.

Respondents were requested to provide mass, energy, and water balance information for

the technology, showing the amount of MSW that would be diverted from landfill disposal

through the recovery of recyclables and generation of products. Respondents were also

requested to describe the quantity and quality of residue resulting from the process.

Table 4-5 provides a summary of the responses, focusing on the quantity of residue and

corresponding diversion rate provided by each respondent. Information was generally provided by respondents in a summary format, with limited (if any) supporting information. Detailed mass and energy balances were not provided. In addition, responses were generally based on the state-wide waste composition data provided in the RFI. Several respondents cautioned that actual mass and energy balances should be based on a project-specific waste characterization. Such caution should be applied to all responses, since project-specific waste characterization could impact diversion and residue generation. While the information provided was limited, such summary-level information is reasonable in consideration of the short response period associated with the RFI. As shown in Table 4-5, diversion potential ranges from approximately 70% to as much as 100%. In general, the thermal processing technologies offer the greatest potential for diversion. The one thermal company that specified 100% diversion (IWT) stated that its reference facilities in Japan are generating 0% residue requiring disposal, and stated that it would guarantee to produce marketable products and sell those products. As shown in Table 4-5, all of the respondents are determined to meet Criterion 4. OWS did not specifically consider the generic waste composition provided in the RFI and did not provide any mass and energy balance information. OWS commented that 60% diversion can be achieved depending on both waste quality and required compost quality. ARI's previous analysis of OWS for New York City indicated a potential residue generation rate of approximately 43%, resulting from pre- and post-digestion processing. For purpose of this evaluation, OWS is determined to meet criterion 4, on the basis that it could potentially achieve a 60% diversion rate with a suitable front-end processing system and consideration of a project-specific waste composition. Similarly, World Waste did not provide any mass and energy balance information. It specified neither a residue generation rate nor a

diversion rate, but commented that it is confident its process will divert “well above 60% for landfill disposal”. Based on information generally available for gasification technologies, it is reasonable to estimate a diversion potential above 60% for World Waste.
4-16

Table 4-5. Criterion 4 – Potential for Diversion from Landfill Disposal

Criterion 4: Any considered CT must be capable of diverting at least 60% by weight of the MSW

received for processing from landfill disposal.

Project Developer and/or

Technology Supplier

(Listed Alphabetically by Type of Technology)

Respondent's Estimated

Residue Generation ⁽¹⁾

Respondent's

Estimated

Diversion

Potential ⁽¹⁾

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated

- Arrow Ecology and

Engineering

[Anaerobic Digestion]

24%

(Residue consists of inert material removed during front-end preparation/separation, e.g., grit, stones, pebbles, glass and ceramic shards, small pieces of plastic and non-descript junk)

76% Yes

Ecocorp

[Anaerobic Digestion]

Approximately 31%

(Residue consists of non-recyclable inerts which are not digestable, e.g., portion of glass, concrete, asphalt and ash, rock, textiles, carpet, electronics)

Approx. 69% Yes

Organic Waste Systems

[Anaerobic Digestion]

Not Provided

(OWS commented that 60% diversion can be achieved depending on both waste quality and required compost quality. ARI analysis for New York City indicated OWS could have a residue generation rate of approximately 43%, resulting from preand

post-digestion processing. However, with a suitable front-end processing system and consideration of a projectspecific waste composition, it is possible that OWS could achieve 60% diversion.)

Not Provided Yes

Thermal Processing

AdaptiveNRG

[Thermal – Plasma Gasification]

5% ($\pm 2\%$)

(The process generates an ash byproduct. AdaptiveNRG states its intention is to have 0% residue – 100% diversion, which requires successful marketing of the ash residue as a construction aggregate. They report a customer base has been established for the ash by-product.)

95% or more Yes

4-17

Project Developer and/or Respondent's Technology Supplier Respondent's Estimated

(Listed Alphabetically by Type of Technology)

Residue Generation ⁽¹⁾

Estimated Criterion

Diversion Met?

Potential ⁽¹⁾

International Environmental Solutions

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

5-15%

(The residue consists predominantly of carbon-based char removed from the pyrolysis chamber, and to a lesser extent particulate from the cyclone filter and dust from the baghouse. Feedstock with higher organic (carbon-based) percentages would yield the lower residual values. IES's economic proforma assumes approximately 10% residue.)

85-95% Yes

Interstate Waste Technologies

[Thermal – Gasification]

0%

(IWT proposes a facility that will process and recycle 100% of the waste provided by Santa Barbara – no residue requiring landfill disposal will be produced. IWT states that it will guarantee to produce

marketable products and sell those products. Reference facilities in Japan generate 0% residue for disposal.)

100% Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

<1%

(Residue consists of particulate matter removed from the baghouse. Plasco reports that the residue will continue heavy metals such as lead and cadmium, and may be considered hazardous depending on the characteristics of the waste received for processing. Plasco will remove and dispose of the residue at its own cost, using an approved hazardous waste contractor as applicable.)

>99% Yes

Primenergy LLC

[Thermal – Gasification]

Approximately 22%

(Residue consists of non-processible inorganic materials not recoverable as marketable recyclables, estimated to be 21% of the MSW received for processing, and fly ash discharged from the gasification of the prepared fuel, estimated to be less than 1% of the MSW received for processing. The process also generates a high-carbon bottom ash, which Primenergy assumes to be marketed as a product.)

Approx. 78% Yes

4-18

Project Developer and/or Respondent's Technology Supplier Respondent's Estimated

(Listed Alphabetically by

Type of Technology)

Residue Generation ⁽¹⁾

Estimated Criterion

Diversion Met?

Potential ⁽¹⁾

Tajiguas Partners

- Waste to Energy, LLC

- Entech Solutions

- Burbank Recycling

- Bedford Enterprises

[Thermal – Gasification]

2-5%

(Residual material from front-end MRF would be feedstock for the gasifier. Residue from the gasifier would consist of lime from scrubbing and other process

residue. The gasifier also generates an inert ash that is proposed to be marketed for use as a building material or road aggregate. The residue and diversion ranges shown above reflect the uncertainty whether the ash would be marketed or disposed.)

95-98% Yes

World Waste Technologies

[Thermal – Gasification]

Not Specified

(Residue would consist of sand and grit not utilized as a fuel in the gasifier, which will be landfilled if no suitable use is available, and ash removed from the gasifier, which World Waste believes can be used as alternative daily landfill cover. No additional details or supporting documentation was provided regarding residue generation and management, but considering typical performance of a wide range of gasification technologies, it is reasonable to estimate the potential for at least 60% diversion.)

Not Specified

(World Waste commented that it is confident its process will divert “well above 60%” from landfill disposal.)

Yes

Other Technology

Herhof California⁽¹⁾

[Other – Biological

Drying/Mechanical

Separation/Combustion Off-site]

Approximately 29-30%

(Based on an estimated 29% mineral fraction that may be marketable for use in road construction, and removal and disposal of batteries to decrease air contaminants during energy recovery. The generation and management of ash residue from off-site energy recovery is not addressed in the response.)

70-71%

(Diversion potential would increase

significantly
upon
successful
marketing of
the mineral
fraction.)

Yes

1. The residue generation rate and diversion potential are expressed as the percent by weight of MSW received for processing, based on the state-wide waste composition data provided in the RFI.

4-19

4.5 Criterion 5 – Projected Tipping Fee

The City and County have established a project goal of financial feasibility and sustainability, which requires that any considered conversion technology have capital and

operating costs that result in a feasible, cost-competitive tipping fee, with long-term

financial stability that would limit financial impacts to affected ratepayers. In consideration

of this goal, Criterion 5 was established as follows:

Criterion 5: Any considered CT must have a projected tip fee that limits financial impact to affected ratepayers (i.e., no more than 10% beyond the price the ratepayer would expect for other alternatives). As clarified by Addendum 1 to the RFI, a projected first-year tipping fee of less than \$100 per ton would be considered to meet this criterion.

For purpose of the RFI, tipping fee projections, with related cost and revenue information,

were requested primarily to obtain a *planning level* view of the prospective economics of

each potential project, and to provide some level of data for technology-to-technology

comparisons. Although all of the respondents did not provide cost and revenue information

at the level of detail requested, it is apparent that (with the exception of OWS and World

Waste) they each did sufficient analytical work to estimate a potential tipping fee, that the

fees presented were for the most part based upon reasonably performed capital and

operating cost work-ups (including in many instances staffing outlines), and that considerations of product outputs, marketability and prices were included. This is

a

sufficient indicator of their understanding of the cost and revenue structures and needs of

integrated municipal solid waste projects.

Eight respondents provided planning level capital and operating cost data, at varying levels

of detail. Cost estimates are highly sensitive to both the type of technology and the capacity (scale, in tons per year) of a project. Many of the respondents requested capital and operating cost data be considered confidential, so such information is presented herein only as an overview.

As presented by the respondents, estimated capital costs ranged from \$24.3 million to \$185.0 million, and estimated annual operating costs ranged from \$3.9 million to \$18.2 million. It can be expected that the capital and operating costs presented in formal proposals would differ somewhat from such planning level estimates, since individual proposers will be able to perform site- and project-specific due diligence as they are preparing their proposals.

It is important that the estimates provided by a respondent be viewed in the context of the technology and the project being envisioned. As one example, the capital and operating costs estimated by International Waste Technologies (IWT) were the highest of all estimates provided. However, as a comparison, the project envisioned by IWT is based on a different technology and is nearly twice as large in scale as that, for example, envisioned by Tajiguas Partners for the Entech gasifier. Because of differences in technology and scale, IWT estimated total annual product revenues of \$19.1 million, and Entech estimated \$6.3 million from the gasification process. Because of these types of factors, at both the planning level and the formal proposal level the projected tipping fees are the more

4-20

appropriate values to evaluate and compare. The results of any evaluation will be skewed when capital and operating costs are viewed in isolation from considerations of scale, technology and product revenues.

Table 4-6 provides a summary of first-year tipping fees projected by the respondents, along with an indication of information provided in support of the fees. As shown in the table, the

projected tipping fees range from approximately \$40 per ton to \$100 per ton and generally appear to assume annual adjustment at a rate consistent with inflationary factors. Based on information available, two of the respondents (Plasco, World Waste) are determined to meet the criterion solely on their statement of projected tipping fee (i.e., no supporting information). One respondent, OWS, did not provide a projected tipping fee. It provided a budgetary construction estimate for the anaerobic digestion process, excluding major facility components such as pre-treatment and civil, site-related elements. It provided no operating costs or revenues. Based on a previous evaluation completed by ARI for New York City, for which OWS provided more comprehensive cost and revenue assumptions, the projected tipping fee for a 500-tpd (182,500-tpy) privately owned and financed project, was \$142 per ton. Based on the lack of information provided by OWS and the extent to which the estimated tipping fee from other evaluations is above the threshold of \$100 per ton, OWS does not meet Criterion 5.

4-21

Table 4-6. Criterion 5 – Projected Tipping Fee

***Criterion 5:** Any considered CT must have a projected tip fee that limits financial impact to affected ratepayers (i.e., no more than 10% beyond the price the ratepayer would expect for other alternatives). [Clarified by Addendum 1 to the RFI to state that a projected tip fee of less than \$100 per ton would be considered to meet this criterion.]*

Project Developer and/or

Technology Supplier

(Listed Alphabetically
by Type of Technology)

Respondent's

Projected

Tipping Fee

Extent of Supporting

Information Provided

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated

- Arrow Ecology and

Engineering

[Anaerobic Digestion]

\$50-\$60/ton

(100,000 tpy)

- Categorized capital costs, operating costs and project revenues provided
- Given market uncertainties, no revenue assumed for compost
- Annual tipping fee adjustment not discussed

Yes

Ecocorp⁽¹⁾

[Anaerobic Digestion]

\$40/ton

(220,000)

- Categorized capital costs, operating costs and project revenues provided
- Well-developed market assumed for compost (\$20/ton); at no value for compost (\$0/ton) ARI estimates the tipping fee would increase to approximately \$46/ton
- Ecocorp cited the potential for carbon credit sales (\$20/ton) as an additional revenue source
- Annual tipping fee adjustment not discussed

Yes

Organic Waste Systems

[Anaerobic Digestion]

Not Provided • Budgetary construction estimate of 22 million euros (approximately \$31 million US) for the AD process, excluding pre-treatment and civil, site-related elements

- Operating costs not provided
- Possible revenue sources identified, but values not provided
- Tipping fee not provided; annual adjustment not discussed
- It appears OWS is offering a designbuild arrangement (i.e., no operating services)
- Previous analysis of OWS completed by ARI for New York City resulted in a projected tipping fee of \$142 per ton

No

4-22

Project Developer and/or

Technology Supplier RePsrpoojencdteendt 's Extent of Supporting Criterion

(Listed Alphabetically
by Type of Technology)

Tipping Fee Information Provided Met?

Thermal Processing

AdaptiveNRG

[Thermal - Plasma Gasification]

\$50/ton

(219,000 tpy)

- Summary capital costs provided; categorized operating costs provided
- Products identified but revenue information not provided
- Annual tipping fee adjustment not discussed

Yes

International Environmental Solutions

- IES

- One Planet Energy

- Rainbow Disposal

- Brownco

[Thermal – Pyrolysis]

\$56/ton

(220,000 tpy)

- Categorized capital cost, operating cost, and revenues provided
- 20-year proforma cash flow and income statements provided
- Annual tipping fee adjustment not discussed, but 3% inflation rate reflected in proforma

Yes

Interstate Waste Technologies

[Thermal – Gasification]

\$71/ton

(220,000 tpy)

- Categorized capital cost, operating cost, and revenues provided
- Product marketing discussed, including letters of interest from prospective purchasers
- 25-year and 30-year proforma provided; projected tipping fee is based on 25-year debt amortization; 30-year amortization would lower projected tipping fee to \$66/ton
- Annual tipping fee adjustment of 2.5% assumed in proformas

Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

\$65-\$90/ton

(150,000 tpy)

- Capital and operating cost information not provided
- Products identified and quantified,

but revenues not provided; 25% revenue sharing above thresholds to be established; two letters of interest to purchase slag provided

- Tipping fee adjustment at 50% of the change in the CPI every five years

Yes⁽²⁾

Primenergy LLC

[Thermal – Gasification]

\$55/ton

(220,000 tpy)

- Categorized capital cost, operating cost and revenues provided

- Annual tipping fee adjustment for inflation

Yes

4-23

Project Developer and/or

Technology Supplier RePsrpoojencdteendt 's Extent of Supporting Criterion

(Listed Alphabetically

by Type of Technology)

Tipping Fee Information Provided Met?

Tajiguas Partners

- Waste to Energy, LLC

- Entech Solutions

- Burbank Recycling

- Bedford Enterprises

[Thermal – Gasification]

\$56-\$100/ton

(variable

depending on

final and actual

project

description)

- Summary, non-categorized capital and operating costs, and revenues for the MRF were provided; the 2007 LA submission was referred to for information on Entech facility costs/revenues (LA included categorized cost and revenue information)

- Unclear how economics of the Entech portion are related to the economics of the larger MRF

Yes

World Waste Technologies

[Thermal – Gasification]

< \$100/ton

(up to

250,000 tpy)

- Capital and operating cost information not provided

- Potential products identified but revenues not provided
- Annual tipping fee adjustment not discussed

Yes⁽²⁾

Other Technology

Herhof California

[Other – Biological Drying/
Mechanical Separation/
Combustion Off-site]

<\$100/ton

(220,000 tpy)

- Categorized capital and operating costs provided; products quantified but revenue information not provided
- Annual tipping fee adjustment not discussed
- Tipping fee sensitivities discussed
- Estimate is based on planning-level economics; actual tipping fee depends on extent of front-end sorting technology used and sale price of materials

Yes

1. Ecocorp provided an estimated tipping fee of \$32/ton for material diverted from landfill disposal and digested. ARI calculated an overall tipping fee of approximately \$40/ton, by accounting for the cost to dispose of residue (i.e., material not diverted from landfill disposal) at an estimated cost of \$56/ton.

2. Criterion determined to be met based only on tipping fee stated by respondent; insufficient information to support further review

4-24

4.6 Criterion 6 – End Products

Directly related to the project goal of increasing diversion from landfill disposal is the City

and County's goal of producing green energy and/or fuel production, along with other

marketable products, as applicable, such as recovered metals and compost. The criterion

established to address this goal is as follows:

Criterion 5: Any considered CT must produce end products that have probable, identifiable or existing markets (including electricity and/or fuel products).

Respondents were requested to provide a listing of all potential products and expected

revenues, along with identification of the expected markets and the anticipated strength of

such markets. For products that have less certain markets, respondents were requested to

describe contingency plans. Information was also requested on respondent experience in marketing products at existing facilities. Table 4-7 identifies the potential products for each respondent, along with a summary of key supporting information provided in support of the marketability of such products. Based on the information provided, all of the respondents will produce electricity or fuel as the primary product. While most respondents have proposed generation of electricity, two of the anaerobic digestion technologies (Ecocorp, OWS) have proposed the generation (or the potential generation) of pipeline-quality natural gas. One of the thermal technologies (World Waste) indicated flexibility to produce electricity, bio-oil, or possibly fuel-grade alcohols. Herhof would produce, through biological drying and mechanical separation, a prepared fuel it calls "Stabilat". The Stabilat fuel would be sold as a substitute clean fuel for coal-fired power plants and cement kilns or, alternately, could be gasified with conversion of the resulting syngas to methanol. For all of the respondents, the generation of electricity or fuel as the primary product is sufficient to establish compliance with the criterion for marketable products.

In addition to the generation of electricity or fuel, all of the respondents also generate secondary products. Without exception, the respondents would either recover various traditional recyclables (such as metal, glass, cardboard) through front-end processing or would recover and market metals through the conversion process. The respondents have demonstrated varying levels of knowledge and expertise in the California marketplace, but all expect the recyclables and recovered metals to be readily marketable. Other products include Digestate (also called compost or organic fertilizer) generated by the anaerobic digestion technologies, and an inert aggregate, char or ash by-product from the thermal technologies. The quality, quantity and characteristics of these byproducts can

vary significantly by individual technology. The respondents have demonstrated varying levels of experience in marketing these products, and in some cases have proposed low end uses as a contingency (e.g., use as alternate daily landfill cover).

4-25

Table 4-7. Criterion 6 – End Products

Criterion 6: *Any considered CT must produce end products that have probable, identifiable or existing markets (including electricity and/or fuel products).*

Project Developer and/or

Technology Supplier

(Listed Alphabetically by
Type of Technology)

Products ⁽¹⁾ Supporting Information Regarding Marketability of Products

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated
- Arrow Ecology and
Engineering

[Anaerobic Digestion]

Electricity

- 228 kWh/ton gross
- 153 kWh/ton net
- 15,336 MWh/yr net

Recyclables (27%)

- metal, glass, fiber,
film/rigid plastic

Digestate (20%)

- Compost and soil
amendment

- CR&R has long-term relationships in secondary material markets with commitments to purchase recyclables

- Digestate from Reference Plant (Israel) sold as soil amendment; samples analyzed in CA for suitability of use; CART expects strong market for digestate, but has assumed no value

- CART will seek approval to use digestate as alternate daily landfill cover as marketing contingency

- Product quantities are directly related to waste composition. The generic waste composition provided with the RFI showed a high amount of recyclables and a low amount of

organics, which results in reduced electricity generation and higher recovery of recyclables from the Arrow process. Arrow's submittals to Los Angeles County and New York City indicate the potential for higher electricity generation (depending on the waste composition)

Yes

Ecocorp

[Anaerobic Digestion]

Pipeline-Quality

Natural Gas

- 93% methane

- 450 million scf/year

Recyclables (8.5%)

- Cardboard, metal

Organic Fertilizer (34%)

- Compost

Carbon Dioxide (CO₂)

- Recovered from

biogas upgrade

- 20,000 tpy

• Ecocorp reports markets for natural gas, organic fertilizer, and CO₂ are well established, but acknowledges contracts need to be developed with prospective buyers

• No information provided on quality of organic fertilizer; long-term, largescale marketability uncertain without further assessment

• No contingency plan provided for marketing the organic fertilizer (compost)

Yes⁽²⁾

4-26

Project Developer and/or

Technology Supplier Products ⁽¹⁾ **Supporting Information Regarding Criterion**

(Listed Alphabetically by

Type of Technology)

Marketability of Products Met?

Organic Waste Systems

[Anaerobic Digestion]

Biogas to pipe-line

quality natural gas or to

electricity

Recyclables

Compost

• No information provided on quantities or marketability of products

- Market potential expected to be comparable to other similar technologies, with confidence about marketing energy and recyclables and uncertainty about long-term, large-scale marketability of the compost
- No contingency plan provided for marketing the compost

Yes⁽²⁾

Thermal Processing AdaptiveNRG

[Thermal – Plasma Gasification]

Electricity

- 12 MW
- 430 kWh/ton gross
- 390 kWh/ton net
- 85,410 MWh/yr net

Ashen By-Product (5%)

- Reportedly inert
- Potentially a residue

Metals

- Recovered preand/
or postprocessing

- AdaptiveNRG would process, remove and market the end products. They have reportedly developed a customer base for the products in California; details were not discussed, but it was stated that terms are still being negotiated.

- AdaptiveNRG reported the plant would generate 12MW of electricity; the generation rates shown to the left were calculated by ARI, with confirmation pending from AdaptiveNRG.

- It is uncertain whether the ashen byproduct would be marketable in California. Ash generated at the pilot plant in Mexico is normally landfilled, but has been certified for use (in Mexico, report pending) and used for hollow block construction and road aggregate. It has also been used as a fertilizer.

Yes

International Environmental Solutions

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

Electricity (or other forms of energy, such as hydrogen, in the future)

- 460 kWh/ton net

Recyclables

- Metals, glass

Carbon Char

- Considered a residue, but potentially marketable

- IES reports that its system has been qualified by the CEC as a renewable energy source

- Recyclables would be marketed by Rainbow Disposal, a team member with active experience marketing materials from its existing MRF in Huntington Beach

- Carbon char is potentially usable in building or road construction materials, as a soil amendment, or for alternate daily landfill cover, subject to additional research

Yes

4-27

Project Developer and/or

Technology Supplier Products (1) **Supporting Information Regarding Criterion**

(Listed Alphabetically by

Type of Technology)

Marketability of Products Met?

Interstate Waste Technologies

[Thermal – Gasification]

Electricity

- 651 kWh/ton net

Metals (6%)

Aggregate (19%)

Sulfur (3%)

Industrial-Grade Salt (1.6%)

Zinc Concentrate (<0.5%)

- Predominantly zinc, but also containing recoverable copper and lead

- IWT provided significant documentation regarding the marketing potential for the products, including letters of interest from prospective purchaser, potential end uses and potential market value

- IWT reports the aggregate is inert and can be used as a sand substitute in concrete or bituminous paving material, or as a sub-base for roads and parking lots.

Supporting information provided by IWT includes TCLP test results and a chart showing the increase in the strength of concrete with the use of the aggregate as a substitute for sand

- As a contingency for marketing the aggregate, IWT reports the possibility of lower-value use as sandblasting grit, select fill material, or alternate daily landfill cover

Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

Electricity

- 1,250 kWh/ton net

Recyclable Metals (2% to 3%)

Construction Aggregate (17%)

Agricultural Sulfur (0.02%)

Industrial-Grade Salt (up to 1%)

Clean Water (Potable Quality)

- 72 gallons per ton of MSW processed (approximately 10.8 million gallons per year)

- Estimated net electricity assumes the supplemental feeding by Plasco of “Consistent Carbon Feed” or CCF, a separate waste stream (such as tires) with a known, consistent energy content. Plasco estimates that without CCF, net power output would be approximately 15% lower.

- Electricity generation assumes use of GE Jenbacher Gas Engine Generators (same engines installed at reference facility, which generate approximately 870 kWh/ton net), along with heat recovery steam generators that capture the waste heat from the engines and generate

steam that is fed to a steam turbine for supplemental electricity generation.

- Letters of interest were provided for potential purchase of the construction aggregate.

Yes

4-28

Project Developer and/or

Technology Supplier Products (1) Supporting Information Regarding Criterion

(Listed Alphabetically by Type of Technology)

Marketability of Products Met?

Primenergy LLC

[Thermal – Gasification]

Electricity

- 468 kWh/ton net

Recyclables (13%)

Bottom Ash (7%)

- Electricity sales to the grid under an assumed, long-term power purchase agreement
- Bottom ash assumed to be sold as carbon fuel for a rotary kiln (\$15/ton)
- Markets for recyclables specified as unknown due to volatility
- Contingency plan is landfill disposal of recyclables and bottom ash (if not marketable)
- Potential project team member is an unidentified MRF operator in Southern California, who would provide expertise to market recyclables and bottom ash.

Yes⁽²⁾

Tajiguas Partners

- Waste to Energy, LLC

- Entech Solutions

- Burbank Recycling

- Bedford Enterprises

[Thermal – Gasification]

Electricity

- 573 kWh/ton net

Biofuels (future option)

Recyclables

Bottom Ash

- Quantities subject to further determination based on integration of the MRF and gasifier
- Electricity sales to the grid and future generation of biofuels as markets are established
- Team members have extensive

national and local experience

marketing recyclables

- Bottom ash to be marketed as a building material or road aggregate, with disposal as a contingency

Yes

World Waste Technologies

[Thermal – Gasification]

Energy (electricity – 20 MW net, bio-oil, or possibly fuel-grade alcohols)

Recovered metals

Bottom ash

- Energy product depends on the technology implemented; details not specified
- No details provided on the recovery of metals and/or other recyclables
- Quantity and characteristics of bottom ash not provided
- Market potential expected to be comparable to other similar technologies, with confidence about marketing energy and recyclables and uncertainty about long-term, large-scale marketability of the bottom ash

Yes

4-29

Project Developer and/or

Technology Supplier Products ⁽¹⁾ Supporting Information Regarding Criterion

(Listed Alphabetically by

Type of Technology)

Marketability of Products Met?

Other Technology

Herhof California⁽¹⁾

[Other – Biological

Drying/Mechanical

Separation/Combustion Off-site]

Stabilat fuel (40%)

Recovered metals (7% to 8%)

Recovered glass (3%)

Mineral fractions (29%)

- Process also generates water, which is cleaned and re-used in the process
- Recycling markets identified and discussed
- Stabilat to be sold for use as a substitute clean fuel for coal-fired power plants and cement kilns, as is

currently done at existing plants in Germany. As an alternative, Stabilat could be gasified with conversion of the syngas to methanol.

- Mineral fraction to be used for road construction or possibly alternate daily landfill cover

Yes

1. Quantities are as provided by the respondents, and when expressed as a percentage are the percent by

weight of MSW received for processing.

2. Based on available information, criterion is substantially met but with uncertainty (and no contingency plan

beyond landfill disposal) associated with marketability of a significant product.

4-30

4.7 Criterion 7 – Environmental Performance

An objective of the project is to divert MSW from landfill disposal, thereby limiting and/or

mitigating environmental impacts of landfilling MSW. In consideration of this environmental

performance goal, the following criterion was established:

Criterion 7: Any considered CT must conform to California environmental standards, and must limit and/or mitigate environmental impacts of landfilling MSW.

Of paramount importance in the development of a CT project will be the ability to obtain

necessary local and State permits and approvals. This is perhaps the most arduous task in

the entire development process; one that can take years to navigate. Making the situation

even more difficult is the fact that California is likely the most difficult State in the U.S. in

which to obtain permits, and enforces the strictest limits on environmental control.

Key permits that project developers may have to obtain are as follows:

Agency of Purview Permit or Approval Required

Local Agencies

Local Enforcement Agencies (LEA) Solid Waste Facility Permit: Most likely major modification of Tajiguas Landfill

SWFP

Monthly inspections

County Planning Department CEQA/NEPA compliance (most likely an EIR), Modification of existing Tajiguas

Landfill Conditional Use Permit (CUP)

Public Works, Solid Waste, and/or other department(s) responsible for integrated

waste management planning

Countywide Integrated Waste Management Plan (IWMP) conformance findings, modifications and Amendments to the Siting Elements, (Disposal Facility and/or Non-disposal Facility Elements) of the Integrated Waste Management Plan Santa Barbara Air Pollution Control District (APCD)

Authority to Construct and Permit to Operate

Building Department Building Permits

Fire Protection District Fire Clearance

Other Local Permits Contact CalGOLD for on-line permit assistance

State Agencies

California Integrated Waste Management Board (CIWMB)

Concurs or objects to LEA issuance of Permit (or issues permit if jurisdiction has no LEA)

4-31

California Energy Commission Power Plant Licensing, over 50 MWe; RPS Eligibility Certification

California Public Utilities Commission (CPUC)

Approval of RPS support for PPAs between eligible generators and purchasers

California Independent System Operator (Cal ISO)

Interconnection Studies, Interconnection Agreements

State Water Resources Control Board (SWRCB)

Provides coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity Construction General Permit, 99-08-DWQ Regional Water Quality Control Boards (RWQCB)

Waste Discharge Requirements (WDRs)

National Pollutant Discharge

Elimination System (NPDES) Storm Water Discharge Permit

Air Resources Board (ARB) Oversight of Santa Barbara APCD Department of Toxic Substances Control

(DTSC)

Regulates hazardous waste permitting, enforcement and Unified Program activities to assure the safe storage, treatment, transportation and disposal of hazardous wastes.

California Coastal Commission Regulate land and water uses in the coastal zone

Other State Permits Contact CalGOLD for on-line permit assistance

Federal Agencies

Federal Energy Regulatory Commission (FERC)

Determination of Qualified FACILITY (QF) status, per compliance with Public Utility Regulatory Policies Act. Conformance findings and Amendments for Electric Tariff, authorizing Cal ISO grid oversight and scheduling

US Environmental Protection Agency (EPA)

National Environmental Policy Act (NEPA), if project involves federal land, money or personnel

In addition, the technology must limit or mitigate environmental impacts of landfilling MSW.

Under this criterion, this means limiting the amount of organic waste or residues from the

conversion process requiring landfill disposal. By keeping organics out of the landfill,

impacts to land, air and water are minimized or eliminated entirely. Table 4-8 summarizes

the assessment of each of the 11 respondents related to Criterion 7.

4-32

Table 4-8. Criterion 7 – Expected Environmental Performance

***Criterion 7:** Any considered CT must conform to California environmental standards, and must*

limit and/or mitigate environmental impacts of landfilling MSW.

Project Developer and/or

Technology Supplier

(Listed Alphabetically by Type of Technology)

Summary of Environmental Performance Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated
- Arrow Ecology and

Engineering

[Anaerobic Digestion]

- Very similar reference plant nearing construction completion in Sydney, Australia
- 76% diversion includes all organics and traditional recyclables; only inerts landfilled; diversion could be higher if residual approved for use as ADC
- Net water producer
- Air emissions from power generation; engines will be fitted with NOx control device

Yes

Ecocorp

[Anaerobic Digestion]

- Proven technology with numerous installations in Europe
- Barcelona plant at 330,000 tpy processing screened MSW is very similar to proposed project
- 70% diversion includes all organics; only inerts to landfill
- No net wastewater generated
- Process is enclosed
- Biofilters can be added if needed for odor control
- Air emissions would result if gas used to generate power via Jenbacher engines; however, they propose to upgrade to pipeline quality gas rather than use for power generation
- Also capturing CO2 for sale

Yes

Organic Waste Systems

[Anerobic Digestion]

- Proven technology with 17 commercial plants; however, most operate on greenwaste (“biowaste”)
- Plant operates under negative pressure and all air directed to biofilter or other control technology to control odor
- Digester residue undergoes static pile forced aeration prior to use as compost
- Organic waste separated in pre-treatment is sent to digestion – therefore, organics removed from the landfill
- Operates at low temps, therefore does not produce toxic compounds

Yes

4-33

Project Developer and/or

(ListeTde Achpnhoalboegtiyc aSlluyp bpyl iTeyr pe of **Summary of Environmental Performance CrMiteert?io n**

Technology)

Thermal Processing

AdaptiveNRG

[Thermal – Plasma Gasification]

- Plasma arc technology
- 95% diversion with by-products to be recycled
- Emissions data available for demonstration plant in

Monterey, Mexico, which has processed MSW
• Diesel generator emissions may require further evaluation

Yes

International Environmental Solutions

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

- 46 TPD demonstration plant has passed all air emission tests performed by SCAQMD
- Demo plant has also passed a Tier 4 SCAQMD Health Risk Assessment at 0.6/million, more than ten times under the limit
- Char and ash are proposed to be marketed for use in road base, soil amendment, or as a last resort for alternative daily landfill cover
- 5-15% inert residuals for disposal
- High diversion potential 85-95%

Yes

Interstate Waste Technologies

[Thermal – Gasification]

- Well proven pyrolysis/gasification technology
- Performance from plants in Japan demonstrates ability to meet California air emission requirements; no emissions from conversion process, only from power generation
- Process capable of 100% diversion – no incoming material needs landfill disposal
- Technology well vetted in other evaluations

Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

- Plasma arc technology has no emissions from conversion operation. Only emissions are from power generation
- 100 TPD demonstration plant in Ottawa has been online since mid 2007. Operates on “black bin” residential MSW
- Diversion over 99.9% with only a very small residual of hazardous APC residue for disposal at Kettleman Hills
- Net generator of potable water
- Vitrified ash to be sold as aggregate or concrete ingredient

Yes

4-34

Project Developer and/or

(Listed in the Appendix of the **Summary of Environmental Performance Criteria** Technology)

Primenergy LLC

[Thermal – Gasification]

- Odor control via biofilter in receiving area
- Full suite of air pollution control devices including selective catalytic reduction for NOx control
- Dry condensing to reduce water consumption
- 79% diversion
- Limited cleaning of Syngas (ash removal only)
- No reference plant for MSW

Yes

Tajiguas Partners

- Waste to Energy, LLC
- Entech Solutions
- Burbank Recycling
- Bedford Enterprises

[Thermal – Gasification]

- Ntech gasification provides diversion of 90-98% depending on ability to reuse ash and rubble
- All organic material converted – only inerts require landfilling or reuse
- Ntech relies on cleaning of feedstock through MRF – no intermediate gas cleaning prior to combustion
- Technology well vetted in other competitions
- Standard air emissions from power generation – although team also focusing on production of liquid fuels in future
- Experienced local MRF processors for feedstock preparation

Yes

World Waste Technologies

[Thermal – Gasification]

- Proposed system involves upfront MRF processing, followed by gasification and power generation
- No details provided on environmental performance of gasification technology; technology demonstrated only in pilot plant at 5 tpd unit capacity
- Proposing potential use of inert ash residual as alternative daily cover at Tajiguas Landfill
- Diversion potential >60% expected

No

Other Technology

Herhof California

[Other – Biological Drying/
Mechanical Separation/
Combustion Off-site]

- Air treatment system for exhaust air from process (LARA – thermal oxidizer)
- Wastewater needs treatment prior to reuse
- System produces Stabilat fuel; no air emissions on site for power generation
- Approx. 71% diversion; potential use of residue for ADC to increase diversion
- Organic material is converted to solid fuel for use offsite (cement kilns, etc.); only inert material is landfilled or

reused

- Many reference plants in Europe

Yes

4-35

4.8 Criterion 8 – Demonstration of Technology

A project undertaken by the City and County of Santa Barbara is intended to be a commercial project capable of processing 100,000 tpy to 220,000 tpy of MSW for a longterm

period (i.e., 20 years or more). The project is not intended to be a pilot project to further develop a particular technology or demonstrate its capabilities. To ensure any

considered technology is sufficiently demonstrated to meet the objectives of the City and

County, the following criterion was established:

Criterion 8: Any considered CT must have been demonstrated at a minimum of one facility of similar size or with a minimum unit size of 50 tons per day (tpd), and shall have been in operation for at least six months (as of February 29, 2008) processing MSW or similar feedstock. Addendum 1 to the RFI clarified that demonstration facilities that have operated intermittently, but processed at least 1,000 tons of MSW or similar feedstock over a one-year period, will be considered to meet the operating requirement of this criterion.

Respondents were requested to provide a listing of the facilities that are currently or have

previously been in operation, indicating pertinent information about each facility and

identifying the facility or facilities that provide the best demonstration of the technology for

processing MSW. Table 4-9 provides a summary of the information provided by each

respondent regarding its reference facility, along with other pertinent information related to

demonstration of the technology.

Based on information available, nine respondents meet Criterion 8. As summarized below,

two respondents do not meet the criterion:

- **Primenergy – Thermal Gasification.** Primenergy has eight commercial installations of its gasification technology with capacities ranging from 30 tpd to 550 tpd. However, none of these installations processes MSW or waste sufficiently

similar to MSW. Primenergy has a 30 tpd demonstration facility in Tulsa, Oklahoma,

that has processed an unspecified amount of refuse derived fuel (RDF).

However,

this installation is below the established threshold of 50-tpd for demonstration of the

technology with MSW. Therefore, Primenergy does not meet Criterion 8.

• **World Waste Technologies – Thermal Gasification.** World Waste has proposed a gasification technology that is in operation at a 5 tpd pilot installation in Sherbrooke, Ontario. A 40-tpd facility is under construction and scheduled to be operational in the third quarter of 2008. Neither the existing pilot plant nor the facility under construction meet the established threshold of 50-tpd for demonstration of the technology with MSW. Therefore, World Waste does not meet Criterion 8.

4-36
Table 4-9. Criterion 8 – Demonstration of Technology

Criterion 8: *Any considered CT must have been demonstrated at a minimum of one facility of*

similar unit size or with a minimum unit size of 50 tons per day (tpd), and shall have been in

operation for at least six months (as of February 29, 2008) processing MSW or similar feedstock.

[Clarified by Addendum 1 to the RFI to state that demonstration facilities that have operated

intermittently, but processed at least 1,000 tons of MSW or similar feedstock over a one-year

period, will be considered to meet the operating requirement of this criterion.]

Project Developer and/or

Technology Supplier

(Listed Alphabetically by
Type of Technology)

**Demonstration of
Conversion Technology**

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated

- Arrow Ecology and
Engineering

[Anaerobic Digestion]

Reference Facility

Location: Tel Aviv, Israel

Status: Commercial-scale Demonstration Facility

Capacity: 50,000 tpy (1 line at 150 tpd)

Type of Waste: MSW

Operating Period: 2003 to Present

Other Information

• 100,000 tpy (300 tpd) commercial facility under construction in Sydney, Australia (scheduled for commissioning in July 2008 with full operation in late 2008)

• Development testing from 1999-2002 (Hadera, Israel)

Yes

Ecocorp

[Anaerobic Digestion]

Reference Facility

Location: Barcelona, Spain

Status: Commercial Facility

Capacity: 330,000 tpy (approximately 900 tpd)

Type of Waste: MSW

Operating Period: 2001 to Present

Other Information

- 2 other commercial facilities (Portugal, Italy) in operation processing MSW
- Numerous other commercial facilities processing a variety of waste including biowaste, agricultural waste, commercial and industrial waste; oldest (1986) is in Berstedt, Germany (156,000 tpy manure)
- Commercial facilities in Lille, France and Uppsala, Sweden, upgrade biogas into pipeline quality natural gas as proposed for Santa Barbara

Yes

4-37

Project Developer and/or**Technology Supplier Demonstration of Criterion**

(Listed Alphabetically by

Type of Technology)

Conversion Technology Met?**Organic Waste Systems**

[Anaerobic Digestion]

Reference Facility

Location: Vitoria, Spain

Status: Commercial Facility

Capacity: 120,000 tpy (approximately 330 tpd)

Type of Waste: Mixed waste

Operating Period: December 2006 to Present

Other Information

- Second suitable reference plant in Hille, Germany, with capacity of 100,000 tpy (residual waste and sludge); commercially operational since January 2005
- Numerous other commercial installations processing a variety of waste; oldest (1992) is in Brecht, Belgium (20,000 tpy biowaste/waste paper)

Yes

Thermal Processing**AdaptiveNRG**

[Thermal – Plasma Gasification]

Reference Facility

Location: Monterey, Mexico

Status: Demonstration (Pilot) Project

Capacity: 36,500 tpy at 100% availability (100 tpd)

Type of Waste: Municipal and other

Operating Period: 2005 to Present

Other Information

- Demonstration unit is portable and has reportedly been transported for use to several landfills in Mexico; operates on a daily basis
- Previous installations at Shell Oil Corporation for

refinery waste (1991, 1994 – operating 10 years before replacement)

Yes

International Environmental Solutions

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

Reference Facility

Location: Romoland, California

Status: Demonstration (Pilot) Project

Capacity: 18,250 tpy at 100% availability (50 tpd)

Type of Waste: Various, including MSW, MRF residuals

Operating Period: 2004 to Present

Other Information

- The facility has been operated for testing purposes (including collection of operating data and air emissions), not on a continuous basis. However, fulltime operation is expected to start around the end of the first quarter of 2008.
- The types of and quantities of waste processed in the demonstration unit has varied; in excess of 6,000 tons of post-MRF MSW has been processed.

Yes

4-38

Project Developer and/or

Technology Supplier Demonstration of Criterion

(Listed Alphabetically by

Type of Technology)

Conversion Technology Met?

Interstate Waste

Technologies

[Thermal – Gasification]

Reference Facilities

Location: Chiba, Japan

Status: Commercial Facility

Capacity: 330 tpd (approximately 103,000 tpy)

Type of Waste: MSW and Industrial Waste

Operating Period: 1999 to Present

Location: Nagasaki, Japan

Status: Commercial Facility

Capacity: 330 tpd (approximately 103,000 tpy)

Type of Waste: MSW

Operating Period: 2005 to Present

Location: Kurashiki, Japan

Status: Commercial Facility

Capacity: 612 tpd (approximately 190,000 tpy)

Type of Waste: MSW, Industrial Waste, Incinerator Ash

Operating Period: 2005 to Present

Other Information

- The reference facilities were selected by IWT for the

following reasons: the Chiba facility demonstrates a long operating history (9 years); the Nagasaki facility demonstrates generation of electricity from synthesis gas using dedicated electricity generation equipment; the Kurashiki facility demonstrates design, construction and operation at a capacity most comparable to that proposed for Santa Barbara

Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

Reference Facility

Location: Ottawa, Canada

Status: Commercial-Scale Demonstration (Pilot) Project

Capacity: 110 tpd (approximately 34,300 tpy)

Type of Waste: MSW with Consistent Carbon Feed (CCF)

Operating Period: July 2007 to Present

Other Information

- The facility is designed to operate 24 hours per day, 340 days per year. It processes 83 tons per day of MSW (post curb-side recycling) and 11 tpd of CCF. Surrogate MSW was initially processed for all process tests.

Yes

4-39

Project Developer and/or

Technology Supplier Demonstration of Criterion

(Listed Alphabetically by

Type of Technology)

Conversion Technology Met?

Primenergy LLC

[Thermal – Gasification]

Reference Facilities

Location: Stuttgart, Arkansas

Status: Commercial Facility (not available for site visits)

Capacity: 550 tpd (up to 206,000 tpy at 100% availability)

Type of Waste: Rice Hulls

Operating Period: December 1996 to Present

Location: Dalton, Georgia

Status: Commercial Facility

Capacity: 80 tpd (20,000 tpy operating 5 days per week, 50 weeks per year)

Type of Waste: Waste Carpet

Operating Period: August 2005 to Present

Other Information

- Primenergy has eight installations with capacities ranging from 30 tpd to 550 tpd. All but one installation (Stuttgart, Arkansas) consists of one unit. None of the installations process MSW or waste sufficiently similar to MSW.
- Primenergy has a 30-tpd demonstration gasification and energy production facility in Tulsa, Oklahoma, which has reportedly conducted several demonstration tests with an unspecified quantity of RDF. This installation is

below the established, 50-tpd threshold for demonstration of the technology with MSW.

No

Tajiguas Partners

- Waste to Energy, LLC
- Entech Solutions
- Burbank Recycling
- Bedford Enterprises

[Thermal – Gasification]

Reference Facility

Location: Genting, Malaysia

Status: Commercial Facility

Capacity: 67 tpd

Type of Waste: MSW

Operating Period: 1998 to Present

Other Information

- Entech has supplied approximately 169 gasifier units over the past 22 years
- Project team members BRI/BEI have suitable demonstration of front-end MRF technology

Yes

4-40

Project Developer and/or

Technology Supplier Demonstration of Criterion

(Listed Alphabetically by

Type of Technology)

Conversion Technology Met?

World Waste Technologies

[Thermal – Gasification]

Reference Facility

Location: Sherbrooke, Ontario

Status: Pilot Facility

Capacity: 5 tpd (approx. 1,800 tpy at 100% availability)

Type of Waste: Unspecified

Operating Period: 2003 to Present

Other Information

- 40-tpd gasification facility under construction and schedule to be operational in 3rd quarter 2008.
- The pilot plant and new installation are below the 50-tpd threshold established for demonstration of the technology.

No

Other Technology

Herhof California

[Other – Biological

Drying/Mechanical

Separation/Combustion Off-site]

Reference Facility

Location: Osnabruck, Germany

Status: Commercial Facility

Capacity: 350 tpd (approximately 90,000 tpy)

Type of Waste: MSW

Operating Period: February 2006 to Present

Other Information

- The reference facility is currently operated by Herhof under a 17-year contract with the City and County
- Herhof has identified numerous other relevant installations that demonstrate the proposed technology

Yes

4-41

4.9 Criterion 9 – Project Team Experience

Development of a successful project requires a project developer to lead the process along with a team with the requisite experience and capabilities to deliver the services requested.

Typically, the teams assembled for MSW projects would include, in addition to the lead project developer, the following key participants: an engineering, procurement and construction (EPC) contractor, which would be responsible for designing the facility, procuring equipment, and constructing and participating in start-up of the facility; a facility operator, which would operate and maintain the facility according to contract-set requirements; a guarantor, which would provide the ultimate guarantee on the costs and performance of the project; and an investment banker, which would be responsible for developing the financing plan for the project and securing the financing. To meet this objective, the following criterion was established:

Criterion 9: *Any considered CT must have a project team that has experience designing, building, and operating a solid waste management facility, either individually or as a team.*

Respondents were requested to identify principal project participants and to provide information specifically related to the financial and managerial capabilities and experience of itself, as respondent, and/or its identified project team to undertake full municipal solid waste project development - - design, financing, construction, and operations. In addition to general and individual capabilities and experience, the experience of identified companies in working as teams on other projects can be an important factor in considering qualifications. While several of the respondents were able to identify specific project teams, others did not and may have had difficulty in doing so given the short response period associated with the

RFI. Where specific team members were not identified, the experience of the respondents' key staff members was provided. This was instructive in indicating whether the developer, itself, has the requisite managerial experience, which in turn would suggest that, for a formal procurement, it would understand the various elements of project development and be able to assemble an appropriately qualified and experienced team of companies and partners. With the exception of OWS, at a minimum, the information provided by most respondents does indicate this understanding. In a formal procurement, there would be no question regarding the requirement to identify and discuss in detail team member qualifications (and commitments) in order for a developer to be considered qualified. In reviewing qualifications, in addition to the information provided in response to the RFI, it is also appropriate to give due consideration to the findings resulting from other, recent project development and procurement efforts. For example, the recent qualification of a respondent team by another public agency for a comparable project can reasonably be considered in making the decision of whether the respondent meets (or could reasonably be expected to meet) the criterion regarding project team experience. Given that perspective, and based upon the information provided and summarized in Table 4-10, all of the respondents with the exception of OWS are determined to meet

4-42

Criterion 9. In addition to the information summarized in Table 4-10, the following observations can be made:

1. CART/Arrow, IES, IWT and Tajiguas/Entech all provided sufficient individual and team information to demonstrate they meet Criterion 9. Also, the key member of each team has been recently (2007) deemed qualified by Los Angeles County to receive a formal Request for Offers for the development of a comparable project.
2. The information provided by Plasco and Herhof indicates that each firm has significant relevant individual and team experience in the development of municipal solid waste projects, including appropriate corporate depth and resources. Under a

formal procurement, Herhof would need to demonstrate adequate technology and resources transfer to the U.S., including design, construction and operations capabilities.

3. AdaptiveNRG, Ecocorp and Primenergy appear to have appropriate technical capabilities, but their ability to assemble effective project development teams is not

certain based on the information provided. However, given their reported experience in developing and operating projects, it can reasonably be assumed that

they can assemble appropriately qualified teams.

4. World Waste identified key individuals with appropriate capabilities, experience and

qualifications in the development of municipal solid waste projects. Further, the company identified highly qualified potential team members. Subject to submittal of

supplemental information by World Waste to clarify its project approach and proposed technology and demonstrate compliance with other evaluation criteria, it is

likely that in response to an RFP World Waste would be able to assemble an effective project team.

5. OWS does not meet Criterion 9. It has no experience in the U.S., and is currently

working without a licensee for its technology in this country. It has not identified any

potential project team members, and appears to be positioning itself more for a design/build effort than for a full-service design/build/operate.

4-43

Table 4-10. Criterion 9 – Project Team Experience

Criterion 9: *Any considered CT must have a project team that has experience designing, building*

and operating a solid waste management facility, either individually or as a team.

Project Developer and/or

Technology Supplier

(Listed Alphabetically

by Type of Technology)

Information Provided by Project Developer and/or

Technology Supplier Regarding Project Team Experience

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated

- Arrow Ecology and

Engineering

[Anaerobic Digestion]

• Project team members were identified as follows, with a summary of cited experience:

- **Lead Developer/Project Manager/Owner and**

Operator – CART: comprised of CR&R, a waste management company serving 50 CA communities and developer of one of the first MRFs in CA in 1999, and Arrow Ecology, the technology supplier, founded in 1999

- **Technology Supplier** – Arrow Ecology (anaerobic digestion system) and Siemens Corporation (energy equipment). Arrow has an existing facility in operation (Tel Aviv, Israel) and a comparable facility under construction (Sydney, Australia). Siemens is an international electronics and engineering firm with \$96 billion in annual sales.

- **Investment Banker** – The Investec Group (Australia), an investment bank with holdings in excess of \$50 million

- **EPC₍₂₎** – Shook Building Systems, Mira Loma, CA, in collaboration with J.R. Miller and Associates, Brea, CA, as the project architect. Each is individually or collaboratively responsible for 50 MSW facilities in CA, including CR&R's facilities.

- **Environmental Permitting** – CH2MHill, Los Angeles, CA, an international engineering firm with experience across a wide range of environmental, infrastructure and waste management projects, as well as industrial projects.

- The submittal states that CR&R and Arrow, the principal team members, have been associated for three years, including the joint submission in 2007 to the Los Angeles County RFI and a pending (2008) formal offer to Los Angeles County.

- Detailed management resource information was not presented. However, the project team has been identified and is composed of appropriately experienced companies.

Yes⁽¹⁾

4-44

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

Ecocorp

[Anaerobic Digestion]

- Project team members were identified as follows:

- **Project Developer** – Ecocorp, a privately held U.S. company. Ecocorp stated it is developing three “large” biogas facilities in the U.S., and indicated it is in discussions with a municipality in Southern California, but did not provide any details regarding this experience.

- **Technology Supplier** – European anaerobic digestion technology providers and partners consisting of Strabag/Linde in Germany and Sweco in Sweden.

- **U.S.-based Equipment Suppliers** – General Electric (combined heat and power equipment); Flottweg (wastewater processing); Quest Air (biogas upgrading equipment); Siemens (controls, gas storage); Wittemann

(carbon dioxide liquefactor and storage).

- Other possible U.S.-based team members (EPC₍₂₎ contractor, permitting consultant, operator, etc.) not identified
- Management resources, including experience of team members, not presented
- Management capabilities and qualifications, particularly of Ecocorp itself and its European partners, could not be evaluated with the information provided. Ecocorp's direct, U.S. project experience is unclear.

Yes⁽¹⁾

Organic Waste Systems

[Anaerobic Digestion]

- OWS, a Belgium company, cited 20 years of multi-plant experience with the proposed technology. It does not have any experience in the U.S. OWS cited license arrangements in other countries, but stated that it currently works in the U.S. without a licensee.
- Resumes of key individuals were provided, and indicate appropriate capabilities, experience and qualification. However, information on management resources was not provided. OWS stated it would provide such information "once the project enters the next stage."
- Potential team members (e.g., EPC₍₂₎ contractor, environmental consultant, investment banker) were not identified.
- It appears possible that OWS would position itself as a design-build (DB) contractor only, with project team members arranged by others (i.e., another project developer).

No

4-45

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

Thermal Processing

AdaptiveNRG

[Thermal - Plasma Gasification]

- Resumes of key individuals for AdaptiveNRG were provided, and indicate appropriate capabilities, experience and qualifications
- Possible team members were not identified, however, it was stated that the company has standing banking relationships with Bank of America, Morgan Stanley, ABN and Royal Bank of Scotland. The company indicated plant operations capabilities, but without detail or discussion of experience.
- Key individuals have appropriate qualifications and identified investment bankers are qualified and experienced. However, management capabilities and qualifications of a potential team, including operating capabilities and qualifications, cannot be evaluated with the information provided

Yes⁽¹⁾

4-46

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically
by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

International Environmental

Solutions

- IES

- One Planet Energy

- Rainbow Disposal

- Brownco

[Thermal – Pyrolysis]

• IES provided summary information on what it identified to be key team members, but specific project roles were not discussed in detail.

- **IES** – Information was not provided on IES, itself, the developer of the technology. However, information submitted in 2007 to Los Angeles County was based on a joint venture with Northern Power Systems. It is unclear whether Northern Power would be involved in this project.

- **Rainbow Disposal Company** – Rainbow has extensive experience in transfer station and MRF ownership and operation (Huntington Beach, CA), as well as in MSW collection. Regarding joint experience, IES and Rainbow are collaborating on development of a conversion technology project at the Huntington Beach facility.

- **One Planet Energy** – This is a recently-formed development company, and appears to be the team member that would structure and arrange the financing. John Wood, one of the firm's founders, is cited as among the top ten financial advisors in the alternative energy financing field, worldwide, in 2006. Piper Jaffray, an investment banker that has indicated financial support for IES, has reported experience in working with the principals of One Planet Energy.

- **Brownco Construction Company** – Founded in 1950, the company is cited to have experience in a variety of projects: commercial, industrial, public works, wind energy and hydrogen fueling stations. Brownco is identified as the EPC⁽²⁾ contractor.

• IES's management qualifications are not evident from the submission, although, the IES team was deemed qualified in 2007 to receive a Request for Offers by Los Angeles County. One Plant Energy is a new company with little information, but the participation of Piper Jaffray is a positive factor. Rainbow and Brownco appear to be appropriately qualified.

Yes⁽¹⁾

4-47

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically
by Type of Technology)

**Technology Supplier Regarding Project Team Experience Met?
Interstate Waste**

Technologies

[Thermal – Gasification]

• Project team members were identified as follows:

- **Project Developer** – The project developer is IWT and Interstate Business Corporation (IBC – its development partner). IWT was founded in 1990 to develop and operate waste-to-energy facilities, including private ownership and financing. It is owned by approximately 1,000 shareholders. IBC (a related company, but not a parent company to IWT) would be the guarantor. IBC is a housing and real estate development and ownership company, and has reportedly served as the developer and guarantor on over 100 development projects, including real estate, infrastructure and waste processing projects over the last 50 years, with a total value of \$2.5 billion.

- **Technology Supplier** – Thermostelect SA

- **Design Engineer** – Burns & Roe (a 75-year old international power and industrial engineering firm with 1,900 employees, ranked #58 of the top 500 design firms)

- **Operator** – Thermostelect/JFE (however, IWT stated it is currently negotiating with two major U.S. facility operators and would select an offer within 45 days of RFI submission)

- **Financial Advisor** – Morgan Stanley

- **EPC₍₂₎** – SNC Lavalin (Canadian-based construction company with annual revenues of \$3.5 billion)

- **Environmental Permitting** – RTP

• The submittal states that IWT, IBC and Morgan Stanley are currently developing the financing for a \$440 million facility in Puerto Rico.

• The members of the IWT project team are appropriately qualified. Thermostelect, SNC Lavalin and Burns & Roe are well established companies in the MSW and related fields. Any evaluation of operating capabilities will be pending until IWT selects its operator.

Yes⁽¹⁾

4-48

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically
by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

Plasco Energy Group

[Thermal – Plasma Gasification]

• Plasco provided summary information on the following key team members:

- **Project Developer/Owner/Operator/Technology**

Provider – Plasco Energy Group, the developer of the technology, is a privately held Canadian company. Plasco would be the contracting party and the principal designer. Its first commercial facility is the Trail Road facility in Ottawa, which has been operating since July 2007.

- **Engineering** – Hatch, Ltd would assist Plasco in design functions. Hatch employs 8,000 people worldwide, with five offices in California. One of its recent major projects included design and construction management services for the tunnel segment of the \$4.2 billion Silicon Valley Rapid Transit project.

- **Construction** – PLC Construction Services, Inc would be construction contractor, a role they served for Plasco's Trail Road facility in Ottawa. PLC is reported to be the largest general contractor in Canada, with annual revenues approaching \$5 billion (Canadian) and a backlog of \$6 billion (Canadian). It has had a presence in the U.S. market since 1975, including California. Its projects include commercial buildings, infrastructure, and power and cogeneration plants.

- **Environmental Consultant** – To be named

- Resumes of key individuals were provided, and indicate appropriate capabilities, experience and qualifications.
- Detailed management resource information was not provided. However, the identified principal team members (PLC, Hatch) are well established companies in related fields.

Yes⁽¹⁾

4-49

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

Primenergy LLC

[Thermal – Gasification]

- Team management resources and personnel were not discussed in any depth, and team structure and roles were not clearly identified. The following, limited information was provided regarding the project team:

- **EPC⁽²⁾** – Primenergy

- **Technology Provider** – Heater Specialists LLC, identified as a “sister” company and a manufacturer and fabricator of refinery and chemical process equipment, would supply the gasification and combustion system. Three unnamed MRF technologies are reportedly being evaluated for pre-processing.

- **Environmental Permitting Consultant** – Bentham Companies, a 100-year old engineering, design, environmental company which also provides design/build services. It is active in the industrial, energy, alternative energy and water/wastewater fields. Bentham was

recently acquired by Science Applications International Corp, a \$10 billion per year research and engineering company.

- Two unnamed, multi-national firms (with project financing experience) were cited as potential participants, without details or role definition. Prospective investment bankers were not identified.
- The prospective team has not been sufficiently defined, and little to no information has been provided on Primenergy and key prospective team members. Although information was not provided, Primenergy's ability to develop its facility in GA indicates its ability to assemble a team. Primenergy stated it would provide information if it is included on the short-list.

Yes⁽¹⁾

4-50

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically
by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

Tajiguas Partners

- Waste to Energy, LLC
- Entech Solutions
- Burbank Recycling
- Bedford Enterprises

[Thermal – Gasification]

• Team management resources were not discussed in detail, but the following was provided regarding the project team:

- **Project Developer** – Waste to Energy, LLC, which is the developer of a USDA agricultural-feedstock pilot biorefinery plant (2007), would serve as lead developer.

- **MRF Technology Provider** – Burbank Recycling and Bedford Enterprises would provide MRF equipment. Burbank has 15 years experience in developing MRFs and transfer stations, and currently processes over 240,000 tpy of materials from residential curbside recycling programs. The company brokers over 10,000 tons per month of recycled materials. Bedford Enterprises has 35 years of experience in processing metals and C&D materials, and operates major roll-off operations on the Central Coast.

- **Gasification Technology Provider** – Entech Solutions, which is one of the four companies selected by Los Angeles County as qualified to receive the County's Request for Offers for a conversion technology project, would provide the gasification technology.

• Tajiguas Partners represents that key team members have existing working relationships. Waste to Energy, Burbank and Bedford have participated in business together for a "number of years." Waste to Energy (through its research and development company, BioEnergy Development LLC) and Entech have been in discussions since 2007 regarding a joint venture on gasification-to-liquids technologies at

BioEnergy's joint USDA research facility in Berkeley.

- While management resources have not been discussed in detail, and integration of the MRF with the gasification technology is not clearly defined, the key team members identified have requisite project development experience, including direct experience with MSW practices in California.

Yes⁽¹⁾

4-51

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

World Waste Technologies

[Thermal – Gasification]

- Resumes of key individuals were provided and indicate appropriate capabilities, experience and qualifications.
- World Waste Technologies identified itself as a project developer with access to a number of technologies (through partnerships and joint venture agreements), citing as an example its current negotiations with a California utility for 20-year power purchase agreements. It also cited a \$30 million project it started-up in Anaheim in 2006.
- Potential team members identified include HDR (a 90-year old major engineering firm) and RRT Design & Construction (a 20-year old turnkey technology and facility developer for both MSW and industrial waste plants).
- Although the limited information provided potentially indicates appropriate qualifications, without clear definition of the project team and submittal of supplemental information, project team experience cannot be evaluated.

Yes⁽¹⁾

4-52

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Project Team Experience Met?

Other Technology

Herhof California

[Other – Biological Drying/

Mechanical Separation/

Combustion Off-site]

- The Herhof team is composed substantially of European firms. The European companies have extensive experience in public/private partnerships, including equity positions in several infrastructure concessions and projects.
- Herhof is owned by Helector SA, which is turn is owned by Elliniki Technodomiki, TEB A.E., a publicly-owned Greek construction company that would provide financial guarantees. The information provided indicates that Herhof and Helector have significant experience both with the specific technology offered as well as, more generally, in the

development of MSW and other infrastructure projects. Participation in those projects has included all principal project development roles: design; technology provisions; construction; operations; product marketing. Herhof has stated that it is developing projects in Canada and Hawaii. Relationships with PLC, a Canadian-based construction company with experience in California, were cited.

- U.S. team members include Finarfin LLC and Dongell Lawrence Finney LLP (California-based legal and regulatory advisory firms); Kamehameha Environmental LLC (a Nevada-based company organized to Herhof technologybased projects in Hawaii, California and other U.S. areas), and Gary Stanley, a California-based economic development consultant.

- Based on the information provided, the Herhof team appears to present appropriate experience and capabilities for project development. The European firms identify appropriate experience in the development of MSW projects, of projects utilizing the Herhof technology, and generally, of developing and financing public/private partnerships for infrastructure. Its U.S. team members appear to have experience in regulatory and other matters specific to project development in California. While it is evident that the Herhof team has the appropriate experience to develop a project, it is not clear from the information provided how the European experience and capabilities would be applied to a project in California (i.e., the team may require supplemental, U.S.-based experience for aspects of design and construction).

Yes⁽¹⁾

1. Criterion substantially met, with the expectation that further details would be provided and reviewed as part of a formal Request for Proposal (RFP) process.
2. EPC is the engineering, procurement and construction contractor.

4-53

4.10 Criterion 10 – Financial Resources

The City and County have not yet determined the ownership structure of any potential,

future conversion technology project, but currently intend to only consider technologies

offered by project developers that can offer private ownership and project financing, if

required, along with adequate financial security. As a result, the following criterion was

established:

Criterion 10: *The project developer must have bonding ability equal to the estimated cost of facility design and construction, and, during operation, equal to the estimated annual operating cost; must not be in bankruptcy; and must provide a financing plan that reasonably demonstrates that it can offer private project financing, if required.*

Information provided by respondents is summarized in Table 4-11 and further addressed

below.

Construction and performance bonds will be important risk mitigation measures for any project undertaken. The willingness of a respondent to provide such bonds would be a positive indicator of its commitment to a project. Although a project may be privately owned and operated, and as such not entail direct financial risk to the City and County, the City and County will rely on a project as a key element in the overall integrated long-term waste management program. As such, they will need protection against a disruption in the provision of the services that would be provided by a project. Construction and performance bonds would provide such protection by, for example, providing a financial source to pay for project completion, initially or, over time, for other disposal in the event of a project disruption or shutdown. Also, surety companies (the providers of bonds) will not provide bonds unless they are comfortable with both the developer and the technology.

Thus, the willingness of a surety to provide bonds would be evidence that the surety had performed both technical and financial due diligence; indirectly, these can be a confidencebuilding back-stop to the due diligence that would be performed by the City and County. Most of the respondents did not address bonding experience or capability, and therefore company-specific conclusions cannot be reached in all cases at this time. This lack of information would be self-correcting during a procurement, when the ability to provide construction and performance bonds would be an absolute requirement in order for any respondent to be considered qualified.

Bankruptcy information was requested to provide a simple but useful snapshot of each respondent as a “going concern” that it was not experiencing severe financial distress.

Most, but not all, of the respondents responded to this specific request. Those that did, responded affirmatively – that they and/or their project team members are not in bankruptcy. For those that did not respond (OWS and AdaptiveNRG), a company-specific

conclusion cannot be reached at this time. However, as with the bond information request, this lack of information would be self-correcting during a procurement, when the absence of bankruptcy in the immediate past (for example, the previous three-to-five years) would be an absolute requirement in order for any respondent to be considered qualified.

4-54

Information on preliminary financing plans was requested primarily to determine whether individual respondents had an understanding of and experience in the structuring of financings for municipal solid waste projects, and to underscore the position that financing would be the responsibility of the developer. Given the lack of project specificity at this point in the process, detailed financing plans and commitments would be premature. As indicated in Table 4-11, below, five of the respondents discussed financing in sufficient depth to indicate their understanding of project financing requirements and structures, as well as their relationships with financial institutions that would structure or otherwise participate in a financing. The financing approaches and assumptions offered were reasonable and reflect customary project financing conditions, including the types of waste delivery and tipping fee payment commitments that would be required of the City and County. Four respondents (CART/Arrow, Entech, IWT and Plasco) indicated comparable project financing experience with at least one project. Ecocorp discussed a relatively unique private/public ownership structure that might be of interest. Of those who did not provide financing discussions, two (AdaptiveNRG and IES) indicated existing banking relationships that would be accessed for project financing purposes. Primenergy stated that a financing plan would be provided if it became short-listed; although it did not discuss financing in any detail, its discussion of the contractual basis of a project suggests an understanding of fundamental project financing needs. World Waste

indicated that it would finance the project through funding provided directly and/or sourced by its utility partner.

Only one responded, OWS, is determined to not meet Criterion 10:

• **Organic Waste Systems – Anaerobic Digestion.** OWS did not address bonding or bankruptcy, and did not provide a preliminary financing plan. OWS appears to be positioning itself as, in effect, a design-build (DB) contractor which would design the facility, specify and procure equipment, and construct the facility. OWS seems to be assuming public ownership, financing and operation. For these reasons, OWS is determined to not meet Criterion 10.

4-55

Table 4-11. Criterion 10 – Financial Resources

Criterion 10: *The project developer must have bonding ability equal to the estimated cost of facility design and construction, and, during operation, equal to the estimated annual operating cost; must not be in bankruptcy; and must provide a financing plan that reasonably demonstrates that it can offer private project financing, if required.*

Project Developer and/or Technology Supplier

(Listed Alphabetically by Type of Technology)

Information Provided by Project Developer and/or Technology Supplier Regarding Financial Resources

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated
- Arrow Ecology and Engineering

[Anaerobic Digestion]

- CR&R's experience in obtaining bonds for its own facilities was cited, without details
- CART stated that none of the participants proposed are in bankruptcy
- Financing was discussed summarily. CART stated that "Investec can provide project financing subject to agreed upon conditions such as the City and County providing a waste supply guarantee for 20 years and an agreed to service fee for 20 years with appropriate inflation safeguards..."
- CART stated that financing would be debt-based, with subordinate debt provided by Investec (as a substitute for equity), and with senior debt provided by Investec or from U.S. sources

- Detailed financial and management resources information was not provided, but was offered on a confidential basis for the principal project team members (CR&R and Arrow)
- CART appears to understand basic project financing needs, although, a preliminary financing plan was not submitted. Arrow's Sydney project was financed on a project-financing basis. Also, in 2007, CART principal project team members (CR&R and Arrow) were deemed qualified to receive a Request for Offers by Los Angeles County.

Yes⁽¹⁾

4-56

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Financial Resources Met?

Ecocorp

[Anaerobic Digestion]

- Bonding was not specifically addressed
- Ecocorp stated that none of the participants proposed are in Bankruptcy
- Ecocorp identified financing requirements, including longterm contracts with the City and County for MSW supply and for product sales. It suggested a financing approach with Ecocorp financing between 80% and 90% of the project under a design-build-own-operate (DBOO) structure, with the City and County providing the remaining 10% to 20% as equity, with the City and County as partial owners of the facility. Sources for Ecocorp's share of financing were not discussed. It also stated that "100%" financing would be possible under a public ownership structure, with Ecocorp providing design-build-operate (DBO) services.
- Ecocorp's discussion (summarized above) indicates an understanding of project financing, although financing experience, resources and capabilities could not be evaluated with the information provided

Yes⁽¹⁾

Organic Waste Systems

[Anaerobic Digestion]

- Bonding was not specifically addressed, however, OWS stated that it does provide plant performance guarantees on facilities it builds in Europe
- OWS did not address bankruptcy
- A preliminary financing plan was not provided.
- OWS appears to be positioning itself as, in effect, a designbuild (DB) contractor which would design the facility, specify and procure equipment, and construct the facility. OWS seems to be assuming public ownership, financing and operation.
- In its 2005 submission to New York City, OWS indicated revenues of nearly \$15 million and a net worth of nearly \$2.5 million and provided information on product marketability

No

Thermal Processing

AdaptiveNRG

[Thermal - Plasma Gasification]

- AdaptiveNRG's bonding capacity is \$250 million
- AdaptiveNRG did not address bankruptcy
- A preliminary financing plan was not provided, however, relationships with investment bankers who provide financing to the company were cited
- Based on the limited information provided, it is difficult to determine if AdaptiveNRG has an understanding of project financing for MSW projects, or to devine its project ownership/financing approach

Yes⁽¹⁾

4-57

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Financial Resources Met?

International Environmental

Solutions

- IES
- One Planet Energy
- Rainbow Disposal
- Brownco

[Thermal – Pyrolysis]

- Bonding was not specifically addressed
- IES stated that none of the team members are in bankruptcy
- IES provided 20-year cash flow and income proformas that projected financial performance, including tax liabilities and investment returns, over the assumed life of a project
- A preliminary financing plan was not provided. However, the response included a letter of “financing support” from Piper Jaffray, which included an identification of key financing requirements, such as an executed power purchase agreement, appropriate permitting, participation by an “appropriate” EPC (engineering, procurement and construction) contractor, adequate equity and/or performance guarantees.
- IES's financial qualifications are not evident from the submission, although, the IES team was deemed qualified in 2007 to receive a Request for Offers by Los Angeles County. The participation of Piper Jaffray, an experienced investment banker, on the team is a positive factor.

Yes⁽¹⁾

Interstate Waste

Technologies

[Thermal – Gasification]

- Bonding was not specifically addressed
- The response stated that neither IWT nor its development partner IBC are in bankruptcy
- A preliminary financing plan was provided. The plan provides for an equity investment of 11%, with the balance of

the financing via tax-exempt (through an allocation under the State's private activity bond cap) and taxable bonds (taxable bonds for the electricity generation portion of the facility).

IWT provided proformas which indicated two debt amortization terms, 25 years and 30 years. The potential use of bond insurance was discussed. The plan indicates the need for a disposal contract with the City and/or County and a long-term power purchase agreement, as principal security for a financing.

- The financing plan provided is appropriate for the project envisioned, and demonstrates an understanding of project financing. IWT's development partner, IBC, has a favorable financial history. In 2007, IWT was deemed qualified to receive a Request for Offers by Los Angeles County.

Yes⁽¹⁾

4-58

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Financial Resources Met?

Plasco Energy Group

[Thermal – Plasma Gasification]

- Bonding was not specifically addressed
- The response stated that Plasco Energy is not in bankruptcy
- Plasco has an internal Project Finance Group. It envisions a financing based substantially on several levels of debt (in lieu of a conventional debt/equity financing) covering both construction and long-term financing. The financing may include some form of Canadian government financial support, since this would represent export business to the U.S., as well as support from subcontractors/equipment suppliers. The response states that financing would require a 20-year disposal contract with the City and/or County and a 20-year power purchase contract. Plasco cited its ability to obtain a \$4 million non-recourse loan to fund its portion of the Trail Road (Ottawa) facility (City of Ottawa and Canadian federal funding was also used to finance the facility).
- The financing approach discussed indicates that Plasco understands MSW project financing requirements, and it appears to have the internal capability to structure financings (although, it does not appear aware of the ability in the U.S. to use tax-exempt financing, which would reduce the tipping fee to some extent). The company has demonstrated the ability to raise funds for technology development and commercialization, and has adequate working capital to support project development, as well as access to project funding.

Yes⁽¹⁾

Primenergy LLC

[Thermal – Gasification]

- Bonding was not specifically addressed
- The response stated that neither Primenergy nor any

potential team members are in bankruptcy

- A preliminary financing plan was not provided. The response stated that financial resource information and a financing plan would be provided if Primenergy was included on the short-list for an RFP. It was noted that any financing would entail a put-or-pay disposal contract with the City and/or County, with stipulated tipping fees, and a long-term site lease.
- Primenergy's discussion of long-term contracts indicates that it understands the fundamentals of MSW project financing. However, insufficient information was provided with the submittal to evaluate Primenergy's financial resources and qualifications.

Yes⁽¹⁾

4-59

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically
by Type of Technology)

Technology Supplier Regarding Financial Resources Met?

Tajiguas Partners

- Waste to Energy, LLC
- Entech Solutions
- Burbank Recycling
- Bedford Enterprises

[Thermal – Gasification]

- Bonding was not specifically addressed, however, Entech's 2007 submission to Los Angeles County included Aon as its surety
- Waste to Energy LLC certified that it, as lead developer, is not in bankruptcy
- A preliminary financing plan was not included. Tajiguas partners stated that it expected a long-term (25- to 30-year) contract to control the City/County wastestream at the landfill and a long-term commitment to use the identified site. It also indicated an interest in discussing City or County financing. The submittal referenced Entech's discussion of financing provided to Los Angeles County in 2007.
- In 2007, Entech was deemed qualified to receive a Request for Offers by Los Angeles County. The project financing discussion it provided for Los Angeles County indicates an understanding of MSW project financing requirements. Burbank Recycling and Bedford Enterprises demonstrate the apparent ability to finance their own facilities.

Yes⁽¹⁾

World Waste Technologies

[Thermal – Gasification]

- Bonding was not specifically addressed
- World Waste stated it is not in bankruptcy
- A preliminary financing plan was not provided. However, World Waste indicated that it would finance the project through funding provided directly and/or sourced by its utility partner. World Waste reported that its utility partner, which is

an investment grade credit, has a market capitalization in excess of \$22 billion and over \$1 billion in cash and shortterm investments on its balance sheet. Its partnership with the utility provides that the utility will fund 100% of the development costs of projects.

- World Waste, itself, has raised over \$55 million in equity capital. The company's senior financial advisor, when active as the CFO of Calpine Corp., raised in excess of \$40 billion in project financing for the development of power plants nationwide.

Yes⁽¹⁾

4-60

Project Developer and/or

Technology Supplier Information Provided by Project Developer and/or Criterion

(Listed Alphabetically

by Type of Technology)

Technology Supplier Regarding Financial Resources Met?

Other Technology

Herhof California

[Other – Biological Drying/

Mechanical Separation/

Combustion Off-site]

- Bonding was not specifically addressed
- Herhof stated that none of the team members are in bankruptcy
- A preliminary financing plan was provided, and included a description of its experience in financing several projects in Europe. It outlined aspects such as debt-to-equity ratios and sources of equity (its parent companies), stating that this material was developed based on preliminary discussions with bankers. It gave examples of several European projects it is involved in that were project-financed with combinations of corporate equity and bank debt (as could be expected in the U.S.).
- The European firms that are part of the Herhof team identify appropriate experience developing and financing public/private partnerships for infrastructure, although, it is not clear from the information provided how the European experience and capabilities would be applied to a project in California.

Yes⁽¹⁾

1. Criterion substantially met, with the expectation that further details would be provided and reviewed as part of a formal Request for Proposal (RFP) process.

4-61

4.11 Criterion 11 – Contracting Status in California

The following criterion was established for purpose of evaluating RFI responses:

Criterion 11: The project developer must not be debarred from contracting in California.

The purpose in requesting this information was to provide a threshold standard that would

assure the City and County that there would be no questions regarding the legal standing of any potential project developer to do business in California. As summarized in Table 4-12, all of the respondents provided a statement in the affirmative that they are not debarred from contracting in California. For purpose of this evaluation, all of the respondents are determined to meet Criterion 11.

4-62
Table 4-12. Criterion 11 – Debarment

Criterion 11: *The project developer must not be debarred from contracting in California.*

Project Developer and/or

Technology Supplier

(Listed Alphabetically
by Type of Technology)

**Statement Provided by Project Developer
and/or Technology Supplier Regarding
Debarment in California**

Criterion

Met?

Anaerobic Digestion

CA Renewable Technologies

- CR&R Incorporated

- Arrow Ecology and Engineering

CART is not debarred from contracting in California. Yes

Ecocorp

Neither Ecocorp nor any of its partner companies proposed to participate in this project are debarred from doing business in California.

Yes

Organic Waste Systems

OWS is not debarred from contracting in California. Yes

Thermal Processing

AdaptiveNRG

[Thermal - Plasma Gasification]

We are a fully-qualified “License A” general engineering contractor in the State of California.

Yes

International Environmental Solutions

- IES

- One Planet Energy

- Rainbow Disposal

- Brownco

[Thermal – Pyrolysis]

One Planet Energy, International Environmental Solutions, Brownco and Rainbow Disposal are not debarred from contracting in California.

Yes

Interstate Waste Technologies

[Thermal – Gasification]

Neither IWT nor any member of its project team has been debarred from contracting in the State of CA.

Yes

Plasco Energy Group

[Thermal – Plasma Gasification]

Plasco Energy is not debarred. Yes

Primenergy LLC

[Thermal – Gasification]

Neither Primenergy nor any of the potential team members are debarred from contracting in CA.

Yes

Tajiguas Partners

- Waste to Energy, LLC

- Entech Solutions

- Burbank Recycling

- Bedford Enterprises

[Thermal – Gasification]

Waste-to-Energy, LLC – as the lead “team member” for the Tajiguas project development – certifies that it is not debarred in California. Nor will Tajiguas Partners contract with any entity for the design/build phase of this project that is debarred in California.

Yes

World Waste Technologies

[Thermal – Gasification]

World Waste is not debarred from contracting in California.

Yes

Other Technology

Herhof California

[Other – Biological Drying/ Mechanical Separation/Combustion Off-site]

No one in this organization has been debarred from operating in the State of California.

Yes

4-63

5-1

5.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

Based on information submitted in response to the RFI issued by the City and County of

Santa Barbara, as well as ARI’s knowledge based on other recent public evaluations of

conversion technologies, eight of the eleven RFI respondents have been determined to

substantially meet the evaluation criteria and are recommended for further consideration by

the City and County of Santa Barbara. Table 5-1 identifies the eight respondents that are

recommended for a short-list to receive a Request for Proposals. The list includes two

anaerobic digestion technologies, five thermal processing technologies (including pyrolysis,

gasification and plasma gasification) and a technology that employs biological drying and mechanical separation with off-site combustion of a prepared fuel.

Three respondents (Organic Waste Systems, Primenergy and World Waste Technologies)

are not currently recommended for further consideration, as summarized below:

- **Organic Waste Systems – Anaerobic Digestion.** OWS provides an anaerobic digestion technology that is primarily focused on processing source-separated, organic waste. Based on its response to the RFI and previous evaluation of this technology by ARI for New York City, OWS does not meet all of the evaluation criteria. Specifically, the capability of OWS to develop a large-scale facility processing mixed MSW (including necessary pre-processing and generation of a marketable compost product) is uncertain (Criterion 1). Also, it appears unlikely that

OWS could develop a project of the required capacity within the available acreage,

likely needing twice that available for a 100,000 tpy project (Criterion 1). Although pre-processing could potentially be located at a different site than the digestion process, this would not be an ideal arrangement and would still require additional land. OWS did not provide an estimated tipping fee. Previous evaluation by ARI for

New York City indicates it could be on the order of \$142 per ton, which is significantly above the threshold of \$100 per ton established for this evaluation (Criterion 5). OWS has provided insufficient information regarding project team experience and financial resources to enable evaluation of its resources and capabilities (Criterion 9 and 10).

- **Primenergy – Thermal Gasification.** Primenergy has proposed unspecified MRF

technology followed by gasification. Based on its response to the RFI and other available information, Primenergy does not meet all of the evaluation criteria. Specifically, although there are eight commercial installations of Primenergy's gasification technology, none of these installations processes MSW or waste sufficiently similar to MSW. Because of this limited experience processing MSW, Primenergy's ability to design and operate a 220,000 tpy MSW facility is uncertain

(Criterion 1). In addition, Primenergy has specified that the project will require a total

of 12 acres – 6 acres each for the MRF and gasification facility, which is double the

acreage currently available for a project. Although the two components could be physically separate, this would not be an ideal arrangement and would still require

additional land (Criterion 1). Primenergy has a 30 tpd demonstration facility in Tulsa,

Oklahoma, that has processed an unspecified amount of refuse derived fuel (RDF).

However, this installation is below the established threshold of 50-tpd for demonstration of the technology with MSW (Criterion 8).

• **World Waste Technologies – Thermal Gasification.** World Waste Technologies

is a project developer with demonstrated MSW technical and financial experience and resources. World Waste suggested development of a facility utilizing a frontend

sorting/preprocessing system followed by a gasification technology. World Waste provided limited information regarding the specific technologies it would use.

It disclosed that the proposed gasification technology has been operational at a 5-

tpd pilot plant in Sherbrooke, Ontario, since 2003, and that a 40-tpd plant is currently

under construction and scheduled to be operational in the third quarter of 2008.

Neither the existing pilot plant nor the facility under construction demonstrate the capability and performance of the technology at the minimum specified unit capacity

of 50-tpd (Criterion 8).

Based on an evaluation of information submitted, other publicly available information, and

market interest demonstrated by response to the RFI, issuing a Request for Proposals

(RFP) for a conversion technology project is reasonable for consideration of alternatives to

landfilling MSW at the Tajiguas Landfill. The RFI process has established an interest from

technology suppliers and project developers for such a project. Eight companies have

been determined to meet the City and County's evaluation criteria and are recommended

on a short-list for further consideration (see Table 5-1). This number of companies should

enable a competitive procurement process.

Should the City and County decide to proceed with an RFP, it should include a formal

request for qualifications as well as technical and price proposals, and should be issued to

the companies included on the recommended short-list.

5-2

Table 5-1. Recommended Short-List

Recommended Short-List

(Unranked - Listed Alphabetically
by Type of Technology)

Anaerobic Digestion

CA Renewable Technologies - CR&R/Arrow

Ecocorp

Thermal Processing

AdaptiveNRG (Plasma Gasification)

International Environmental Solutions (Pyrolysis)

Interstate Waste Technologies (Gasification)

Plasco Energy Group (Plasma Gasification)

Tajiguas Partners - WTE/Entech (Gasification)

Other Technology

Herhof California (Biological Drying/Mechanical Separation/Off-Site Combustion
5-3

APPENDIX A

**SEPTEMBER 2003 SHORT-LIST OF
CONVERSION TECHNOLOGY COMPANIES**

(SANTA BARBARA COUNTY

MULTI-JURISDICTIONAL SOLID WASTE TASK GROUP)

APPENDIX A

**September 2003 Short-list of Conversion Technology Companies
(Santa Barbara County Multi-Jurisdictional Solid Waste Task Group)**

- Renewable Resources Alliance, LLC - Primenergy/CR&R (Thermal Gasification) ⁽¹⁾
- Arrow Ecology, Ltd (Anaerobic Digestion)
- Ecocorp (Anaerobic Digestion)
- Brightstar Environmental, LLC (Thermal Gasification) ⁽²⁾
- Waste Recovery Systems, Inc. (Anaerobic Digestion)
- Herhof Umwelttechnik (Biological Drying/Mechanical Processing)
- Genahol (Acid Hydrolysis)

1. Renewable Resources Alliance, LLC withdraw from consideration after being shortlisted

by the MJSWTG.

2. Brightstar Environmental is no longer in business.

APPENDIX B

REQUEST FOR INFORMATION (RFI)

AND

ADDENDUM NO. 1 TO RFI

1

Santa Barbara, California

Conversion Technology Project

Request for Information

February 6, 2008

Introduction

The City and County of Santa Barbara, California, are evaluating the feasibility of developing

a conversion technology (CT) project as an alternative to landfilling post-recycled municipal

solid waste (MSW) at the Tajiguas Landfill. The Tajiguas Landfill currently disposes approximately 220,000 tons per year (tpy) of MSW. If determined to be feasible and desirable for the City and County, a project will be implemented to divert MSW that is not currently recycled from landfill disposal, by converting the non-recycled material into beneficial products such as energy, fuels, or other marketable products (e.g., compost, aggregate, metals). Such a project would be implemented as a supplement to, not a replacement for, recycling efforts. The City and County have established specific goals for a CT project, which are presented in Attachment 1.

In 2002 and 2003, a Subgroup of the Santa Barbara County Multi-Jurisdictional Solid Waste Task Group (MJSWTG) identified and evaluated numerous conversion technologies for consideration at the Tajiguas Landfill. Based on that previous review and evaluation process, a short-list of seven (7) CT companies was identified that could provide a feasible alternative to landfilling MSW. The Subgroup recommended to the MJSWTG consideration of a CT facility as part of a long-term solid waste management plan.

A significant amount of time has passed since the MJSWTG completed the evaluation and short-listing of conversion technology companies. During that time, changes have occurred in the capabilities and experience of many of the CT companies. In addition, several large studies have been published by other public jurisdictions that have evaluated numerous CT companies, including studies by the City and County of Los Angeles and New York City. As a result, the City and County of Santa Barbara are conducting an updated feasibility evaluation. The evaluation will be based on information included in the published studies referenced above, as well as information provided in response to this Request for Information. The updated evaluation is intended to determine whether a CT project is feasible as an alternative to landfilling MSW at the Tajiguas Landfill. It is also intended to

determine which CT companies are best suited and capable of providing a CT project at the Tajiguas Landfill, and to short-list those companies for a potential future procurement.

Evaluation Process

The evaluation process will build on past work by the MJSWTG and recent, published studies by other public jurisdictions, along with a review of key supplemental information that may be provided by CT companies in response to this Request for Information (RFI).

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In order to complete the evaluation, eleven (11) primary evaluation criteria have been established (see Attachment 2). These criteria are minimum screening parameters. Each technology supplier considered in the evaluation must meet all of the criteria in order to be further considered for a future procurement. The criteria have been structured to assess the viability of a reasonably-sized, commercial project that meets the goals established by the City and County (Attachment 1). The intent is to apply the criteria to develop an un-ranked short-list of approximately ten (10) technology suppliers. In establishing the short-list, the City and County reserve the right to conduct a comparative, secondary application of the primary evaluation criteria. If completed, secondary application of the criteria would assess the degree to which technology suppliers exceed the minimum requirements and are thus comparatively advantageous or highly advantageous. The outcome of the evaluation process is intended to be an un-ranked short-list of companies determined to be best suited and capable of providing a successful CT project at the Tajiguas Landfill. The short-list and the evaluation process leading up to the short-list will not be used to actually make the selection of a preferred CT company. Selection would be based on detailed, comparative evaluation and ranking of formal proposals submitted in response to a future procurement. CT companies included on the short-list would be invited to submit proposals under any such procurement.

Request for Information (RFI)

CT companies responding to this RFI are requested to provide information that enables the City and County to review and evaluate the capabilities of the proposed technology and the experience and qualifications of the project team. At a minimum, information should be submitted to address each of the eleven criteria identified in Attachment 2 and to clearly demonstrate that such criteria are met by the respondent. Attachment 3 provides guidance regarding the information to be submitted for each criterion. For purpose of this RFI, responses should be based on a project concept whereby the City and County would enter into a long-term waste supply agreement with the project developer, and would provide a site for the facility. Financing may be public or private, but for purpose of this RFI, responses should assume that the project developer would design, build, own, operate and finance the project, with the potential for public purchase at the end of the financing period. The project developer would be responsible for marketing all products. The project developer would also be responsible for disposing of residue, but may assume, for purpose of this RFI, that non-hazardous residue can be disposed at the Tajiguas Landfill at a cost of \$56.00 per ton. Responses to this RFI should also be based on the following assumptions:

- **Project Size.** The project should be a commercial (i.e., not a demonstration) facility designed to process post-recycled MSW. The project must be capable of processing a minimum of 100,000 tpy of MSW during the first operating year of the project, and must be capable of increasing capacity up to 220,000 tpy within 10 years of the first operating year of the project.

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- **Project Location.** Responses should assume that the project would be located at the Tajiguas Landfill. The Tajiguas Landfill is a County-owned and operated facility, located in Goleta, California. The County has designated an area at the landfill consisting of approximately 6 contiguous acres that would be available for

development of a CT facility. Additional area may be available in other parts of the landfill property, if necessary, to supplement the 6 acres currently designated for a CT

facility. Responses should address the suitability of a 6-acre parcel for project development, and should clearly state the acreage required to develop a facility.

• **Site Characteristics.** The Tajiguas Landfill is a modern, Subtitle D, municipal solid

waste landfill. It includes a leachate collection and control system, and a methane gas

collection system. Methane collected at the landfill is combusted on-site to generate

electricity. There is an existing, 3-MW landfill gas generator at the site that has been

in operation for approximately seven years. In addition to the availability of electricity

on the site, a natural gas pipeline is located at the entrance to the landfill. There is no

water or sewer service at the site. The area designated for a CT project is located on

the landfill property, and is accessible by existing, on-site roadways (see Attachment

4). The area is level and cleared; it is on fill material, with a portion over waste material. It is located outside of the Coastal Zone. The area is currently about 560

feet long and averages 350 feet wide. It will be expanded by grading to result in a total

area of approximately 6+ acres for development of a conversion technology facility.

• **Waste Characterization.** A current waste characterization is not available from the

City and County of Santa Barbara for MSW disposed at the Tajiguas Landfill.

Responses to this RFI should assume that the waste composition is as defined in the

December 2004 Statewide Waste Characterization Study prepared by Cascadia Consulting Group for the California Integrated Waste Management Board. The Executive Summary of that study is provided as Attachment 5 to this RFI, and includes

the link to the full study on the Board's website. Table ES-3 of the Executive Summary, Composition of California's Overall Disposed Waste Stream by Material

Type, should be the basis of responses to this RFI.

RFI Process

Information submitted in response to this RFI will be reviewed and evaluated in consideration

of the goals and criteria provided in Attachments 1 and 2, to determine the feasibility of a CT project as an alternative to landfilling post-recycled MSW at the Tajiguas Landfill, and to establish a short-list of technology suppliers determined to be best suited and capable of providing a successful CT project at the Tajiguas Landfill. CT companies included on the short-list would be invited to submit proposals under a future procurement. The preliminary schedule for the RFI and evaluation process is as follows:
Issue Request for Information: February 6, 2008
Responses due: February 26, 2008
Preliminary Evaluation Complete: March 24, 2008

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The period of time for CT companies to prepare responses and the period of time for the City and County to review and evaluate responses are both short. The intent of this aggressive schedule is to allow the City and County to proceed quickly to a potential future procurement, should the City and County decide to do so. Recognizing that limited time will be available to review and evaluate responses, without substantial opportunity for clarification or addendum of information, CT companies are encouraged to submit clear and detailed information with their responses. Responses should be submitted electronically to the County of Santa Barbara and to their consultant, Alternative Resources, Inc., by 11:00 AM, Eastern Standard Time, on Tuesday, February 26, 2008, as follows:

County of Santa Barbara:

Mr. Carlyle Johnston
Senior Program Specialist
County of Santa Barbara Public Works Dept.
130 East Victoria Street, Suite 100
Santa Barbara, CA 93101

CJohnst@cosbpw.net

Alternative Resources, Inc.:

Ms. Susan Higgins
Senior Project Engineer
Alternative Resources, Inc.
1732 Main Street
Concord, MA 01742

SHiggins@alt-res.com

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Attachment 1
Santa Barbara Conversion Technology Project
Project Goals

Increase Diversion of Post-Recycled MSW for Affected Jurisdictions. Any considered CT must increase the diversion of post-recycled MSW intended for landfill disposal through pre-processing (or post-processing) and/or conversion of post-recycled MSW into beneficial products such as energy, fuels, or other marketable products (e.g., compost, aggregate, metals).

Reduce Environmental Impacts of Landfilling MSW. Any considered CT must limit and/or mitigate environmental impacts of landfilling MSW, including but not limited to water quality and greenhouse gas emissions.

Provide Financial Feasibility and Sustainability. Any considered CT must have capital and operating costs that result in a feasible, cost-competitive tipping fee, with long-term financial stability that would limit financial impacts to affected rate payers.

Produce Green Energy and Other Marketable Products. Any considered CT must include a component of green energy and/or fuel production, along with other marketable products, as applicable, such as recovered metals and compost.

Provide a Humane Work Environment. The project will be dedicated to maintaining humane working conditions, and will not consider any CT that is deemed to have an unjust or unsafe impact on workers.

Result in a Long-Term Waste Disposal Plan. Any considered CT must result in a long-term waste disposal alternative for participating jurisdictions within Southern Santa Barbara County (with a 20 year minimum lifespan required).

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Attachment 2
Santa Barbara Conversion Technology Project
Primary Evaluation Criteria
(Minimum Screening Parameters)

1. Any considered CT must be capable of processing a minimum of 100,000 tons per year

(tpy) of MSW during the first operating year of the project, and must be capable of increasing capacity up to 220,000 tpy within 10 years of the first operating year of the project.

2. Any considered CT must be capable of operating for a minimum of 20 years.
3. Any considered CT must be compatible with local solid waste management programs, including recycling programs.
4. Any considered CT must be capable of diverting at least 60% by weight of the MSW received for processing from landfill disposal.
5. Any considered CT must have a projected tip fee that limits financial impact to affected ratepayers (i.e., no more than 10% beyond the price the ratepayer would expect for other alternatives).
6. Any considered CT must produce end products that have probable, identifiable or existing markets (including electricity and/or fuel products).
7. Any considered CT must conform to California environmental standards, and must limit and/or mitigate environmental impacts of landfilling MSW.
8. Any considered CT must have been demonstrated at a minimum of one facility of similar size or with a minimum unit size of 50 tons per day (tpd), and shall have been in operation for at least six months (as of February 29, 2008) processing MSW or similar feedstock.
9. Any considered CT must have a project team that has experience designing, building and operating a solid waste management facility, either individually or as a team.
10. The project developer must have bonding ability equal to the estimated cost of facility design and construction, and, during operation, equal to the estimated annual operating cost; must not be in bankruptcy; and must provide a financing plan that reasonably demonstrates that it can offer private project financing, if required.
11. The project developer must not be debarred from contracting in California.

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Attachment 3

Santa Barbara Conversion Technology Project

Information Requested for Application of Evaluation Criteria

Criterion Requested Information

1. Any considered CT must be capable of processing a

minimum of 100,000 tons per year (tpy) of MSW during the first operating year of the project, and must be capable of increasing capacity up to 220,000 tpy within 10 years of the first operating year of the project.

- Describe, in narrative form, the proposed conversion technology along with a description of how a facility would work including, as applicable: receipt of waste, preprocessing, conversion, post-processing, and product and residue management.
- Identify the initial facility capacity that would be proposed (between 100,000 and 220,000 tpy). Describe the number of processing lines and unit capacities to meet that overall facility capacity. Describe whether unit capacities and facility capacity are comparable to existing applications of the technology, or how scale-up will be achieved.
- If initial capacity would be less than 220,000 tpy, describe how the facility would be modularly expanded, within 10 years, to 220,000 tpy and discuss possible disruptions or interruptions to operations, if any, during expansion work.
- Identify the acreage required to develop the proposed facility, at initial and full capacity. Describe whether any specific design features are required to develop the proposed facility within the available site area of 6 acres. If more than 6 acres would be required for the proposed facility, describe if the additional acreage could be located in a non-contiguous area of the site or off-site.

2. Any considered CT must be capable of operating for a minimum of 20 years.

- Describe the useful life of the technology, in the application that would be proposed. Provide available supporting information, such as the length of time existing facilities have operated and the contractual operating periods for such facilities. If operating histories do not directly provide evidence of a 20-year useful life, provide information on fabrication, construction, operations, maintenance and/or capital replacement strategies intended to assure such useful life.

3. Any considered CT must be compatible with local solid waste management programs, including recycling programs.

- Describe how the technology can be incorporated into an integrated, municipal solid waste management program that has, as one of its priorities, recycling and/or energy and materials recovery.
- Describe how the technology could supplement recycling activities.
- Identify any technology-specific feed stock requirements that could be impacted by recycling programs or other waste management activities.
- Describe the flexibility of the technology to manage municipal solid waste along with other potential waste streams, such as wastewater sludge.

4. Any considered CT must be capable of diverting at least 60% by weight of the MSW received for processing from landfill disposal.

- Provide mass, energy, and water balance information for the technology, showing the amount of MSW that would be diverted from landfill disposal through the recovery of recyclables and generation of products (including electricity, as

applicable).

- Describe the quantity and quality of the residue resulting from the process that would require landfill disposal, including identification of the source of that residue in the process.
- Provide available supporting information, such as diversion data from existing facilities.
- Discuss the eligibility of the technology for diversion credits, now or in the future.

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Criterion Requested Information

5. Any considered CT must have a projected tip fee that limits financial impact to affected ratepayers (i.e., no more than 10% beyond the price the ratepayer would expect for other alternatives).

- For the proposed facility capacity, provide *planning-level* cost and pricing estimates (in 2008 dollars), including capital cost, operating cost, product revenue (by product), and tip fee revenue.
- Provide a breakdown of capital cost including: permitting, design and construction, and cost for structures, equipment, environmental control systems, utilities, ancillary systems, vehicles, and other costs.
- Provide a breakdown of operating costs including: labor, residuals disposal, utilities, chemicals, maintenance and repair, capital repair and replacement, and other costs.
- Provide a staffing plan for the proposed facility, corresponding to the planning-level operating costs.
- Provide a breakdown of potential revenues by product type.
- For the costs identified above, estimate the corresponding, first-year tipping fee. Describe how the tipping fee would be expected to change over the life of the project (i.e., what events or circumstances may affect the tip fee, such as build-out to 220,000 tpy, if not done initially, general inflation, change in MSW composition, energy and/or materials prices over time, state or federal regulations).
- Describe the availability of any funding sources (e.g., grants, state or federal loan guarantees, etc.) for the proposed technology, how such funds would be pursued, and the potential impact of such funds on the planning-level cost and pricing estimates.

6. Any considered CT must produce end products that have probable, identifiable or existing markets (including electricity and/or fuel products).

- Provide a listing of all potential products, including electricity and/or fuel products, and expected revenues by product (unit-price basis).
- For each product, identify the expected market and describe the anticipated strength of that market.
- Describe contingency plans for products that may have less certain markets.
- Describe experience in marketing products at existing facilities.
- Discuss the eligibility of the technology for renewable energy credits under current conditions or, if not eligible today, under what future circumstances might the technology be eligible for renewable energy credits.

7. Any considered CT must conform to California environmental standards,

and must limit and/or mitigate environmental impacts of landfilling MSW.

- Describe the types of permits expected to be needed to implement the technology.
- Describe how the technology would limit and/or mitigate the impacts of landfilling MSW.
- Describe expected environmental performance, and provide any supporting information associated with existing facilities (e.g., air emissions data; consumptive water use; wastewater data; traffic impacts; site and aesthetic considerations).
- For technologies that produce an intermediate gas (syngas, biogas) that would be combusted to generate electricity, describe whether the gas is (or otherwise could be) captured and pre-cleaned prior to conversion to electricity. Identify any existing facilities where this practice has been demonstrated.

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Criterion Requested Information

8. Any considered CT must have been demonstrated at a minimum of one facility of similar size or with a minimum unit size of 50 tons per day (tpd), and shall have been in operation for at least six months (as of February 29, 2008) processing MSW or similar feedstock.

- Provide a listing of the facilities that are currently or have previously been in operation, indicating location and name of facility, facility capacity, unit capacity, period of operation (including if operated continuously or on a limited basis), type of operation (e.g., demonstration or commercial facility), and type of waste processed.
- Identify the facility or facilities that provide the best demonstration of the technology.
- If available, provide photographs of the technology and facilities in a jpg format.

9. Any considered CT must have a project team that has experience designing, building and operating a solid waste management facility, either individually or as a team.

- Identify principal project participants (e.g., lead developer; project manager; owner; investment banker or funders; engineering procurement and construction (EPC) contractor; suppliers of major equipment; operator; environmental permitting consultant, etc.)
- Describe the experience of individual project team members in the following key areas:
 - Project development, design and construction of municipal solid waste facilities in general, and utilizing the proposed or similar technology
 - Project finance
 - Regulatory and permitting experience in the U.S. for solid waste management facilities, including experience in California and with the CEQA process
 - Public-private partnership experience in the U.S. for municipal solid waste projects, including experience in responding to public procurements

- Experience marketing products from the technology
- Describe the experience of the project team in working together previously in development, permitting, design, construction and operation of a solid waste management facility and with the proposed or similar technology, providing specific project examples, where available.
- Describe the overall technical and financial resources of the project team, including the location of key resources (e.g., outside the U.S., within the U.S., California-based). As appropriate, also provide such information for any parent corporations that may be proposed as guarantors of participating subsidiaries and/or projects. If available, provide audited financial statements (annual reports) for the immediately preceding fiscal year for principal team members.

10. The project developer must have bonding ability equal to the estimated cost of facility design and construction, and, during operation, equal to the estimated annual operating cost; must not be in bankruptcy; and must provide a financing plan that reasonably demonstrates that it can offer private project financing, if required.

- Provide a preliminary financing plan that reasonably demonstrates the project team can structure a private project financing, if required (i.e., for a design, build, own, operate (DBOO) approach). Indicate commitments from the City and County that may be necessary to support a DBOO structure.
- Describe the financial resources of each principal member of the project team regarding the ability to provide the requested bonding (or other comparable project security instruments) for project construction and operation, and experience in obtaining such bonds or security for other projects.
- Provide a statement that the project developer is not in bankruptcy.

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Criterion Requested Information

11. The project developer must not be debarred from contracting in California.

- Provide a statement that the project developer is not debarred from contracting in California.

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Attachment 4

**Aerial of Proposed CT Site at the Tajiguas Landfill
(approximately 6 acres after final grading)**

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Attachment 5

Executive Summary

Statewide Waste Characterization Study

December 2004

**Cascadia Consulting Group, Inc., under contract for
California Integrated Waste Management Board**

Contractor's Report to the Board Executive Summary Statewide Waste Characterization Study

December 2004

Produced under contract by:

Cascadia Consulting Group, Inc.

*The complete study can be found on the Board's website at
<http://www.ciwmb.ca.gov/Publications/default.asp?pubid=1097>*

Executive Summary

Introduction and Objectives

In 2003 and 2004, the California Integrated Waste Management Board (CIWMB) conducted a statewide study with the objective of obtaining information on the types and amounts of materials disposed at solid waste facilities throughout the state. In many ways, this study followed the standards and protocols established for the 1999 Statewide Waste Characterization Study. As with the 1999 study, the present study derives quantity and composition estimates for the commercial, residential, and self-hauled waste streams throughout California.

However, the present study departs significantly from the 1999 study in its use of samples obtained from vehicles at disposal facilities to characterize commercial waste, instead of samples obtained at actual commercial sites. The present study also examines additional material types and includes additional analysis of the disposal rates of rigid plastic packaging containers (RPPC) and California redemption value (CRV) containers at a level of detail beyond what was done in the 1999 study ¹.

Study Methodology

Waste sampling occurred using a stratified random sampling methodology in which waste was sampled from numerous subgroups (strata) to develop a waste composition profile for each stratum. The strata were then "added together" in a way that reflects each stratum's relative contribution to the overall waste stream, thus producing overall waste composition information. Strata considered in this study included the geographical region, the waste sector (residential, commercial or self-hauled), and the waste subsector (single-family residential, multifamily residential, residential self-hauled, and commercial self-hauled).

The state was divided into five regions that were selected because of similarities in demographic, climate, geographic, and economic characteristics. Data regarding waste composition was gathered from 550 waste samples sorted at 22 disposal facilities (landfills and transfer stations) in five regions during four seasons. Whenever possible, a randomized process was used to select participating disposal facilities, vehicles carrying waste, multifamily dwellings, and waste samples to include in the study. Approximately equal numbers of waste samples belonging to each waste sector were obtained from each region of the state.

The waste from samples was sorted into 98 material types that can be fit to California's Standard List of Material Subtypes for Waste Sorting as well as RPPC types and CRV types that have been defined by CIWMB staff and described in Appendix B: List and Definitions of Material Types. All material types were chosen and defined such that they can be fit to the material types used during California's 1999 Statewide Waste Characterization Study. New for this study were

separate types for four categories of electronic waste, expanded plastic film types, and carpeting. Also, for the first time, the CIWMB included a contamination study for selected material types. In addition, surveys of vehicle drivers at the entrances to participating disposal facilities produced data that was used to estimate the portion of California's waste that corresponds to each of the waste sectors and subsectors. Generally, the surveys were conducted on the same days that waste sampling occurred. All vehicles bringing waste to the site during a pre-determined ten-hour period were surveyed. The generating sector represented by the waste was identified, and the net weight of each load was recorded. A total of 4,693 surveys were completed.

¹ The 1999 study is available at <http://www.ciwmb.ca.gov/Publications/default.asp?pubid=824>.

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Results

The data gathered during the sampling efforts was compiled, and statistical analyses were performed in order to extrapolate the findings to statewide estimates. The final report includes detailed findings for the following areas:

- Disposed waste composition and tonnage for the state's overall waste stream and the commercial, residential, and self-hauled sectors.
- Disposed waste composition and tonnage of the single-family residential and multifamily residential subsectors.
- Disposed waste composition and tonnage of the commercial self-hauled and residential selfhauled subsectors.
- Disposed waste tonnage for four waste-generating activities that comprise commercial selfhauled waste.
- Disposed waste composition and tonnage for RPPCs and CRV containers statewide.

The findings show that, statewide, the commercial sector comprises 47 percent of the waste stream, the residential sector (single-family plus multifamily) represents 31.6 percent, and the self-hauled sector is responsible for the remaining 21.3 percent. The data also shows that approximately 350,770 tons of RPPCs were disposed statewide in 2003, equating to 0.87 percent of the overall waste stream.

Table ES-1 depicts the estimated contribution to the overall waste stream of each sector. Figure ES-A through Figure ES-D display the breakdown of the waste stream by nine material classes of material, for the overall waste stream and each of the three waste sectors that were studied. Table ES-2 presents the ten most prevalent material types in the overall disposed waste stream. Finally, Table ES-3 provides a detailed breakdown of the composition of the overall waste stream by material type.

A note on data for the *construction & demolition* material class: the data in this category reflects the total amounts of these **material types** in the overall disposed waste stream, regardless of the activity generating the material. For example, the *lumber* material type would include wood scraps from a home craft project that were disposed in a residential garbage can. Another example would be a pallet that a business disposed in its dumpster. These materials were not generated by construction and demolition **activities**, but they fall under the *lumber* material type in the *construction & demolition* material class.

Also, construction and demolition activities generate other materials in addition to the ones listed under the *construction & demolition* material class, such as *cardboard*, *ferrous metal*, and *plastic film*. These materials were counted under the *paper*, *metal*, and *plastic* material classes, even though they were generated by construction and demolition activities. In sum, the amounts of materials listed in the *construction & demolition* material class cannot be used as an estimate of the total amount of construction and demolition waste disposed in California. A future study, to be conducted in 2005, will focus on characterizing and quantifying construction and demolition

waste as a separate waste stream.

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Table ES-1: Estimated Contribution of Each Sector to California's Overall Disposed Waste Stream, 2003

**Est. Percentage
of Disposed
Waste Stream
Est. Tons
Disposed
Statewide**

Commercial 47.0% 18,924,058
Residential 31.6% 12,721,055
Single-family residential 23.4% 9,403,504
Multifamily residential 8.2% 3,317,551
Self-hauled 21.3% 8,590,215
Commercial self-hauled 17.3% 6,963,322
Residential self-hauled 4.0% 1,626,894
Totals 100.0% 40,235,328

Numbers may not total exactly due to rounding. Source: Individual facility records and 2003 vehicle survey findings applied to CIWMB Disposal Reporting System 2003 tonnage figures.

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Figure ES-A: Material Classes in California's Overall Disposed Waste Stream, 2003

Mixed Residue 1.1%
Special Waste 5.1%
Household Hazardous Waste 0.2%
Plastic 9.5%
Electronics 1.2%
Metal 7.7%
Glass 2.3%
Paper 21.0%
Organic 30.2%
Construction & Demolition 21.7%

Figure ES-B: Material Classes in the Commercial Disposed Waste Stream, 2003

Mixed Residue 1.0%
Special Waste 5.2%
Household Hazardous Waste

0.1%
Plastic
12.0%
Electronics
1.2%
Metal
8.8%
Glass
2.0%
Paper
26.5%
Organic
29.2%
Construction
&
Demolition
14.1%

Figure ES-C: Material Classes in the Residential Disposed Waste Stream, 2003

Metal
6.1%
Electronics
1.5%
Plastic
9.4%
Mixed
Residue
1.9%
Special
Waste
1.2%
Glass
3.8%
Organic
42.7%
Household
Hazardous
Waste
0.3%
Paper
22.2%
Construction
& Demolition
10.8%

Figure ES-D: Material Classes in the Self-Hauled Disposed Waste Stream, 2003

Household
Hazardous
Waste
0.1%
Organic
14.0%
Paper
7.1% Glass
1.0%
Special
Waste
10.6%
Mixed
Residue
0.2%
Metal
8.0%
Electronics
0.6%

Plastic
3.9%
Construction
&
Demolition
54.6%

Numbers may not total exactly due to rounding.

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Table ES-2: Ten Most Prevalent Material Types in California's Overall Disposed Waste System, 2003

Material Type Est. Pct. Est. Tons Cumulative Pct.

Food 14.6% 5,854,352 14.6%
Lumber 9.6% 3,881,214 24.2%
Uncoated Corrugated Cardboard 5.7% 2,312,147 29.9%
Remainder/Composite Paper 5.7% 2,274,433 35.6%
Remainder/Composite Organics 4.4% 1,752,803 40.0%
Leaves and Grass 4.2% 1,696,022 44.2%
Remainder/Composite Construction and Demolition 3.6% 1,452,009 47.8%
Other Miscellaneous Paper 3.5% 1,400,526 51.3%
Bulky Items 3.4% 1,348,224 54.6%
Remainder/Composite Metal 2.5% 1,018,242 57.1%

Any differences between *cumulative percent* figures and the sum of *estimated percent* figures are due

to rounding. *Note: *Remainder/composite paper* includes such items as waxed corrugated cardboard, aseptic packages, paper towels, and photographs. Examples of *remainder/composite organics* include leather items, cork, garden hoses, carpet padding, and diapers. The material type *remainder/composite construction and demolition* includes such items as tiles, toilets, and fiberglass insulation. *Remainder/composite metal* includes such items as small non-electronic appliances, motors, and insulated wire.

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Table ES-3: Composition of California's Overall Disposed Waste Stream by Material Type, 2003

Est. Pct. + / - Est. Tons Est. Pct. + / - Est. Tons

Paper 21.0% 8,445,989 Organic 30.2% 12,166,452
Uncoated Corrugated Cardboard 5.7% 1.2% 2,312,147 Food 14.6% 2.6% 5,854,352
Paper Bags 1.0% 0.5% 386,097 Leaves and Grass 4.2% 1.0% 1,696,022
Newspaper 2.2% 0.4% 887,091 Prunings and Trimmings 2.3% 0.6% 920,356
White Ledger 1.1% 0.3% 447,516 Branches and Stumps 0.3% 0.2% 119,754
Colored Ledger 0.1% 0.0% 20,583 Agricultural Crop Residues 0.0% 0.0% 0
Computer Paper 0.1% 0.0% 20,845 Manures 0.1% 0.0% 36,506
Other Office Paper 0.7% 0.2% 296,203 Textiles 2.4% 1.3% 947,789
Magazines and Catalogs 0.8% 0.2% 311,143 Carpet 2.1% 0.7% 838,869
Phone Books and Directories 0.2% 0.1% 89,403 Remainder/Composite Organics 4.4% 0.8% 1,752,803
Other Miscellaneous Paper 3.5% 0.6% 1,400,526
Remainder/Composite Paper 5.7% 0.7% 2,274,433 **Construction & Demolition 21.7% 8,732,074**
Concrete 2.4% 0.9% 966,607
Glass 2.3% 934,926 Asphalt Paving 0.0% 0.0% 10,414
Clear Glass Bottles and Containers 0.9% 0.1% 356,467 Asphalt Roofing 1.9% 1.0% 767,981
Green Glass Bottles and Containers 0.4% 0.1% 180,570 Lumber 9.6% 1.4% 3,881,214
Brown Glass Bottles and Containers 0.3% 0.0% 104,568 Gypsum Board 1.7% 0.8% 676,430
Other Colored Glass Bottles and Containers 0.0% 0.0% 3,106 Rock, Soil, and Fines 2.4% 1.0% 977,419
Flat Glass 0.4% 0.4% 151,344 Remainder/Composite Construction and Demolition 3.6% 0.8% 1,452,009
Remainder/Composite Glass 0.3% 0.1% 138,870
Household Hazardous Waste 0.2% 73,599
Metal 7.7% 3,115,357 Paint 0.0% 0.0% 19,203
Tin/Steel Cans 0.8% 0.2% 323,540 Vehicle and Equipment Fluids 0.0% 0.0% 1,000
Major Appliances 1.5% 2.1% 616,663 Used Oil 0.0% 0.0% 548
Used Oil Filters 0.0% 0.0% 1,376 Batteries 0.1% 0.0% 34,021
Other Ferrous 2.4% 0.5% 969,676 Remainder/Composite Household Hazardous 0.0% 0.0% 18,827

Aluminum Cans 0.2% 0.0% 74,851
 Other Non-Ferrous 0.3% 0.1% 111,008 **Special Waste 5.1% 2,038,431**
 Remainder/Composite Metal 2.5% 0.6% 1,018,242 Ash 0.1% 0.1% 60,160
 Sewage Solids 0.0% 0.0% 0
Electronics 1.2% 481,353 Industrial Sludge 0.0% 0.0% 0
 Brown Goods 0.1% 0.0% 41,394 Treated Medical Waste 0.0% 0.0% 15,367
 Computer-related Electronics 0.3% 0.2% 119,917 Bulky Items 3.4% 1.2% 1,348,224
 Other Small Consumer Electronics 0.2% 0.1% 93,273 Tires 0.3% 0.2% 126,633
 Television and Other Items with CRTs 0.6% 0.5% 226,769 Remainder/Composite Special Waste 1.2% 1.6% 488,047
Plastic 9.5% 3,809,699 Mixed Residue 1.1% 0.3% 437,448
 PETE Containers 0.5% 0.1% 216,134
 HDPE Containers 0.5% 0.1% 189,549
 Miscellaneous Plastic Containers 0.5% 0.1% 206,470
 Plastic Trash Bags 1.0% 0.2% 390,460
 Plastic Grocery and Other Merchandise Bags 0.4% 0.0% 147,038
 Non-Bag Commercial and Industrial Packaging Film 0.7% 0.3% 290,331
 Film Products 0.2% 0.2% 93,073
 Other Film 2.1% 0.6% 826,757
 Durable Plastic Items 1.4% 0.2% 561,543 **Totals 100.0% 40,235,328**
 Remainder/Composite Plastic 2.2% 0.3% 888,343 **Sample count: 550**
Confidence intervals calculated at the 90% confidence level. Percentages for material types may not total 100% due to rounding.

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**Santa Barbara, California
 Conversion Technology Project
 Request for Information - Addendum No. 1
 February 24, 2008**

This is Addendum No. 1 to the February 6, 2008, Request for Information (RFI) for the Santa Barbara, California, Conversion Technology Project. This Addendum No. 1 provides the following clarifications and answers to questions regarding the RFI:

1. Can the due date for submittal of RFI responses be extended?

The due date for submittal of RFI responses is extended to Friday, March 7, 2008.

2. Approximately five years ago, Santa Barbara issued an RFP for a conversion technology project. Is Santa Barbara serious about the current RFI effort?

Yes, the City and County of Santa Barbara are working cooperatively and diligently to evaluate the feasibility of developing a conversion technology (CT) project as an alternative to landfilling post-recycled municipal solid waste at the Tajiguas Landfill. As part of that process, in January 2008 the City Council and the County Board of Supervisors reviewed and approved the project goals and evaluation criteria included in the RFI (RFI attachments 1 and 2, respectively). The next step, reviewing responses to the RFI, is critical to future project success. Your participation is appreciated.

3. Can a site walk-over be conducted?

Yes. Requests to visit the site should be coordinated with Carlyle Johnston by email at

CJohnst@cosbpw.net or by telephone at 805-882-3617.

4. Would Santa Barbara consider a pilot plant at the Tajiguas Landfill?

The City and County of Santa Barbara will consider projects that meet the evaluation criteria identified in the RFI. See evaluation criterion #1 for further guidance.

5. Please clarify evaluation criterion #5, regarding projected tip fee, on a \$/ton basis.

The current tipping fee for MSW at the Tajiguas Landfill is \$55.50 per ton. For purpose of the RFI, conversion technology projects with a projected tipping fee of less than \$100 per ton will be considered to meet evaluation criterion #5.

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6. Regarding evaluation criterion #8, please clarify whether it is required that the technology operated consistently for the six month period prior to the RFI?

Operating commercial facilities that are the basis of demonstrating compliance with evaluation criterion #8 shall have been in operation for at least six months, prior to

February 29, 2008. Commercial facilities that are not operating as of February 29, 2008, but previously operated for at least six months, can also be the

basis of demonstrating compliance with evaluation criterion #8. It is recognized that

some respondents may have a demonstration facility, but not an existing or previously operated

commercial facility, and that such demonstration facilities may not be operated on a continuous basis. For purpose of the RFI, demonstration facilities that

have operated intermittently, but processed at least 1,000 tons of MSW or similar feedstock over a one-year period, will be considered to meet the operating requirement

of evaluation criterion #8.

7. Attachment 3 to the RFI lists many things that our company does not normally give out this early in the development process. Please advise what is required to be submitted with the RFI response.

At a minimum, RFI responses should address each of the eleven evaluation criteria in

order to demonstrate that such criteria are met by the respondent. Attachment 3 to the

RFI provides guidance regarding the information to be submitted. The information

requested in Attachment 3 will enable the City and County to effectively review and evaluate the capabilities of the proposed technology and the experience and qualifications of the project team. Responders are encouraged, but not required, to submit the specific information requested in Attachment 3. Responders are required to submit sufficient information to demonstrate all eleven evaluation criteria are met.

8. The RFI requests that responses be submitted electronically. Is it acceptable to submit the main text of the RFI response via e-mail, along with separate delivery of a CD and paper copy of more voluminous, supplemental material?

If the full RFI response is too large to submit electronically, it is acceptable to submit the main text of the RFI response via e-mail, along with separate delivery of supplemental material. All information considered to be part of the RFI response is to be submitted by the RFI response due date of March 7, 2008.