

Evaluation of Municipal Solid Waste Conversion Technologies

Prepared for the City and County of
Santa Barbara, California

April 2008



Alternative Resources, Inc.
in association with
Clements Environmental Corporation

Overview

- Previous Evaluation by MJSWTG (2002-2003)
- Adopted Project Goals and Evaluation Criteria (January 2008)
- Identified Conversion Technology Suppliers (February 2008)
- Prepared and Issued Request for Information (February 2008)
- Received and Evaluated RFI responses (March 2008)
- Evaluation Report (April 2008)

Project Goals

- Increase Diversion of Post-Recycled MSW for Affected Jurisdictions
- Reduce Environmental Impacts of Landfilling MSW
- Provide Financial Feasibility and Sustainability
- Produce Green Energy and Other Marketable Products
- Provide a Humane Work Environment
- Result in a Long-Term Waste Disposal Plan (20 year minimum)

Evaluation Criteria

- Processing Capacity (100,000-220,000 tpy, 6 acres)
- Operating Term (20 years)
- Compatibility with Solid Waste Programs
- Diversion from Landfill Disposal (>60%)
- Projected Tipping Fee (<10% impact on ratepayers)
- End Products (marketable)
- Environmental Performance
- Demonstration of Technology (50 tpd, 6 months)
- Project Team Experience
- Financial Resources
- Contracting Status (not debarred in CA)

Conversion Technology Companies Identified for Consideration

Anaerobic Digestion	Thermal Processing
CA Renewable Technologies (Arrow)*	AdaptiveNRG
Canada Composting (BTA Process)	AlterNRG/Westinghouse
Ecocorp*	Bioengineering Resources, Inc.
Orgaworld	Entech Solutions
Organic Waste Systems (DRANCO)	Ebara Corporation
Waste Recovery Systems (Valorga)*	GEM America
Hydrolysis	International Environmental Solutions
Arkenol/Blue Fire Ethanol	Interstate Waste Technologies
Biofine (Biometrics)	Plasco Energy Group
Genahol*	Primenergy*
Masada	Solena Group
Other Processing	Startech Environmental Corporation
Herhof California*	World Waste Technologies
Waste-to-Energy, Inc.	

* Conversion technology company included on the MJSWTG 2003 short-list.

Request for Information (RFI)

- RFI issued to 25 companies (February 2, 2008)
- Addendum No. 1 and Clarifications (February 24, 2008)
- Information Provided in RFI
 - Project Goals
 - Project Size (100,000-220,000 tpy)
 - Project Location (Tajiguas Landfill – 6 acres)
 - Waste Characterization (CIWMB 2004 Statewide Study)
 - Evaluation Criteria
- Information Requested by RFI
 - Demonstration that Evaluation Criteria are met
 - Response due date of March 7, 2008
- Eleven (11) responses

RFI Respondents

Anaerobic Digestion	Thermal Processing
CA Renewable Technologies (CR&R/Arrow)*	AdaptiveNRG
Ecocorp*	International Environmental Solutions
Organic Waste Systems (Dranco)	Interstate Waste Technologies
Hydrolysis	Plasco Energy Group
[No Responses]	Primenergy*
Other Processing	Tajiguas Partners (WTE/Entech)
Herhof California*	World Waste Technologies

* Conversion technology company included on the MJSWTG 2003 short-list

Evaluation Criteria

- Processing Capacity (100,000-220,000 tpy, 6 acres)
- Operating Term (20 years)
- Compatibility with Solid Waste Programs
- Diversion from Landfill Disposal (>60%)
- Projected Tipping Fee (<10% impact on ratepayers)
- End Products (marketable)
- Environmental Performance
- Demonstration of Technology (50 tpd, 6 months)
- Project Team Experience
- Financial Resources
- Contracting Status (not debarred in CA)

Respondents Not Meeting All Evaluation Criteria

Project Developer and/or Technology Supplier (Listed Alphabetically by Type of Technology)	Are All Criteria Met?	Summary
Organic Waste Systems (Anaerobic Digestion)	No	<ul style="list-style-type: none"> • Ability to develop large-scale plant processing MSW is uncertain; project would require 12+ acres (Criterion 1) • Estimated tipping fee not provided for Santa Barbara; based on other analyses, may be significantly greater than \$100/ton (Criterion 5) • Potential project team not identified; experience and financial resources not provided (Criterion 9 and 10)
Primenergy LLC (Gasification)	No	<ul style="list-style-type: none"> • Technology not demonstrated at 50 tpd for MSW (Criterion 8) • Ability to develop large-scale MSW plant is uncertain; project would require 12 acres (Criterion 1)
World Waste Technologies (Gasification)	No	<ul style="list-style-type: none"> • Technology not demonstrated at 50 tpd for MSW (Criterion 8) • Ability to develop large-scale MSW plant is uncertain (Criterion 1) • Environmental performance is uncertain (Criterion 7)

* Conversion technology company included on the MJSWTG 2003 short-list

Anaerobic Digestion

Project Developer and/or Technology Supplier (Listed Alphabetically)	Reference Facility	Major Products
CA Renewable Technologies	Tel Aviv, Israel 150 tpd (2003) MSW	Electricity Recyclables Compost
Ecocorp	Barcelona, Spain 900 tpd (2001) MSW	Natural gas CO ₂ Recyclables Compost

- Diversion rate estimated by respondents ranges from 70-80%
- Diversion rate estimated by respondents is based on State-wide waste characterization (CIWMB, December 2004); actual diversion will depend on project-specific waste characterization
- Diversion rate is based on sale or beneficial use of compost as alternative daily landfill cover
- First-year tipping fee estimated by respondents ranges from \$40-\$60 per ton
- Tipping fees estimated by respondents are based on planning-level economics, and are subject to detailed design for site-specific and project-specific conditions

Thermal Processing

Project Developer and/or Technology Supplier (Listed Alphabetically)	Reference Facility	Major Products
AdaptiveNRG (Plasma)	Monterey, Mexico 100 tpd (2005) MSW and other	Electricity Metals Ash Product
International Environmental Solutions (Pyrolysis)	Romoland, California 50 tpd (2004) MSW, MRF residuals	Electricity Recyclables Carbon Char
Interstate Waste Technologies (Gasification)	Chiba, Japan 330 tpd (1999) MSW, Industrial	Electricity Metals Aggregate Other
Plasco Energy Group (Plasma)	Ottawa, Canada 110 tpd (2007) MSW with other	Electricity Metals Aggregate Other
Tajiguas Partners (Gasification)	Genting, Malaysia 67 tpd (1998) MSW	Electricity Biofuels (future) Recyclables Ash Product

- Diversion rate estimated by respondents ranges from 85-100%
- Diversion rate estimated by respondents is based on State-wide waste characterization (CIWMB, December 2004); actual diversion will depend on project-specific waste characterization
- Diversion rate is based on sale or beneficial use of aggregate/ash product for building material/road construction or other uses
- First-year tipping fee estimated by respondents ranges from \$50-\$100 per ton
- Tipping fees estimated by respondents are based on planning-level economics, and are subject to detailed design for site-specific and project-specific conditions

Other Technology

Project Developer and/or Technology Supplier (Listed Alphabetically)	Reference Facility	Major Products
Herhof California (Biological Drying, Mechanical Separation, Off-site Combustion)	Osnabruck, Germany 350 tpd (2006) MSW	Stabilat Fuel Recyclables Metal Glass Mineral Fraction

- Diversion rate estimated by respondent is approximately 70%
- Diversion rate estimated by respondent is based on State-wide waste characterization (CIWMB, December 2004); actual diversion will depend on project-specific waste characterization
- Diversion rate is based on sale or beneficial use of mineral fraction for road construction or alternative daily landfill cover
- First-year tipping fee estimated by respondents to be less than \$100 per ton
- Tipping fee estimated by respondent is based on planning-level economics, and is subject to detailed design for site-specific and project-specific conditions

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 (Biological Drying/Mechanical Separation/Combustion Off-site)

Moving Forward with Conversion Technology

What are our next steps?

Important Decisions Needed to Assure Quality RFP:

- ▶ Roles & Responsibilities
- ▶ Contractual Considerations
- ▶ Technical Evaluations
- ▶ Resource Requirements

Roles & Responsibilities

► Likely Roles & Responsibilities:

- | | |
|---|------------------------|
| <input checked="" type="checkbox"/> Site leasing | at Tajiguas Landfill |
| <input checked="" type="checkbox"/> Residual disposal | at Tajiguas Landfill |
| <input checked="" type="checkbox"/> Permitting | Company responsibility |
| <input checked="" type="checkbox"/> Design/Construction | Company responsibility |
| <input checked="" type="checkbox"/> Public Outreach | City/County lead |

Roles & Responsibilities

▶ Decisions Yet to be Made:

- Participating Jurisdictions
- Waste Supply
- Ownership
- Operations
- Financing

Contractual Considerations

- ▶ Needs Additional Development
 - Design/Performance Standards
 - Key Terms & Conditions (contract principles)
 - Special Legal Counsel (internal and/or external)

Technical Evaluations

- ▶ Facility Size & Location
 - Site configuration evaluation will take 3 months
- ▶ Type & Characterization of Waste
 - New evaluation will cost \$75,000 and take 3 months
- ▶ Subsurface Testing
 - Will cost \$20,000 and take 2 months
- ▶ Legal Counsel
 - Assistance on contractual considerations will cost \$125,000 to \$175,000 and will take 6 months
- ▶ Resource Requirements
 - Staff, consultants & legal counsel to produce

Closing Remarks

- ▶ Staff will now present process...