REQUEST FOR PROPOSALS

FEASIBILITY STUDY FOR THE

SANTO ANDRE WASTE TO ENERGY AND LANDFILL GAS RECOVERY FACILITY PROJECT

Submission Deadline: **1:00 PM LOCAL TIME**

THURSDAY, NOVEMBER 10, 2011

Submission Place: Lineu Carlos Cunha Mattos
Semasa
Av. José Caballero, 143
09040-210 Santo Andre SP, Brazil
Phone: 011 55 (11) 4433-9925

SEALED PROPOSALS SHALL BE CLEARLY MARKED AND RECEIVED PRIOR TO THE TIME AND DATE SPECIFIED ABOVE. PROPOSALS RECEIVED AFTER SAID TIME AND DATE WILL NOT BE ACCEPTED OR CONSIDERED.

REQUEST FOR PROPOSALS

SECTION 1: INTRODUCTION 3
1.1 BACKGROUND SUMMARY 3
1.2 OBJECTIVE .....
1.3 PROPOSALS TO BE SUBMITTED .....
1.4 CONTRACT FUNDED BY USTDA .....
SECTION 2: INSTRUCTIONS TO OFFERORS .....
2.1 PROJECT TITLE .....
2.2 DEFINITIONS .....
2.3 DEFINITIONAL MISSION REPORT .....
2.4 EXAMINATION OF DOCUMENTS .....
2.5 PROJECT FUNDING SOURCE .....
2.6 RESPONSIBILITY FOR COSTS .....
2.7 TAXES .....
2.8 CONFIDENTIALITY .....
2.9 ECONOMY OF PROPOSALS .....
2.10 OFFEROR CERTIFICATIONS .....
2.11 CONDITIONS REQUIRED FOR PARTICIPATION .....
2.12 LANGUAGE OF PROPOSAL .....
2.13 PROPOSAL SUBMISSION REQUIREMENTS .....
2.14 PACKAGING .....
2.15 AUTHORIZED SIGNATURE .....
2.16 EFFECTIVE PERIOD OF PROPOSAL .....
2.17 EXCEPTIONS .....
2.18 OFFEROR QUALIFICATIONS .....
2.19 RIGHT TO REJECT PROPOSALS .....
2.20 PRIME CONTRACTOR RESPONSIBILITY .....
2.21 AWARD .....
2.22 COMPLETE SERVICES .....
2.23 INVOICING AND PAYMENT .....
SECTION 3: PROPOSAL FORMAT AND CONTENT .....
3.1 EXECUTIVE SUMMARY .....
3.2 COMPANY INFORMATION .....
3.2.1 COMPANY PROFILE .....
3.2.2 OFFEROR'S AUTHORIZED NEGOTIATOR .....
3.2.3 NEGOTIATION PREREQUISITES .....
3.2.4 OFFEROR'S REPRESENTATIONS .....
3.2.5 SUBCONTRACTOR PROFILE
3.2.6 SUBCONTRACTOR'S REPRESENTATIONS
3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL .....
3.4 TECHNICAL APPROACH AND WORK PLAN .....
3.5 EXPERIENCE AND QUALIFICATIONS .....
SECTION 4: AWARD CRITERIA .....

ANNEX 1	FEDBIZOPPS ANNOUNCEMENT
ANNEX 2	BACKGROUND DEFINITIONAL MISSION REPORT
ANNEX 3	USTDA NATIONALITY REQUIREMENTS
ANNEX 4	USTDA GRANT AGREEMENT, INCLUDING MANDATORY CONTRACT CLAUSES
ANNEX 5	TERMS OF REFERENCE (FROM USTDA GRANT AGREEMENT)
ANNEX 6	COMPANY INFORMATION

Section 1: INTRODUCTION

The U.S. Trade and Development Agency (USTDA) has provided a grant in the amount of US$469,000 to SEMASA - Serviço Municipal de Saneamento Ambiental de Santo André ("Grantee") in accordance with a grant agreement dated June 27th, 2011 (the "Grant Agreement"). USTDA will fund the cost of goods and services required for the preparation of a feasibility study ("Study") on the proposed Santo Andre Waste to Energy and Landfill Gas Recovery Facility Project ("Project") in Brazil ("Host Country"). The Grant Agreement is attached at Annex 4 for reference. The Grantee is soliciting technical proposals from qualified U.S. firms to provide expert consulting services to perform the Feasibility Study.

1.1 BACKGROUND SUMMARY

SEMASA is the Municipality of Santo Andre's entity responsible for the city's solid waste operations including collection and landfill disposal. In addition to its solid waste management responsibilities, SEMASA provides a range of other environmental services including water treatment/distribution and wastewater collection and treatment in the city.

This project is a priority for the Municipality of Santo Andre. The proposed feasibility study would help the municipality of Santo Andre to identify and define appropriate technologies to reduce landfill emissions as well as to manage its waste disposal difficulties while also providing much needed additional base load power.

The feasibility study would be comprised of several measures to determine the technical and financial viability of developing a waste to energy and landfill gas recovery facility in the Municipality of Santo Andre, state of Sao Paulo, Brazil. A background Definitional Mission is provided for reference in Annex 2.

1.2 OBJECTIVE

The objective of this feasibility study is to evaluate the technical and economic feasibility of developing solid waste derived energy recovery facilities in the municipality of Santo Andre in Brazil. The facilities that will be the subject of this feasibility study will include 1) a landfill gas recovery project at the existing municipal landfill in Santo Andre and; 2) a conventional waste to energy (WTE) facility for processing municipal solid waste (MSW) generated in the municipality. To the degree required, each of these will be separately evaluated during the investigation. The Terms of Reference (TOR) for this Feasibility Study are attached as Annex 5.

1.3 PROPOSALS TO BE SUBMITTED

Technical proposals are solicited from interested and qualified U.S. firms. The administrative and technical requirements as detailed throughout the Request for Proposals (RFP) will apply. Specific proposal format and content requirements are detailed in Section 3.

The amount for the contract has been established by a USTDA grant of US$469,000. **The USTDA grant of US$469,000 is a fixed amount. Accordingly, <u>COST will not be a factor in</u>**

the evaluation and therefore, cost proposals should not be submitted. Upon detailed evaluation of technical proposals, the Grantee shall select one firm for contract negotiations.

1.4 CONTRACT FUNDED BY USTDA

In accordance with the terms and conditions of the Grant Agreement, USTDA has provided a grant in the amount of US$469,000 to the Grantee. The funding provided under the Grant Agreement shall be used to fund the costs of the contract between the Grantee and the U.S. firm selected by the Grantee to perform the TOR. The contract must include certain USTDA Mandatory Contract Clauses relating to nationality, taxes, payment, reporting, and other matters. The USTDA nationality requirements and the USTDA Mandatory Contract Clauses are attached at Annexes 3 and 4, respectively, for reference.

Section 2: INSTRUCTIONS TO OFFERORS

2.1 PROJECT TITLE

The project is called Santo Andre Waste to Energy and Landfill Gas Recovery Facility Project.

2.2 DEFINITIONS

Please note the following definitions of terms as used in this RFP.

The term "Request for Proposals" means this solicitation of a formal technical proposal, including qualifications statement.
The term "Offeror" means the U.S. firm, including any and all subcontractors, which responds to the RFP and submits a formal proposal and which may or may not be successful in being awarded this procurement.

2.3 DEFINITIONAL MISSION REPORT

USTDA sponsored a Definitional Mission to address technical, financial, sociopolitical, environmental and other aspects of the proposed project. A copy of the report is attached at Annex 2 for background information only. Please note that the TOR referenced in the report are included in this RFP as Annex 5.

2.4 EXAMINATION OF DOCUMENTS

Offerors should carefully examine this RFP. It will be assumed that Offerors have done such inspection and that through examinations, inquiries and investigation they have become familiarized with local conditions and the nature of problems to be solved during the execution of the Feasibility Study.

Offerors shall address all items as specified in this RFP. Failure to adhere to this format may disqualify an Offeror from further consideration.

Submission of a proposal shall constitute evidence that the Offeror has made all the above mentioned examinations and investigations, and is free of any uncertainty with respect to conditions which would affect the execution and completion of the Feasibility Study.

2.5 PROJECT FUNDING SOURCE

The Feasibility Study will be funded under a grant from USTDA. The total amount of the grant is not to exceed US$469,000.

2.6 RESPONSIBILITY FOR COSTS

Offeror shall be fully responsible for all costs incurred in the development and submission of the proposal. Neither USTDA nor the Grantee assumes any obligation as a result of the issuance of this RFP, the preparation or submission of a proposal by an Offeror, the evaluation of proposals, final selection or negotiation of a contract.

2.7 TAXES

Offerors should submit proposals that note that in accordance with the USTDA Mandatory Contract Clauses, USTDA grant funds shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in the Host Country.

2.8 CONFIDENTIALITY

The Grantee will preserve the confidentiality of any business proprietary or confidential information submitted by the Offeror, which is clearly designated as such by the Offeror, to the extent permitted by the laws of the Host Country.

2.9 ECONOMY OF PROPOSALS

Proposal documents should be prepared simply and economically, providing a comprehensive yet concise description of the Offeror's capabilities to satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of content.

2.10 OFFEROR CERTIFICATIONS

The Offeror shall certify (a) that its proposal is genuine and is not made in the interest of, or on behalf of, any undisclosed person, firm, or corporation, and is not submitted in conformity with, and agreement of, any undisclosed group, association, organization, or corporation; (b) that it has not directly or indirectly induced or solicited any other Offeror to put in a false proposal; (c) that it has not solicited or induced any other person, firm, or corporation to refrain from submitting a proposal; and (d) that it has not sought by collusion to obtain for itself any advantage over any other Offeror or over the Grantee or USTDA or any employee thereof.

2.11 CONDITIONS REQUIRED FOR PARTICIPATION

Only U.S. firms are eligible to participate in this tender. However, U.S. firms may utilize subcontractors from the Host Country for up to 20 percent of the amount of the USTDA grant for

specific services from the TOR identified in the subcontract. USTDA's nationality requirements, including definitions, are detailed in Annex 3.

2.12 LANGUAGE OF PROPOSAL

All proposal documents shall be prepared and submitted in English and Portuguese. Annex 6 does not need to be translated into Portuguese.

2.13 PROPOSAL SUBMISSION REQUIREMENTS

The **Cover Letter** in the proposal must be addressed to:

Lineu Carlos Cunha Mattos
Semasa
Av. José Caballero, 143
09040-210 Santo Andre SP, Brazil
Phone: 011 55 (11) 4433-9925

An Original in English and Portuguese, one (1) copy in English, and three (3) copies in Portuguese as well as a CDROM or Flash drive with an electronic (pdf) copy of the files of your proposal must be received at the above address no later than Thursday, November 10, 2011, at 1:00 pm (local time).

Proposals may be either sent by mail, overnight courier, or hand-delivered. Whether the proposal is sent by mail, courier or hand-delivered, the Offeror shall be responsible for actual delivery of the proposal to the above address before the deadline. Any proposal received after the deadline will be returned unopened. The Grantee will promptly notify any Offeror if its proposal was received late.

Upon timely receipt, all proposals become the property of the Grantee.

2.14 PACKAGING

The original and each copy of the proposal must be sealed to ensure confidentiality of the information. The proposals should be individually wrapped and sealed, and labeled for content including "original" or "copy number x"; the original **in English and Portuguese, one (1) copy in English, and three (3) copies in Portuguese as well as a CDROM or Flash drive with an electronic (pdf) copy of the files** should be collectively wrapped and sealed, and clearly labeled.

Neither USTDA nor the Grantee will be responsible for premature opening of proposals not properly wrapped, sealed and labeled.

2.15 AUTHORIZED SIGNATURE

The proposal must contain the signature of a duly authorized officer or agent of the Offeror empowered with the right to bind the Offeror.

2.16 EFFECTIVE PERIOD OF PROPOSAL

The proposal shall be binding upon the Offeror for NINETY (90) days after the proposal due date, and Offeror may withdraw or modify this proposal at any time prior to the due date upon written request, signed in the same manner and by the same person who signed the original proposal.

2.17 EXCEPTIONS

All Offerors agree by their response to this RFP announcement to abide by the procedures set forth herein. No exceptions shall be permitted.

2.18 OFFEROR QUALIFICATIONS

As provided in Section 3, Offerors shall submit evidence that they have relevant past experience and have previously delivered advisory, feasibility study and/or other services similar to those required in the TOR, as applicable.

2.19 RIGHT TO REJECT PROPOSALS

The Grantee reserves the right to reject any and all proposals.

2.20 PRIME CONTRACTOR RESPONSIBILITY

Offerors have the option of subcontracting parts of the services they propose. The Offeror's proposal must include a description of any anticipated subcontracting arrangements, including the name, address, and qualifications of any subcontractors. USTDA nationality provisions apply to the use of subcontractors and are set forth in detail in Annex 3. The successful Offeror shall cause appropriate provisions of its contract, including all of the applicable USTDA Mandatory Contract Clauses, to be inserted in any subcontract funded or partially funded by USTDA grant funds.

2.21 AWARD

The Grantee shall make an award resulting from this RFP to the best qualified Offeror, on the basis of the evaluation factors set forth herein. The Grantee reserves the right to reject any and all proposals received and, in all cases, the Grantee will be the judge as to whether a proposal has or has not satisfactorily met the requirements of this RFP.

2.22 COMPLETE SERVICES

The successful Offeror shall be required to (a) provide local transportation, office space and secretarial support required to perform the TOR if such support is not provided by the Grantee; (b) provide and perform all necessary labor, supervision and services; and (c) in accordance with best technical and business practice, and in accordance with the requirements, stipulations, provisions and conditions of this RFP and the resultant contract, execute and complete the TOR to the satisfaction of the Grantee and USTDA.

2.23 INVOICING AND PAYMENT

Deliverables under the contract shall be delivered on a schedule to be agreed upon in a contract with the Grantee. The Contractor may submit invoices to the designated Grantee Project Director in accordance with a schedule to be negotiated and included in the contract. After the Grantee's approval of each invoice, the Grantee will forward the invoice to USTDA. If all of the requirements of USTDA's Mandatory Contract Clauses are met, USTDA shall make its respective disbursement of the grant funds directly to the U.S. firm in the United States. All payments by USTDA under the Grant Agreement will be made in U.S. currency. Detailed provisions with respect to invoicing and disbursement of grant funds are set forth in the USTDA Mandatory Contract Clauses attached in Annex 4.

Section 3: PROPOSAL FORMAT AND CONTENT

To expedite proposal review and evaluation, and to assure that each proposal receives the same orderly review, all proposals must follow the format described in this section.

Proposal sections and pages shall be appropriately numbered and the proposal shall include a Table of Contents. Offerors are encouraged to submit concise and clear responses to the RFP. Proposals shall contain all elements of information requested without exception. Instructions regarding the required scope and content are given in this section. The Grantee reserves the right to include any part of the selected proposal in the final contract.

The proposal shall consist of a technical proposal only. A cost proposal is NOT required because the amount for the contract has been established by a USTDA grant of US$469,000, which is a fixed amount.

Offerors shall submit **one (1) original in English and Portuguese, one (1) copy in English and three (3) copies in Portuguese** of the proposal. Proposals received by fax cannot be accepted.

Each proposal must include the following:

Transmittal Letter,
Cover/Title Page,
Table of Contents,
Executive Summary,
Company Information,
Organizational Structure, Management Plan, and Key Personnel,
Technical Approach and Work Plan, and
Experience and Qualifications.

Detailed requirements and directions for the preparation of the proposal are presented below.

3.1 EXECUTIVE SUMMARY

An Executive Summary should be prepared describing the major elements of the proposal, including any conclusions, assumptions, and general recommendations the Offeror desires to make. Offerors are requested to make every effort to limit the length of the Executive Summary to no more than five (5) pages.

3.2 COMPANY INFORMATION

For convenience, the information required in this Section 3.2 may be submitted in the form attached in Annex 6 hereto.

3.2.1 Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), the information requested in sections 3.2.5 and 3.2.6 below must be provided for each subcontractor.

1. Name of firm and business address (street address only), including telephone and fax numbers.

2. Year established (include predecessor companies and year(s) established, if appropriate).

3. Type of ownership (e.g. public, private or closely held).

4. If private or closely held company, provide list of shareholders and the percentage of their ownership.

5. List of directors and principal officers (President, Chief Executive Officer, Vice-President(s), Secretary and Treasurer; provide full names including first, middle and last). Please place an asterisk (*) next to the names of those principal officers who will be involved in the Feasibility Study.

6. If Offeror is a subsidiary, indicate if Offeror is a wholly-owned or partially-owned subsidiary. Provide the information requested in items 1 through 5 above for the Offeror's parent(s).

7. Project Manager's name, address, telephone number, e-mail address and fax number.

3.2.2 Offeror's Authorized Negotiator

Provide name, title, address, telephone number, e-mail address and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

3.2.3 Negotiation Prerequisites

1. Discuss any current or anticipated commitments which may impact the ability of the Offeror or its subcontractors to complete the Feasibility Study as proposed and reflect such impact within the project schedule.

2. Identify any specific information which is needed from the Grantee before commencing contract negotiations.

3.2.4 Offeror's Representations

If any of the following representations cannot be made, or if there are exceptions, the Offeror must provide an explanation.

1. Offeror is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The Offeror has all the requisite corporate power and authority to conduct its business as presently conducted, to submit this proposal, and if selected, to execute and deliver a contract to the Grantee for the performance of the Feasibility Study. The Offeror is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment, or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. The Offeror has included, with this proposal, a certified copy of its Articles of Incorporation, and a certificate of good standing issued within one month of the date of its proposal by the State of _____. The Offeror commits to notify USTDA and the Grantee if they become aware of any change in their status in the state in which they are incorporated. USTDA retains the right to request an updated certificate of good standing.

3. Neither the Offeror nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

4. Neither the Offeror, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 3 above.

5. There are no federal or state tax liens pending against the assets, property or business of the Offeror. The Offeror, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

6. The Offeror has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The Offeror has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected Offeror shall notify the Grantee and USTDA if any of the representations included in its proposal are no longer true and correct at the time of its entry into a contract with the Grantee.

3.2.5 Subcontractor Profile

1. Name of firm and business address (street address only), including telephone and fax numbers.

2. Year established (include predecessor companies and year(s) established, if appropriate).

3.2.6 Subcontractor's Representations

If any of the following representations cannot be made, or if there are exceptions, the Subcontractor must provide an explanation.

1. Subcontractor is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The subcontractor has all the requisite corporate power and authority to conduct its business as presently conducted, to participate in this proposal, and if the Offeror is selected, to execute and deliver a subcontract to the Offeror for the performance of the Feasibility Study and to perform the Feasibility Study. The subcontractor is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. Neither the subcontractor nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

3. Neither the subcontractor, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 2 above.

4. There are no federal or state tax liens pending against the assets, property or business of the subcontractor. The subcontractor, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

5. The subcontractor has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The subcontractor has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected subcontractor shall notify the Offeror, Grantee and USTDA if any of the representations included in this proposal are no longer true and correct at the time of the Offeror's entry into a contract with the Grantee.

3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL

Describe the Offeror's proposed project organizational structure. Discuss how the project will be managed including the principal and key staff assignments for this Feasibility Study. Identify the Project Manager who will be the individual responsible for this project. The Project Manager shall have the responsibility and authority to act on behalf of the Offeror in all matters related to the Feasibility Study.

Provide a listing of personnel (including subcontractors) to be engaged in the project, including both U.S. and local subcontractors, with the following information for key staff: position in the project; pertinent experience, curriculum vitae; other relevant information. If subcontractors are to be used, the Offeror shall describe the organizational relationship, if any, between the Offeror and the subcontractor.

A manpower schedule and the level of effort for the project period, by activities and tasks, as detailed under the Technical Approach and Work Plan shall be submitted. A statement confirming the availability of the proposed project manager and key staff over the duration of the project must be included in the proposal.

3.4 TECHNICAL APPROACH AND WORK PLAN

Describe in detail the proposed Technical Approach and Work Plan (the "Work Plan"). Discuss the Offeror's methodology for completing the project requirements. Include a brief narrative of the Offeror's methodology for completing the tasks within each activity series. Begin with the information gathering phase and continue through delivery and approval of all required reports.

Prepare a detailed schedule of performance that describes all activities and tasks within the Work Plan, including periodic reporting or review points, incremental delivery dates, and other project milestones.

Based on the Work Plan, and previous project experience, describe any support that the Offeror will require from the Grantee. Detail the amount of staff time required by the Grantee or other participating agencies and any work space or facilities needed to complete the Feasibility Study.

3.5 EXPERIENCE AND QUALIFICATIONS

Provide a discussion of the Offeror's experience and qualifications that are relevant to the objectives and TOR for the Feasibility Study. If a subcontractor(s) is being used, similar information must be provided for the prime and each subcontractor firm proposed for the project. The Offeror shall provide information with respect to relevant experience and qualifications of key staff proposed. The Offeror shall include letters of commitment from the individuals proposed confirming their availability for contract performance.

As many as possible but not more than six (6) relevant and verifiable project references must be provided for each of the Offeror and any subcontractor, including the following information:

Project name,
Name and address of client (indicate if joint venture),
Client contact person (name/ position/ current phone and fax numbers),
Period of Contract,
Description of services provided,
Dollar amount of Contract, and
Status and comments.

Offerors are strongly encouraged to include in their experience summary primarily those projects that are similar to or larger in scope than the Feasibility Study as described in this RFP.

Section 4: AWARD CRITERIA

Individual proposals will be initially evaluated by a Procurement Selection Committee of representatives from the Grantee. The Committee will then conduct a final evaluation and completion of ranking of qualified Offerors. The Grantee will notify USTDA of the best qualified Offeror, and upon receipt of USTDA's no-objection letter, the Grantee shall promptly notify all Offerors of the award and negotiate a contract with the best qualified Offeror. If a satisfactory contract cannot be negotiated with the best qualified Offeror, negotiations will be formally terminated. Negotiations may then be undertaken with the second most qualified Offeror and so forth.

The selection of the Contractor will be based on the following criteria:

- Project management skills pertaining to the evaluation, design and implementation of municipal solid waste-to-energy projects (10%)

- Regional experience in Brazil or in comparable market economies in the region (15%)

- Experience related to solid waste-to-energy facility design, construction and operation (15%)

- Experience in and knowledge of various commercialized and emerging waste-to-energy technologies and systems that could be applicable for this project including technologies applicable to the recovery of energy from landfill gas (15%)

- Experience in the economic evaluation and financial modeling of solid waste management infrastructure projects (15%)

- Experience in power sector assessments and evaluations for potential sale of recovered energy (15%)

- Experience in and knowledge of the procedures used and requirements of financing agencies such as multilateral banks including, at a minimum, risk management, procurement procedures and project management requirements for financing (10%)

- Working knowledge of U.S. suppliers who may provide services and equipment for Brazil's solid waste sector, and in particular, waste-to-energy projects. (5%)

Proposals that do not include all requested information may be considered non-responsive.

Price will not be a factor in contractor selection.

ANNEX 1

Lineu Carlos Cunha Mattos, Semasa, Av. José Caballero, 143 – Centro,
09040-210 Santo Andre, SP, Brazil, Phone: 011 55 (11) 4433-9925

B – Brazil: Santo Andre Waste to Energy and Landfill Gas Recovery Facility Project

POC: Rob Yavuz, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009. SANTO ANDRE WASTE TO ENERGY AND LANDFILL GAS RECOVERY FACILITY PROJECT. The Grantee invites submission of qualifications and proposal data (collectively referred to as the "Proposal") from interested U.S. firms that are qualified on the basis of experience and capability to develop a feasibility study to determine the technical and financial viability of developing a waste to energy and landfill gas recovery facility in the Municipality of Santo Andre, SP, Brazil.

The feasibility study would be comprised of several measures to determine the technical and financial viability of developing a waste to energy and landfill gas recovery facility in the Municipality of Santo Andre. The Terms of Reference (TOR) for this Feasibility Study are attached as Annex 5.

The U.S. firm selected will be paid in U.S. dollars from a $469,000 grant to the Grantee from the U.S. Trade and Development Agency (USTDA).

A detailed Request for Proposals (RFP), which includes requirements for the Proposal, the Terms of Reference, and a background definitional mission/desk study report are available from USTDA, at 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901. To request the RFP in PDF format, please go to: https://www.ustda.gov/businessopps/rfpform.asp. Requests for a mailed hardcopy version of the RFP may also be faxed to the IRC, USTDA at 703-875-4009. In the fax, please include your firm's name, contact person, address, and telephone number. Some firms have found that RFP materials sent by U.S. mail do not reach them in time for preparation of an adequate response. Firms that want USTDA to use an overnight delivery service should include the name of the delivery service and your firm's account number in the request for the RFP. Firms that want to send a courier to USTDA to retrieve the RFP should allow one hour after faxing the request to USTDA before scheduling a pick-up. Please note that no telephone requests for the RFP will be honored. Please check your internal fax verification receipt. Because of the large number of RFP requests, USTDA cannot respond to requests for fax verification. Requests for RFPs received before 4:00 PM will be mailed the same day. Requests received after 4:00 PM will be mailed the following day. Please check with your courier and/or mail room before calling USTDA.

Only U.S. firms and individuals may bid on this USTDA financed activity. Interested firms, their subcontractors and employees of all participants must qualify under USTDA's nationality requirements as of the due date for submission of qualifications and proposals and, if selected to carry out the USTDA-financed activity, must continue to meet such requirements throughout the duration of the USTDA-financed activity. All goods and services to be provided by the selected firm shall have their nationality, source and origin in the U.S. or host country. The U.S. firm may use subcontractors from the host country for up

to 20 percent of the USTDA grant amount. Details of USTDA's nationality requirements and mandatory contract clauses are also included in the RFP.

Interested U.S. firms should submit their Proposal in English and Portuguese directly to the Grantee by 1:00 pm (Local time), November 10, 2011 at the above address. Evaluation criteria for the Proposal are included in the RFP. Price will not be a factor in contractor selection, and therefore, cost proposals should NOT be submitted. The Grantee reserves the right to reject any and/or all Proposals. The Grantee also reserves the right to contract with the selected firm for subsequent work related to the project. The Grantee is not bound to pay for any costs associated with the preparation and submission of Proposals.

ANNEX 2

Brazil 2010-51015A
1 Final Report
1 CD-ROM
HC: JW
RECEIVED
APR 29 2011
PF
U.S. DEPARTMENT OF COMMERCE
NY AM AY PD
GM DR SF DD
IS DE GJ

Definitional Mission Final Report

BRAZIL: ENERGY RECOVERY AND SOLID WASTE MANAGEMENT PROJECT OPPORTUNITIES

FEDERATIVE REPUBLIC OF BRAZIL

PERFORMANCE TECHNOLOGY, INC.
P.O. Box 1778
Lewiston, Maine 04240
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8.4. Human Capacity Building 44

9. **IMPACT ON THE ENVIRONMENT** 45
9.1. The Environmental Nature of Waste-to-Energy Projects 45
9.2. Positive Impacts of the Proposed Waste-to-Energy Projects 45
9.3. Potential Negative Impacts of the Proposed Waste-to-Energy Projects 46

10. **IMPACT ON U.S. LABOR** 47
10.1 Basis for Project Impact on U.S. Labor 47

11. **QUALIFICATIONS** 49

12. **JUSTIFICATION** 51
12.1 Economic Implications 51
12.2 Environmental Implications 51
12.3 Alternative Energy Generation Implications 52

13. **TERMS OF REFERENCE** 53
13.1 Basis for the Terms of Reference 53

14. **FEASIBILITY STUDY BUDGET** 57
14.1 Basis for Project Feasibility Study Budget 57

15. **FINDINGS AND RECOMMENDATIONS** 59
15.1 Findings and Conclusions 59
15.2 Recommendations 61

16. **CONTACTS** 64

ANNEX 1 - **RECOMMENDED TERMS OF REFERENCE** 67

ANNEX 2 - **SPONSOR LETTER OF SUPPORT** 81

ANNEX 3 - **BRAZIL COUNTRY TRADE FACT SHEET** 82

ANNEX 4 - **INTERNATIONAL ENVIRONMENTAL SOLUTIONS PROJECT INFORMATION** 84

ANNEX 5 - **INTEGRATED SOLID WASTE MANAGEMENT ALTERNATIVES** 105

ANNEX 6 - **TRADE ASSOCIATIONS AND CONSULTANTS** 118

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2
INTRODUCTION AND BACKGROUND

2.1 INTRODUCTION

A number of municipalities in Brazil have requested assistance from the United States Trade and Development Agency (USTDA) for development of municipal solid waste-to-energy (WTE) facilities as major components of their Integrated Solid Waste Management (ISWM) programs. As a result of these requests, USTDA commissioned a Definitional Mission (DM) to evaluate whether it is in USTDA's best interests to provide support for the proposed projects. Performance Technology Inc. (PerformTech) was selected to undertake the Definitional Mission on behalf of USTDA. As an integral part of the DM, a PerformTech field team traveled to Brazil from August 15 through September 8, 2010 to meet with project sponsors and other stakeholders. During the fieldwork, PerformTech gathered relevant information about the proposed projects to evaluate their technical, institutional and financial characteristics and development factors. The municipalities where waste-to-energy projects were investigated during the DM are shown in Figure 2.1. (The investigation of projects in São Bernardo de Campo and Brumadinho were added to PerformTech's initial project evaluation matrix as a result of a request by USTDA's representative in Brazil at the beginning of the DM field work.) It should be noted that, during PerformTech's work in Brazil, it was determined that the municipality of São Bernardo de Campo has already completed a waste-to-energy project Feasibility Study and reportedly has already issued a request for proposals for the development of a 1,000 tonne per day waste-to-energy facility that would serve São Bernardo and an adjacent municipality (Diadema).

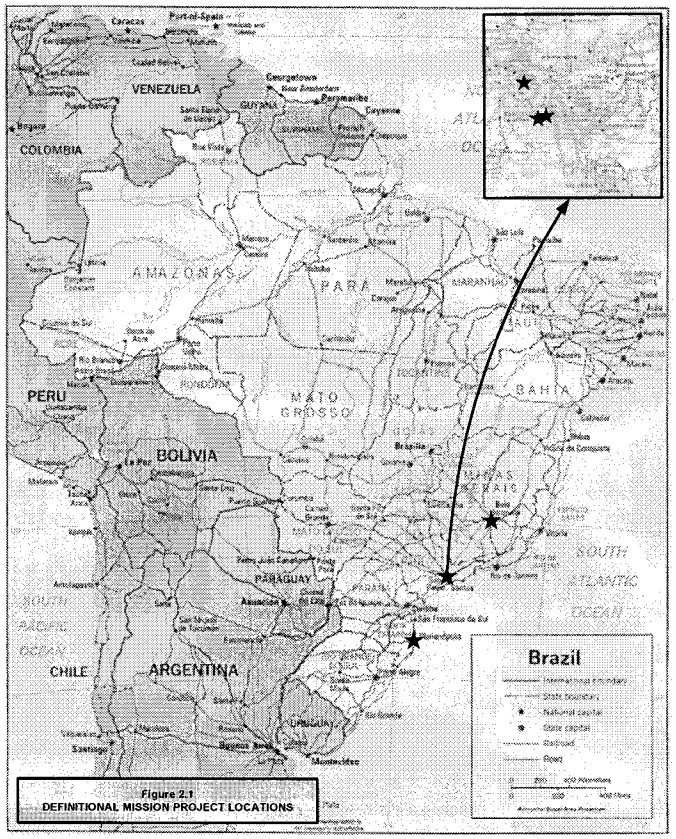


Figure 2.1
DEFINITIONAL MISSION PROJECT LOCATIONS

Table 2.1 on the following page shows the current estimated population of each of the subject municipalities and an estimate of their current daily and annual municipal solid waste (MSW) generation. During the DM field work, solid waste management conditions

were physically observed in each of the listed municipalities except for the municipality of Brumadinho. (All meetings relative to the Brumadinho project were held in São Paulo with a representative of a United States company (International Environmental Solutions) seeking to develop a waste-to-energy application in that city.) Further information concerning each project locale and PerformTech's observations of the solid waste management conditions in each of the municipalities is presented in Section 3 of this DM report.

Table 2.1
Municipal Population and Solid Waste Generation

MUNICIPALITY	POPULATION[1]	UNIT MSW GENERATION RATE[2-3]	ESTIMATE GENERATION TONNES/DAY	ESTIMATED GENERATION TONNES/YEAR[4]
Sao Paulo	11,037,593	1.27	14,018	5,116,476
Santo Andre	673,396	0.80	539	196,632
Sao Bernardo de Campo	810,979	0.80	649	236,806
Florianopolis	408,161	0.73	298	108,754
Bromadinho	34,361	0.52	18	6,522

Notes
1 Source: Instituto Brasileiro de Geografia e Estatística
2 Kilograms/capita/day -
3 Source: Integrated Municipal Solid Waste Management Manual in Latin American and Caribbean Cities
4 Based on 365 days per year

2.2 INTEGRATED SOLID WASTE MANAGEMENT AND THE ROLE OF WASTE-TO-ENERGY

Conceptually, from a solid waste management standpoint, the DM assessment was undertaken within an overall objective of evaluating the potential waste-to-energy facilities as components of an Integrated Solid Waste Management (ISWM) program in each of the reference cities as defined by international sound practice and standards. For this assessment, ISWM is defined as:

> *"A form of solid waste management where an appropriate technology is applied in a sustainable manner for various components of the solid waste stream".*

Through this definition, the authors of this DM report recognize that energy recovery is only one of the solid waste processing options that may be developed as a component of an effective ISWM program in the reference cities. In some instances, other recovery processes such as compost production and enhanced recycling may be more practical and cost-effective than more technically complex and costly waste-to-energy systems. Additionally, some types of solid waste discards may be more effectively processed by alternative approaches to waste-to-energy applications. For example, food waste (which tends to have high moisture content (50% or more)) does not lend itself to sustainable combustion without the use of supplemental fossil fuel. Also, other materials such as paper, metals, glass and plastics may be better managed through informal and formal recycling practices. With this understanding, waste-to-energy facilities are often classified as optional processes that may not be applicable or appropriate for all locales. Accordingly, the technical complexity and high capital cost of state-of-the-art waste-to-energy facilities that are designed to meet stringent regulations such as those in the United States and the European Union requires that a detailed and accurate Feasibility Study be

carefully undertaken a part of project planning. This is because of the high technical and economic risks associated with their development and sustained operations.

As will be presented in this DM report, it should also be noted that many of the elements that must be closely investigated in an effective WTE Feasibility Study are common to each of the proposed projects, particularly in the municipalities that are neighboring or within the same state such as the municipalities of São Paulo and Santo Andre. This may provide USTDA with an opportunity to streamline and leverage its assistance to the benefit of multiple municipalities without necessarily replicating the full investigation of common issues. This is also supported by the fact that USTDA has already funded a waste-to-energy Feasibility Study for the city of Rio de Janeiro which is currently underway. Some of the findings of the Rio de Janeiro Feasibility Study may be applicable to the assessments that may result from this current Definitional Mission and USTDA's decision to proceed with assistance to any of the municipalities that are the subject of this current investigation.

In the DM, PerformTech sought to define the current incentives that the municipalities may have in developing a waste-to-energy facility. The three primary factors that normally serve as WTE project incentives include:

1. The cost of electricity in Brazil - Since 1995, Brazil has had a trading and power generation free-market which has stimulated significant competition in the power sector and has led to considerable power infrastructure investments from both Brazilian and international companies. The need for and the value of potentially recovered energy from the processing of solid waste can be a significant political and economic incentive for considering WTE projects.
2. The potential availability of carbon credits or certified emission reductions - This has led many companies and municipalities in Brazil to the development of landfill gas (LFG) recovery projects at municipal solid waste disposal sites. In some cases, this results in the recovery of energy (primarily in the form of methane content of the landfill gas). A number of the LFG to electricity projects in Brazil have derived carbon offsets for electricity sold to the grid and trading of the credits derived from the registration of these projects on the international market.
3. The cost of solid waste disposal - As is the case in many countries with evolving economies and improving solid waste management standards, the cost of landfill disposal in Brazil has increased significantly in recent years as the environmental control nature of disposal facilities has improved. This increasing cost provides a growing incentive for seeking an effective means of reducing the amount of solid waste requiring landfill disposal. (Waste-to-energy facilities (that rely on combustion as a basic process) serve as an effective means for significant volume reduction that can reduce the amount of municipal solid waste to be landfilled by up to 85% of its volume.)

Because of these basic reasons, many municipalities in Brazil are now considering the possible application of waste-to-energy projects in their solid waste management programs. This has led to the current request for assistance from USTDA. In a general sense, PerformTech believes that the incentives for considering waste-to-energy projects have evolved sufficiently in Brazil for

such projects to be considered. Beyond these general considerations, however, the unique characteristics of each project must be closely evaluated to determine if their implementation also complies with USTDA objectives in providing development funding assistance. That is the basic intent of this Definitional Mission investigation.

The Waste-to-Energy Research and Technology Council (WTERT), located at the Earth Engineering Center of Columbia University in New York City, has established the following basic facts relative to waste-to-energy applications which PerformTech concurs with and has used as a basis for quantifying WTE elements of this DM assessment.

1. The average capital cost per annual ton of capacity for a waste-to-energy project constructed to United States or European Union standards is about $650 per annual ton. Based on a typical 330 day per year operating schedule, this is approximately $200,000 per daily ton of installed capacity. As a result of the above, the capital cost for a 1,000 ton per day facility, constructed to sound international standards, would be approximately $200 million. This is consistent with recent WTE project development in the U.S.
2. A waste-to-energy facility processing typical municipal solid waste will generate a net output of 500 to 600 kWh per ton for sale and use by local utilities.
3. A 1,000 ton per day WTE facility will require a staff of about 60 people based on a 3 shift per day operating schedule. WTE facilities are usually operated on a 24 hours per day - 7 days per week schedule with periodic downtime for repair or scheduled preventative maintenance.
4. The economic benefits associated with a waste-to-energy facility include:
   a. The value of the electrical energy generated,
   b. The tipping fees paid by communities bringing solid waste to the WTE facility, and
   c. The value of ferrous and nonferrous materials recovered during processing.
5. The environmental benefits of a waste-to-energy facility include the following:
   a. WTE plants conserve fossil fuels by generating electricity where one ton of MSW combusted reduces fossil fuel use by approximately one barrel of oil or 0.25 tons of coal.
   b. Each ton of municipal solid waste combusted rather than landfilled reduces greenhouse gas emissions by about 1.2 tons of carbon dioxide based on the eliminated discharge of methane associated with uncontrolled landfill gas emissions.
   c. WTE plants reduce the space required for landfilling by about 85%

(It is noteworthy that there is a Brazilian counterpart to the WTERT (WTERT Brazil) located in Rio de Janeiro. This organization was recently created as a result of the growing interest in the application of waste-to-energy technology in Brazil.)

2.3 CURRENT ENVIRONMENTAL AND SOLID WASTE MANAGEMENT IN BRAZIL

Brazil has the third-largest territory in the Americas and the fifth largest in the world. From a

South American perspective, Brazil comprises almost 1/2 of the South American continent both geographically and in terms of population. With a population of about 170 million people, Brazil must deal with many critical urban problems since Brazil's population is primarily urban with almost 2/3 of the population concentrated in Brazil's cities. As is the case in many countries, the high level of urbanization in Brazil has created a need for more effective municipal services particularly in the country's larger metropolitan areas such as São Paulo and Rio de Janeiro. Municipal solid waste management, as one of these critical municipal services, is also one of the most visible functions provided by municipalities. In recent decades, solid waste management programs in Brazil has evolved to a point where considerable progress has been made in improving solid waste management conditions particularly in Brazil's larger cities which will, most likely, be the locations for any waste-to-energy facilities developed in the near future.

As a result of Brazil's rapidly growing economy, there has been a significant increase in the amount of solid waste generated throughout the country. Worldwide statistics have shown that affluent countries generally produce more solid waste per capita than developing countries. The statistics have also demonstrated that the overall population of a city is often a factor in solid waste generation where more solid waste is produced both in terms of the total amount generated and in the average unit generation rate of its populace. In Brazil, historical solid waste management and demographic data shows that, between 1992 and 2000, the country's population grew by about 16% while total municipal solid waste generation grew by about 49% (or approximately three times faster). This emphasizes the critical priority of effective solid waste management especially in terms of Brazil's continually growing economy and its rate of general urbanization.

The Associaçao Brasileira de Empresas de Limpeza Publica e Residuos Especiais (ABRELPE – an association of solid waste management professionals and companies in Brazil) reports that the total generation of municipal solid waste in Brazil increased by 7.7% from 2008 to 2009. This increase was attributed to the country's increasing population and an increase in the per capita generation rate of about 6.6%. These increases are consistent with waste stream growth experience in other countries with strong economies. ABRELPE also reported that the total amount of solid waste actually collected during this period increased by 8% with a significant proportion of the solid waste collected resulting from municipal programs in the larger cities in the southeast region of the country (which includes the São Paulo Metropolitan Region where a number of the investigated waste-to-energy applications are located.) In 2009, it was further estimated that about 57% of the total collected solid waste in Brazil was properly disposed of in environmentally sound controlled or sanitary landfills which was an increase of about 2% from the previous year.

The improvement in solid waste collection and disposal services in the highly populated urban areas of Brazil is a positive factor when considering the development of waste-to-energy facilities. This is due to the fact that improved solid waste management services will normally require increased expenditures which can then provide a greater economic driver for the development of solid waste diversion facilities such as waste-to-energy applications. However, in Brazil, the financial resources available for further improvement are still a limiting factor in

the rate of overall solid waste management enhancement. For example, in its Panorama des Residuos Solidos no Brazil 2009 annual report, ABRELPE states that:

> *"The financial aspects related to urban cleaning services, especially municipal expenditures with MSW collection and other related services, are rather limited, becoming a barrier to progress required by the sector, mainly those needed in waste disposal. The picture established in 2009, as seen, still demands attention and requires improvements to fully adequate the MSW management in Brazil. This way, it is extremely necessary to establish and make it available specific funds and credit lines for the investments required and also the institutions by the municipalities of an appropriate charging system for waste services that brings economic sustainability to them."*

Irrespective of any limits to available funds, governmental officials throughout Brazil are seeking to enhance the means by which municipal solid waste is managed. This has included the development of processes and facilities that seek to recover the intrinsic value of the solid waste stream in the form of recovered materials and/or energy. The ability and willingness of government leaders to support the development of typical waste-to-energy facilities is usually a function of the level of development of environmental control infrastructure and the laws and regulations that govern it.

2.3.1 Environmental Laws and Regulations in Brazil and Their Enforcement

In Brazil, significant progress has also been made in the evolution of laws and regulations which will affect the potential development of the subject waste-to-energy facilities. On August 3, 2010, the government of Brazil adopted a new National Policy on Waste Management which will have a major impact on the feasibility and prospects of all forms of solid waste recovery processes including waste-to-energy applications. Established by Federal Law No. 12,305/2010, the policy provides, among other things, guidelines on environmentally appropriate management of solid waste. According to the policy, solid waste management plans must be developed and implemented by generators of solid waste resulting from industrial, health care, mining and public activities, as well as commercial establishments that generate hazardous waste. The following lists the basic concepts, principles and foundations of the new national solid waste policy.

Basic Concepts

- 3Rs (reduce, reuse and recycle);
- Integrated solid waste management;
- Formal inclusion of waste pickers organizations;
- Post-consumption and logistics reversal (producer responsibility for solid waste);
- Cleaner production.

Principles and Foundations

- Sustainable development;
- Participation of civil society in its entirety in sustainable plans and programs;
- Integration of waste pickers in programs with actions for solid waste flow and availability;
- Environmentally sound waste collection, processing and disposal.

The new policy helps to emphasize the need to further improve solid waste management processes and conditions throughout the country. It will also provide an incentive for the development of cost-effective and environmentally sound management facilities that may include waste-to-energy facilities if they are technically and economically feasible. Although it took almost 2 decades of debate for the new solid waste policy to be enacted, it is an indication that the government of Brazil is now serious about finally gaining control of its solid waste management issues. The policy establishes that government, business and the public are responsible for the effectiveness of their actions aimed at ensuring compliance with provisions of the policy and the rules and regulations that will evolve from it. A critical element of the policy is the producer responsibility elements which could influence the actions that must be taken in developing solid waste management facilities and processes. This is an important regulatory issue that will need to be closely evaluated in any Feasibility Study associated with a potential waste-to-energy project. Another critical factor that will need to be closely evaluated in the Feasibility Study is the potential relationship between required recycling mandates resulting from the new policy and their effect on new proposed waste-to-energy systems.

Currently, there are a number of existing state laws and regulations that will also affect the feasibility of the evaluated projects. For example, on November 4, 2009, the government of the state of São Paulo through its Secretaria de Estado do Meio Ambiente, issued an Executive Order which established guidelines and conditions for permitting and operating thermal treatment processes in urban solid waste energy recovery units. One of the positive driving forces for this Executive Order was the fact that solid waste thermal treatment was listed as a global warming mitigation technology. (Brazil has established an aggressive posture in dealing with global warming issues and this has helped to support the interest in waste-to-energy applications.)

Prior to the issuance of these guidelines, the management of solid waste through waste-to-energy facilities was governed by São Paulo State Law #12.300 of March 16, 2006 which established a statewide policy. In addition, CONAM Ordinance #316 of October 29, 2002 also established procedures and criteria for the operation of solid waste thermal treatment systems. The 2009 Executive Order recognized that WTE systems can now be safely developed through an application of best available environmental control technology which, in developing the order, was viewed to be the prevailing standards of the European Union. PerformTech believes that the standards and guidelines presented in the Executive Order can readily be met by state-of-the-art waste-to-energy facilities utilizing technologies that are commercially available in both the United States and the European Union. The status and evolution of laws and regulations that directly relate to waste-to-energy facilities from both a solid waste management and environmental compliance (air quality, etc.) perspective will be an important issue that must be evaluated during any Feasibility Study. This is also an example of the type of study element that may be generic to different projects located in neighboring municipalities or in municipalities in the same state such as in the municipalities of Santo Andre and São Paulo.

2.3.2 Solid Waste Management in Brazil

At the federal level, responsibility for solid waste management is shared among three Ministries (Health, Environment and Cities). Proper coordination between them, however, has

historically been lacking. The Foro de Lixo e Cidadania (Waste and Citizenship Forum) was recently created to facilitate coordination of the various Ministry agendas and that of other governmental and non-governmental organizations involved in solid waste management. The new national solid waste policy creates a further basis for assuring greater coordination and cooperation among all stakeholders in the future.

The solid waste management situation varies significantly at the state level throughout Brazil. While some Brazilian states currently have specific solid waste legislation, others are in the process of preparing similar legislation or have yet to begin. Although there has been a significant increase in federal funding to the solid waste management sector in recent decades (particularly for the closure of open dumps), available resources are still perceived to be below what the sector needs to deal with all of the prevailing issues in the country.

Three of the projects evaluated in this DM are located in the State of São Paulo within the extensive urban metropolitan area centered on the city of São Paulo. Figure 2.2 presents an illustration of the general improvements that have been made in the overall environmental characteristics of solid waste disposal facilities in São Paulo state from 1997 to 2007. As shown, a significant proportion of the municipalities in the state are now served by controlled or sanitary landfills in comparison with disposal conditions that prevailed in 1997 when open dumps predominated. While this may not be totally indicative of the progress that has been made throughout the country (particularly in the country's rural areas and smaller cities), it is a significant indication that improvements are progressing thereby providing an increasing incentive for developing optional recovery projects such as those evaluated in this DM. PerformTech believes that Figure 2.2 is also reflective of improved enforcement of existing laws and regulations and the enactment of new provisions requiring more effective facilities and services especially in urbanized locales in Brazil.

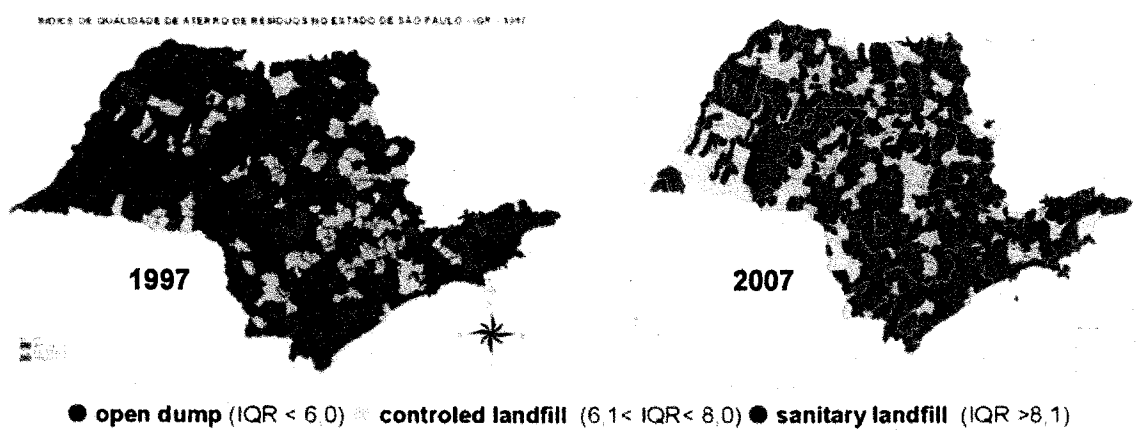


Figure 2.2
EVOLUTION OF LANDFILL DISPOSAL STANDARDS IN SAO PAULO STATE

PerformTech also believes that the improved conditions reflected in Figure 2.2 are extremely important in considering the future of solid waste management in the region since a better opportunity for developing waste-to-energy facilities is created because the priority for future investment does not need to be focused solely on the core mandatory solid waste management services including collection and disposal. (In many developing countries that are just beginning to deal with their solid waste problems, it is often difficult to consider costly optional facilities such as waste-to-energy applications when significant investments are required in the core mandatory collection and disposal processes to achieve even a basic level of service.)

Additionally, the improvements in disposal facilities serving municipal solid waste sources may also be an indication of an increased involvement by the private sector in designing, constructing and operating these facilities. While this helps to improve overall environmental conditions in Brazil, it may also significantly increase the cost of disposal for many municipalities. This can lead to an enhancement of the economic driver for any processing facility that seeks to reduce the amount of solid waste requiring ultimate disposal (which is the basic solid waste management premise of the proposed waste-to-energy projects.) However, worldwide experience has shown that, even though valuable energy can be recovered at waste-to-energy facilities, these plants will generally cost more than the direct disposal of municipal solid waste at state-of-the-art landfills. This creates another extremely important aspect of an effective Feasibility Study which must clearly define the anticipated economic impact of the evaluated projects when compared to other available solid waste management alternatives.

One of the other critical issues that will need to be closely evaluated in a Feasibility Study is the effect that the typical municipal solid waste composition in Brazil will have on the practicality of recovering its energy content. In many countries (particularly developing countries), municipal solid waste has a high organic content which, in turn, correlates to a high moisture level that can have a significant impact on the feasibility of technologies that make use of combustion as a primary process. While available solid waste composition data for Brazil has shown some variation, Figure 2.3 presents the general results of a recent detailed analysis of solid waste composition for the municipality of São Paulo. Based on the proportion of organic content shown, this becomes a crucial element in evaluating waste-to-energy projects both in terms of their technical feasibility and in the selection of a technological approach for recovering the solid waste's energy content.

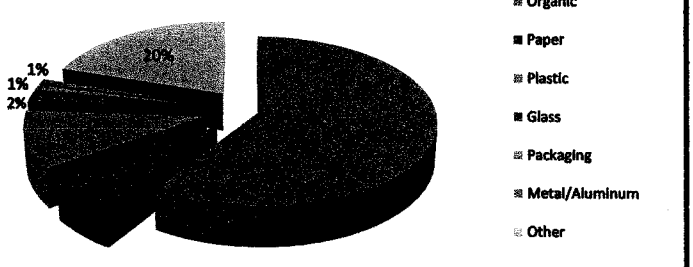


Figure 2.3
REPORTED SAO PAULO SOLID WASTE COMPOSITION

Another issue that will need to be addressed in implementing waste-to-energy facilities throughout Brazil will be the extent of potential opposition to their development. Historically, waste-to-energy facilities have been controversial because of concerns about ash residue disposal and air emissions (particularly in terms of the emission of heavy metals and trace

organic (dioxin and furan) compounds). This has often led to organized and strident opposition to the development of WTE facilities in many locales particularly in the United States. Current objective data from existing state-of-the-art waste-to-energy facilities clearly demonstrate that the environmental concerns associated with such facilities are now not warranted. This is primarily due to the effectiveness of currently available processing and environmental control technologies. However, some opposition remains. In Brazil, a source of that opposition may be the formal organized waste picker associations that have evolved throughout the country. By 2005, waste picker organizations already accounted for 13% of the raw material supplied to the recycling industries in Brazil. They represent 2.5% of the 14,954 enterprises identified in the country and have annual revenues of about R$4.5 million. These organizations generally believe that waste-to-energy facilities will eliminate their livelihood as a result of not allowing access to the materials recovery opportunities that they have historically utilized. This opposition has included the recent publication of media articles opposed to waste incineration as an acceptable solid waste management concept.

2.4 ENERGY SUPPLY AND PRODUCTION IN BRAZIL

Energy supply and cost are major development issues that countries throughout the world must also deal with in sustaining their economies and supporting their populations. The historical worldwide reliance on fossil fuels clearly leads to an understanding that these energy resources are finite and influenced by complex political situations. Governments typically now have an understanding that continued and sustained economic growth may be limited in the future by the availability of sufficient and affordable energy resources. As a result, solid waste materials are now viewed by some municipalities and energy utilities and suppliers as a potential energy source that would otherwise be lost through burial in landfills without achieving any recovery benefits. In parallel to this consideration of lost energy recovery benefits, governmental and environmental entities are now aware that MSW landfills are a major contributor of greenhouse gas (in the form of methane) to the atmosphere. This has resulted in a significant number of projects aimed at recovering and treating (primarily through combustion) the landfill gas which results from solid waste decomposition. While many of these projects simply combust (through flaring) the landfill gas as a means of mitigating the emission of LFG methane content, there are many LFG projects that also recover the landfill gas' energy content for a beneficial use such as the generation of electricity. Many countries (including the United States and countries of the European Union) have adopted environmental regulations aimed at minimizing the uncontrolled emission of landfill gas from solid waste disposal facilities. This has required major landfills in the U.S. to collect and treat landfill gas as a means of reducing undesirable air emissions prior to discharge. In parallel, programs have also been established to provide economic incentives for developing LFG collection and treatment systems at active or closed landfills so as to reduce greenhouse gas emissions from these facilities. The availability of these economic incentives is particularly advantageous in developing countries where the funds derived from these programs can then be applied toward general improvement of other solid waste management processes and facilities.

Because of its economic growth, Brazil has a rapidly growing electricity production system with a current capacity of about 100 GW (1 GW equals 1 million kilowatts). Brazil's energy supply is

dominated by hydroelectric power stations, which comprise about 90% of total existing capacity. Currently, Brazil is the world's 10th largest energy consumer and, by far, the largest on the South American continent where the country's electricity market is almost double that of the rest of South America combined.

Brazil's strong economy and its growing industrial base have required significant energy generation growth to keep up with the country's expanding economy. Between 1998 and 2008, Brazil's installed generating capacity more than doubled from 49.6 GW to 102.6 GW. This increase in generating capacity was required due to demand increase as Brazil's economy has grown. (Currently, about 47% of Brazil's electricity production is absorbed by industrial uses with residential and commercial use accounting for about 22% and 17%, respectively.) Power consumption is expected to grow by almost 16% in the coming years. Because of this, the government of Brazil estimates that more than US$ 24 billion in public and private investment will be needed over the next decade to meet the country's power generation needs. In May 2010, the Brazilian Secretariat of Energy Planning and Development released a new National Energy Policy directive and priorities for a countrywide energy expansion in the near term future. This plan projects that, by the year 2030, Brazilian energy supply will need to significantly increase to meet demand. PerformTech believes that alternative energy sources such as municipal solid waste-to-energy facilities will be an important element in the projected energy supply increase.

Brazil is currently the worldwide leader in supplying energy from renewable sources which is primarily due to its significant hydroelectric resources. (Table 2.2 presents the general mix and growth of Brazilian energy sources in recent years which demonstrates the dominance of hydroelectric sources.) Brazil's current energy policy emphasis on renewable sources is a function of the country's vast natural resources and may also help to stimulate the growing interest in developing waste-to-energy facilities as a future renewable energy source. During PerformTech's meetings with a number of power suppliers in Brazil, it was learned that some power utilities in Brazil are exploring direct investments in waste-to-energy applications as potential new sources of energy. An example of such an evaluation is the current Feasibility Study by Empresa Metropolitana de Aguas e Energia S.A (EMAI) in São Paulo state where the utility is exploring the feasibility of developing WTE facilities for a number of the coastal cities in the state. In addition, in a meeting with the electricity distribution company in Florianopolis, PerformTech learned that they completed a feasibility analysis for developing a waste-to-energy facility for the region about 4 years ago.

Table 2.2

ELECTRICITY SUPPLY MATRIX (GWh)

Source	2008	2009	Variation
Hydroelectric	369,556	390,988	5.8%
Nuclear	13,969	12,957	-7.2%
Natural Gas	27,778	13,332	-53.7%
Coal	6,205	5,214	-16.0%
Petroleum	15,628	12,724	-18.6%
Biomass	20,681	23,877	-15.5%
Industrial Gas	8,301	7,066	-14.9%
Imports	42,211	39,666	-6.0%
TOTAL	**505,330**	**505,824**	**0.1%**

Source: Balanco Energetico Nacional 2009

Historically, the ownership of power generation infrastructure in Brazil was dominated by public agencies through a federally controlled (53.9%) holding company (Eletrobras) and its four main regional subsidiaries (FURNAS, CHESF, Eletrosul and Eletronorte). A significant proportion of the generation capacity controlled by Electrobras was provided by the Itaipu hydroelectric plant, which is a 12 GW facility jointly owned by the governments of Brazil (through Eletrobras) and Paraguay. Most of the power generated by this facility is supplied to Brazil.

Prior to 1995, the distribution of generated electric power was accomplished through about 50 regional distribution companies that were mostly owned by Brazil's state governments. Around 1995, with the urging of the World Bank, the government of Brazil began to implement reforms intended to provide more private sector involvement in power distribution infrastructure and management. Accordingly, over the following six years, most of the public distribution companies were privatized with the strong involvement of United States and European Union companies. However, little of the power generation capacity was sold and privatized. In addition, during the same time period, there was very little new generating capacity built despite a demand growth of about 5% per year or more.

The recent interest in the growth in power supply infrastructure has been enhanced by the policy of the Lula administration in creating energy auctions as the primary means for electrical distribution companies to take part in projects that will allow them to acquire energy for their customers. (The continuity of this policy after the recent presidential elections has yet to be determined. However, with the election of a new president (who used to be the country's Minister of Mines and Energy) from the same political party, there is a strong possibility that current policies will continue.)

In 2004, the government of Brazil created a new energy planning agency (EPE - Empresa de Pesquisa Energetica) under the Ministry of Mines and Energy. The size and influence of this agency has grown since its formation as a result of an evolving realization of the importance of energy planning in securing Brazil's economic future. For planning purposes, demand for electricity is forecast by EPE up to 20 years in the future and EPE regularly carries out studies to determine the most economical way of meeting this future demand. When the periodic evaluation process is completed, EPE carries out an auction and the company that bids the lowest price for new power supply is awarded a contract to build and operate the new facility or facilities to provide that power. As a result of the auction and the implementation of the winning facilities, Power Purchase Agreements (PPA) are signed with the distribution companies.

The Brazilian government recently held a wind, hydroelectric and biomass auction that was expected to derive US$ 5.5 billion in investments in new renewable energy sources. The resulting investments will come primarily from private enterprise. The auction, which will contract power from 89 wind farms, small hydroelectric and biomass plants will add an installed capacity of about 2,890 MW to Brazil's national energy supply matrix. The contracts for energy to be provided by small hydroelectric plants will run for 30 years, while those for biomass and wind generation will run for 20 years. Brazil's alternative energy auction was conducted through a process whereby the government first announced the energy demand required by distributors to serve the energy supply market by 2013, and then potential electricity

generators competed to provide energy to fill that demand at the lowest price. The Brazilian government held a similar auction in December 2010 aimed at meeting the national demand projection for 2015. The auction was open to all generation sources, including alternative sources such as wind and biomass; small, medium and large-sized hydroelectric power plants; and natural-gas-fueled thermal plants. This auction process may ultimately be a mechanism for future waste-to-energy facility energy sales where WTE project developers may seek to enter their projects into the auction process to fulfill future projected energy needs. This could result in securing financeable energy sales agreements that will serve as the basis for the financial/economic structure of new waste-to-energy facilities. Because of the capital-intensive nature of waste-to-energy facilities that are built to state-of-the-art performance and environmental standards, financing will, most likely, be directly contingent on guaranteed waste supply and energy sales. The December 2010 auction process may help to establish the basis for the energy sale component of the economic feasibility of the subject facilities.

2.5 THE PERFORMTECH DEFINITIONAL MISSION APPROACH

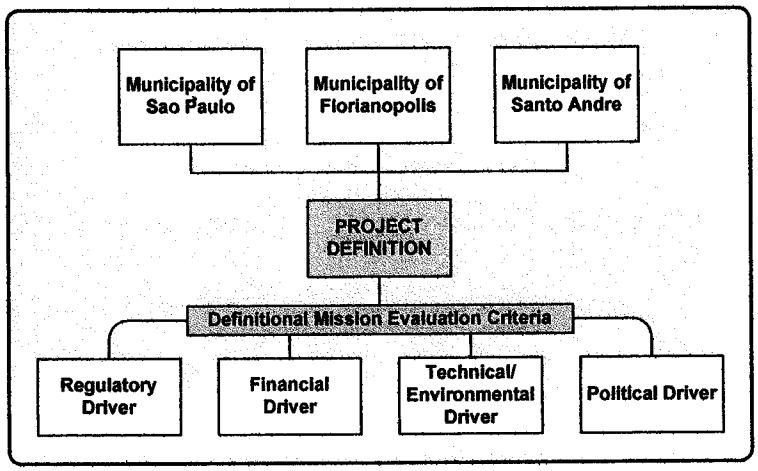
The approach taken by PerformTech to accomplish the Brazil Waste-to-Energy Definitional Mission included the following activities:

1. Written material provided by USTDA and the project sponsors was reviewed to define the technical and institutional characteristics of the proposed projects.
2. PerformTech met with project sponsor staff or representatives (as well as other stakeholders) to discuss the reference projects and to pose initial questions that PerformTech had concerning the projects.
3. An extensive internet data search was undertaken to find additional background information on the projects and conditions in Brazil and, in particular, the regions where the proposed waste-to-energy projects are located.
4. Upon determining whether any of the projects had sufficient merit for further consideration by USTDA, PerformTech prepared draft Terms of Reference (TOR) and consultant budgets for the work that could result from USTDA's support. Given the common basis for a feasibility evaluation of any WTE facility, PerformTech believes that many of the Feasibility Study elements for each evaluated project are similar and may actually overlap. This is particularly the case for projects located in the same state such as the São Paulo and Santo Andre projects.
5. The draft TOR and consultant budget was then submitted to the project sponsors from any municipality or other governmental entity for which PerformTech is recommending USTDA assistance for their review and ratification prior to completion of this Definitional Mission report. (A copy of Project Sponsors' concurrence letter concerning the draft TORs and budgets is presented in Annex 2 of this DM report.)
6. Based on the results of the DM investigation, conclusions and recommendations concerning each of the proposed projects were generated by PerformTech and are presented in Section 15 of this report.

This Definitional Mission is intended to assess the technical, development, economic and financial merits of the proposed waste-to-energy projects and to help determine whether the proposed projects comply with prerequisite USTDA development and assistance criteria. To accomplish this, the Definitional Mission evaluates whether the identified projects will:

- Help improve solid waste management service and infrastructure conditions in Brazil and, through possible replication, in other countries in the region;
- Be technically, financially and economically sound and based on commonly accepted best practice and sustainable solid waste management approaches;
- Be a development priority for the project sponsors;
- Stimulate a meaningful level of exports of solid waste management and environmental equipment, technology and services from the United States to Brazil; and
- Enhance the implementation process of the identified projects as a result of USTDA participation through full or partial funding of the feasibility studies or any other form of project development assistance such as reverse trade missions, etc.

PerformTech's Premise for Evaluating Projects - The development potential of any project in any country can be defined by the quality and sufficiency of its implementation drivers. This project driver concept is based on the premise that the implementation of any publicly developed project is influenced by a number of factors that **drive** the project to completion. The primary development drivers that are applicable to environmental projects (which include waste-to-energy projects) are illustrated in Figure 2.4. PerformTech believes that effective and sufficient development drivers keep a project implementation process moving forward. They also allow a project to remain in a priority position throughout its development process while competing for the necessary resources (financial, personnel, etc.) required for full implementation by project sponsors. A capital intensive project that may engender some controversy (such as waste-to-energy facilities) requires significant and sufficient drivers to be successfully implemented. Project development drivers applicable to the subject WTE projects include the following:



DEFINITIONAL MISSION PROJECT EVALUATION MODEL
Figure 2.4

- The **regulatory driver** recognizes that sufficient environmental legislation and regulatory enforcement must exist or, at a minimum, be under serious development to support (or even mandate) the implementation of the project. The regulatory driver recognizes that

having laws and regulations by themselves do not necessarily mean that the driver is sufficient. Laws and regulations must be accompanied by the appropriate means (and political will) to effectively enforce them. This is often a major problem in many developing countries where laws and regulations exist but are not effectively enforced.

- The **financial driver** recognizes that a project will only be developed if there is a means of financing it once it has been technically and institutionally defined (through feasibility studies, etc.) and designed. In many cases, this may mean that project implementation will be a function of the willingness of the government of Brazil and financial institutions such as the World Bank, Inter-American Development Bank or Brazilian Development Bank to undertake projects in a particular sector. Alternatively, the interest of private companies who may develop these facilities as business opportunities can also be an important element in defining the financial driver for waste-to-energy projects.
- The **technical/environmental driver** recognizes that the project must be technically viable and that reasonable technology alternatives must be available to accomplish a desired result (such as the improvement of solid waste management through volume reduction or the recovery of energy as an alternative energy source) in an effective and sustainable manner. Commercially available technologies must exist to accomplish the desired result within the limitations (solid waste composition, etc.) that may exist in any particular locale.
- The **political driver** recognizes that the project must be a high priority for political leadership who have decision-making powers pertaining to the manner in which the project is financed, funds allocated for its development, or permits/approvals issued through a regulatory process. Political support is crucial to WTE project implementation. The political driver may be affected by the overall economics associated with developing waste-to-energy facilities which, in many cases, have led to solid waste management costs that exceed the cost of conventional disposal in sanitary landfills that comply to sound international standards. The recent elections in Brazil may have a favorable impact in quantifying the value of the political driver. With the recent election of a new president from the same party as the previous president, policy continuity is expected which allows PerformTech to evaluate potential future directions from the context of current policies and initiatives.

PerformTech's perception of the impact of the above standard drivers on the subject projects is presented as a basis for the recommendations found in Section 15 of this DM report. In a general sense, PerformTech believes that the overall development characteristics and drivers for waste-to-energy projects in Brazil are positive but that specific conditions in each of the evaluated locales affect PerformTech's individual recommendations concerning each of the investigated projects.

3
PROJECT DESCRIPTIONS

At the beginning of the Definitional Mission, USTDA provided initial direction and information concerning the proposals that they received from three potential project sponsors. This included requests from the municipalities of São Paulo, Santo Andre, and Florianopolis for consideration of their proposed waste-to-energy facilities. During the DM field work, USTDA's in-country representative in Brazil further requested that PerformTech also review two other potential projects in São Bernardo de Campo and Brumadinho. (During the DM field work, a representative of PerformTech's field team met with municipal officials in São Bernardo de Campo and learned that they had already completed a Feasibility Study and were actively soliciting proposals for the implementation of their proposed 1,000 tonne per day waste-to-energy facility.) In evaluating the Brumadinho situation, the PerformTech field team met with a representative of a United States company seeking to develop the waste-to-energy gasification application in Brumadinho.

Project locations, population and approximate solid waste generation for the evaluated municipalities are shown in Figure 2.1 and Table 2.1. As shown in Table 2.1, the subject municipalities vary significantly in population. The population in each municipality is an important factor in defining the quantity of solid waste that must be managed by the municipality. (The municipal solid waste generation shown in Table 2.1 was determined through the application of a population-based unit solid waste generation rate derived from typical urban conditions in South America.) Additional information relative to each municipality and project is presented below.

3.1 SÃO PAULO

The municipality of São Paulo, with an estimated population of about 11 million people, is the largest city in Brazil and in the southern hemisphere and is the capital of São Paulo state. Currently, São Paulo is the world's seventh largest metropolitan area. As the business center for Brazil, São Paulo exerts a strong national and regional influence in commerce and finance. With its population living within an area of 1,523 square kilometers (588 sq. mi.), São Paulo is the most populous city proper in the Americas. The city also lies at the center of the heavily urbanized São Paulo metropolitan area, which had an estimated total population of about 19,890,000 people in 2009 in an area of about 7,944 square kilometers (3,067 square miles). (Two of the other evaluated municipalities (Santo Andre and São Bernardo de Campo) are located within the São Paulo metropolitan area and physically abut the city of São Paulo.)

São Paulo is currently estimated to be the 10th richest city in the world, and is expected to be the 6th richest by 2025. Its gross domestic product in 2006 was R$ 282,852,338,000 (which is equivalent to approximately 12.3% of the total Brazilian GDP and represent about 36% of all production of goods and services from the state of São Paulo. It has been estimated that the

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determined to be significantly important to the potential development of a WTE facility in Santo Andre as will be explained in greater detail below.

PerformTech is not recommending funding assistance for the municipality of São Paulo for a Feasibility Study for their proposed waste-to-energy investigations at this time. This is due to an existing issue associated with the current solid waste management concession contractual structures in São Paulo which may preclude the development of waste-to-energy facilities until after the concession contract periods are over in 2024. It appears that the current concession agreements in Sao Paulo make it impossible to develop waste to energy facilities in São Paulo without the direct involvement of the concession contractors. Meetings with representatives of both concession contractors demonstrated that they have little interest in developing waste to energy facilities at this time.

3.2 SANTO ANDRE

The municipality of Santo Andre is located in the state of São Paulo and has an estimated population of 673,396 people based on the 2009 census. Santo Andre is located adjacent to the municipality of São Paulo in the Metropolitan Region of São Paulo and is one of a group of municipalities known as Greater ABC (A = Santo André, B = São Bernardo do Campo, C = São Caetano do Sul) Region. The municipality has an area of about 175 square kilometers, resulting in a population density of 3,816 inhabitants per square kilometer.

3.2.1 Solid Waste Management Conditions in Santo Andre - In its original correspondence to USTDA, Santo Andre's solid waste management agency (Servico Municipal de Saneamento Ambiental de Santo Andres - SEMASA) reported that it produces about 800 tons of municipal solid waste per day. The city also reported a low recycling rate where only about 698 tons of recyclables are collected each month. This equates to approximately 3% of the municipality's total solid waste stream. While the original request from the municipality of Santo Andre made reference to a potential interest in evaluating plasma treatment of urban waste, PerformTech's meetings and follow-on discussions with the municipality did not reveal a specific focus on any particular technology in exploring their waste-to-energy interest.

In addition to its residential population, the city of Santo Andre is home to a number of heavy industrial plants. These industrial plants (chemical processing, tire manufacturing, etc.), which are located in close proximity to each other, could be potential users of energy in the form of either steam and electricity.

Santo Andre has a landfill which, at the time of the site visit by the PerformTech Field Team, was closed. Currently, the municipality's solid waste is transported to a private landfill in an adjacent municipality (Maua). The construction of additional short-term disposal capacity to receive solid waste was almost completed at the city's landfill and the landfill has the further horizontal and vertical expansion potential for an additional 15 years of disposal capacity. The proposed expansion area at the municipality's landfill site includes an existing building formerly used for a composting operation and currently used by a recycling cooperative.

One potential site for a WTE facility has already been identified within the existing boundary for the municipal landfill site. The site is located in a natural valley that could pose a technical and regulatory issue concerning proper dispersion of air emissions from a WTE plant. (Siting criteria

is one of the key issues to be investigated in a comprehensive Feasibility Study and is reflected in the draft Terms of Reference presented in this DM report for a potential project in Santo Andre.) Currently, there is an infectious medical waste treatment facility in an area adjacent to the proposed WTE site. Because of the lack of direct steam users in the landfill locale, a WTE facility constructed at the proposed landfill site is likely limited to the generation of electricity for internal use and sale. The industrial facilities in the city are likely too far for an economic transport and distribution system for direct steam sale if the proposed WTE facility is located at the landfill site. (This is also one of the issues that would need to be explored in a Feasibility Study along with the distance to the existing power grid.)

Currently, landfill gas is being discharged from the landfill through passive vents where escaping gas is being flared (combusted). The vent flaring was initiated prior to creation of the Clean Development Mechanism (CDM) of the Kyoto Protocol and, as a result, does not generate carbon offset credits for the municipality.

Two relevant reports are available which provide additional background on solid waste management and MSW characterization in Santo Andre and will be available for any future Feasibility Study of a potential waste-to-energy application in the municipality. These reports include the following:

- Relatorio Caracterizacao Gravimetrica Dos Residuous Solidos Urbanos Domiciliares Do Municipio de Santo Andre. 2008.
- Caracterizacao Do Residuos Solidos Urbanos Do Municipio de Santo Andre. December 2005.

3.2.2 Administrative Structure for Solid Waste Management - SEMASA, as a municipal enterprise, is responsible for the city's solid waste operations including collection and landfill disposal within the city. SEMASA has an annual budget of about Rs $300 million. In addition to its solid waste management responsibilities, SEMASA provides a range of other environmental services including water treatment/distribution and wastewater collection and treatment.

3.2.3 Waste-to-Energy (WTE) Facility Development Considerations - SEMASA is reviewing the potential for WTE as a treatment option to reduce the volume of the municipality's solid waste stream for disposal. In early September 2010, SEMASA and other municipal officials participated in a study tour of various WTE facilities in Europe. According to a SEMASA official interviewed during the DM, a WTE project is expected to be procured under a public-private partnership approach, probably through a Build-Operate-Own-Transfer (BOOT) mechanism. Under a BOOT approach, the proposed WTE facility would be designed, built and operated by a private sector company that would also finance the facility. The facility would then be transferred to SEMASA, most likely, after a 20-year contract operations period. Because of this preferred project procurement approach, PerformTech focused a portion of the recommended Terms of Reference contained in this DM report on an analysis of minimum performance criteria rather than on a detailed technical definition (preliminary design, etc.) of a single technological approach. This would provide some flexibility in the procurement approach in selecting a contractor representing various technologies.

An important issue that could ultimately hinder development of a WTE facility in Santo Andre (in any of the subject municipalities, for that matter) was a statement by SEMASA officials that Brazilian laws and regulations limits the fees that can be paid (tip fee) for solid waste that would go to a processing facility to no more than the amount being paid for landfill disposal. The private landfill being used on a temporary basis by Santo Andre charges Rs $65 per metric ton. This includes the transport cost to the disposal site. At the city's landfill, the tip fee is Rs $45 per metric ton. Accordingly, any Feasibility Study resulting from USTDA support will need to closely focus on the comparative economic factors (tipping fees, etc.) of any new WTE facility and the current alternative disposal facilities available in the region. Based on PerformTech's experience in developing waste-to-energy projects, this is a major issue that must be investigated in the proposed Feasibility Study because of the high costs often associated with waste-to-energy applications built to sound practice standards.

In follow-up meetings after completion of PerformTech's fieldwork, USTDA's regional representative, Rodrigo Mota, facilitated direct meetings between the municipality and EMAI which has resulted in a potential working relationship between Santo Andre and the regional utility for development of the proposed WTE facility. PerformTech believes that this is a significant development that could improve the development aspects of the project by enhancing the importance of the recovered electricity from the project. As a result of this potential relationship, PerformTech has included an evaluation of alternative institutional arrangements between the municipality and utility in the proposed Feasibility Study Terms of Reference.

PerformTech is recommending funding assistance from USTDA for completion of a Feasibility Study in the municipality of Santo Andre for its proposed waste-to-energy facility. Based on the Terms of Reference and budget established for this feasibility analysis, PerformTech recommends that USTDA provide funding of $468,480 for this Feasibility Study. In addition, PerformTech is recommending that the proposed feasibility study include elements to support an evolving working relationship between SEMASA (Santo Andre's solid waste management agency) and Empresa Metropolitana de Aguas e Energia S.A (EMAI - the state energy utility in Sao Paulo state). In addition, the proposed Terms of Reference for the proposed Feasibility Study includes an investigation of the technical and economic feasibility of developing a landfill gas recovery system at the Santo Andre landfill in addition to the subject conventional waste to energy application.

3.3 SÃO BERNARDO DE CAMPO

The municipality of São Bernardo de Campo is located in the state of São Paulo adjacent to the municipality of São Paulo and has an estimated population of 810,979 people based on the 2009 census. The municipality's total land area is about 408.45 square kilometers resulting in a population density of 1,962 inhabitants /square kilometers. As is the case with Santo Andre, São Bernardo de Campo is one of the Greater ABC regional municipalities.

From the 1950s on, the general economy of São Bernardo de Campo was based on the auto industry with plants manufacturing a variety of automobile brands (Volkswagen, Ford, Scania, Toyota, Mercedes-Benz, Karmann Ghia). In addition, the auto parts industries that supported

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4

PROJECT SPONSOR'S CAPABILITIES AND COMMITMENT

A key aspect of the DM field work was to define and evaluate the capabilities and commitment of each potential project sponsor for implementing the proposed waste-to-energy projects should USTDA decide to provide funding or another form of assistance. This is particularly important in developing WTE facilities because of their technical complexity, high capital cost and resulting potential economic impact on each municipality. In the case of the recommended Santo Andre Feasibility Study, the project sponsor for USTDA purposes is the municipal governments.

As a result of its meeting in the municipality of Santo Andre, PerformTech was impressed with the knowledge and apparent technical, monitoring and management capability of the municipal officials that participated in PerformTech's meetings and site visits. This included meetings with representatives of the municipal enterprises directly responsible for providing solid waste management services as well as with the municipal officials that were responsible for monitoring the activities of these entities on behalf of the municipalities. A significant level of technical sophistication was apparent in the manner by which solid waste management services are currently provided and monitored.

Generally, the development of waste-to-energy facilities (especially for the size facilities that would be required in Santo Andre) will, most likely, be developed through significant private contractor involvement possibly through public and private sector participation (PPP) development/procurement mechanisms such as Design/Build/Operate (DBO) or Build/Operate/Own/Transfer (BOOT) approaches. If this is the case, the primary municipal responsibilities will be to monitor the overall performance of the WTE facility and administer its contractual relationship with the entity responsible for physically implementing the facility. PerformTech believes that, based on its dialogue and information review concerning the municipality of Santo Andre, the project sponsors have the capabilities to successfully fulfill their responsibilities concerning the proposed waste to energy project if developed through a conventional public/private procurement process.

Further, the new solid waste management policy in Brazil will help to assure that municipalities throughout the country undertake their solid waste management responsibilities in a manner that prevents environmental degradation. As a result, a strong regulatory environment will help to assure the ongoing commitment of any municipalities that undertake the development of solid waste processing and disposal facilities to compliance with effective standards.

5 IMPLEMENTATION FINANCING

5.1 THE FINANCIAL NATURE OF SOLID WASTE MANAGEMENT PROJECTS

As a result of its evaluation, PerformTech is recommending USTDA support for the Santo Andre waste to energy project Feasibility Study. The estimated capital cost of this project based on a projected application of a conventional 1,000 tonne per day mass burn WTE technology is US$ 200 million. This capital cost is based on an assumption that it will be determined during the Feasibility Study that solid waste from outside of Santo Andre would also be available for processing at the proposed WTE facility.

One of the principal issues commonly associated with environmental or public service sector projects that are considered for support funding from USTDA is defining the means by which any proposed project can be financed. The difficulty in achieving environmental project financing is often an impediment to actually implementing projects irrespective of their technical and development potential. In case of waste-to-energy facilities, however, the power production capabilities of these systems can have a significant influence on their financial development prospects. In some Brazilian locations, the entities responsible for power generation and distribution have investigated the possibility of developing waste-to-energy facilities as a means of creating additional generation capacity for their customers. These utilities can generally provide the means by which financing could be achieved or, at a minimum, can provide the contractual basis by which produced energy can be sold to the benefit of a waste-to-energy project's economic and financial structure. The actions in evaluating and supporting waste to energy projects in the São Paulo region by EMAI is an example of an energy utility's positive position in the development of such facilities. Further, the potential evolving relationship between EMAI and SEMASA in Santo Andre can be an important factor in achieving financing of the proposed WTE facility.

The public sector has most often been responsible for developing public service infrastructure projects. Municipalities have often had to develop solid waste processing and landfills facilities to meet ISWM needs and regulatory requirements. The capital intensive nature of conventional waste-to-energy facilities often makes it difficult for municipalities to implement such projects without outside assistance. For publicly owned facilities, qualified contractors are normally required to minimize the technical and performance risks associated with these facilities. Additionally, throughout the world, the development of waste-to-energy facilities has often been achieved with the strong participation of the private sector that, as the developer of such projects, seeks to establish the necessary financeable contractual relationships with solid waste sources for processing feedstock supply and energy markets for purchase of recovered energy.

In addition to the project financing elements of the above development scenarios, U.S export potential from waste-to-energy projects can also be realized through the sale of specific

equipment and services to public or private sector project developers for inclusion in comprehensive projects. The technical complexity of state of the art waste-to-energy facilities requires varied, often sophisticated, technical systems and equipment for their overall function. As a result, smaller scale financing opportunities, such as those provided through the U.S. Export/Import Bank, can be important. This could include technical equipment associated with the direct processing of the solid waste as well as technically complex air pollution control equipment commonly required by international standards such as those found in the United States and the European Union.

5.2 FINANCING CONDITIONS IN BRAZIL

In September 2009, Moody's Investor Service became the last of the three main rating agencies to promote Brazil's sovereign debt ratings to investment grade. The investment grade rating results from a number of factors including Brazil's strong banking system, high level of foreign currency reserves and quick recovery from the global recession experienced in recent years. These factors have led to significant recent national and foreign investment in Brazil. For example, the 2008 foreign direct investment in Brazil reached a record US$ 45.1 billion which was up more than 30% over the prior year. The historical trend in foreign direct investment and GDP in Brazil is shown in Figure 5.1 below which demonstrates the general evolution of Brazil's economy and the perspective of foreign investors in Brazil's financial prospects.

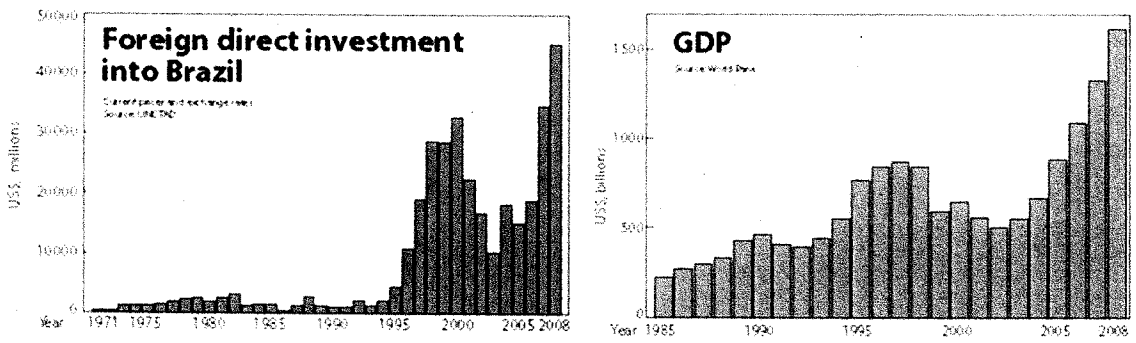

Figure 5.1
RECENT ECONOMIC GROWTH IN BRAZIL

The current financial strength of Brazil evolved from the late 1960s and early 1970s when Brazil was transformed by governmental leadership through a significant general infrastructure expansion. This was accompanied with a strong effort by the government to increase the country's overall industrial base which resulted in a substantial increase in the number of industrial facilities. This also resulted in a major shift of the country's population base to the southeast region of the country (particularly in the São Paulo region) where boom conditions were created. Initially, during this high growth period, other governmental initiatives that may be relevant to potential development of waste-to-energy projects in Brazil include:

- The Public-Private Partnership Law, promoting infrastructure investment of R$ 66 billion. This could generate significant business opportunity for U.S. suppliers once fully implemented.
- The Acceleration Growth Program (known as "PAC Plan") launched in 2007. This program has driven investments in the areas of energy, transport, housing and sanitation. In addition, the PAC Plan focuses on the construction program for the development of the upcoming major sports events (2014 FIFA World Cup and 2016 Olympic Games) which will also create opportunities for United States environmental equipment and service suppliers.

Each of the above may have a favorable impact on the ability to finance the proposed waste-to-energy facilities. Further, existing programs from key financial entities may also have an impact on project financing. Some of these key programs include the following:

5.3 UNITED STATES EXPORT-IMPORT BANK

The U.S. Export/Import (Ex-Im) Bank is an independent U.S. Government agency which assists in financing overseas sales of U.S. goods and services. Established in 1994 to increase support for exports of environmentally beneficial goods and services, the Ex-Im Bank has grown from 10 transactions in 1994, to a high of 68 in 2007. It's current total portfolio exceeds US$3 billion.

Ex-Im Bank has several different programs available to support the export of environmentally beneficial goods and services which can include important technical components of waste-to-energy facilities. Under its normal environmental financing program, Ex-Im Bank offers short, medium and long-term support for transactions with the private sector, and short and medium-term support for public buyers. Capital equipment supported by Ex-Im Bank's medium term loans or guarantees may have up to a seven year term or a maximum funding limit of US$10 million. Long-term loans of up to ten years are also available for private sector borrowers. Ex-Im Bank programs fit into four major categories including:

1. **Working Capital** - The Working Capital Guarantee Program significantly reduces a lender's risk on working capital loans made to creditworthy U.S. companies for export-related activities.
2. **Insurance** - Ex-Im Bank offers a variety of export credit insurance policies to exporters and financial institutions to reduce repayment risks on foreign receivables due to political or commercial events. Policies may cover single or repetitive sales to single or multiple buyers. As determined by the product, repayment terms are available for short-term sales (up to 180 days, exceptionally 360 days) and medium-term sales (up to five years).
3. **Direct Loans** - Direct loans to foreign buyers enable exporters to overcome financing gaps and compete against foreign subsidized competition with the lowest interest rates allowed under international guidelines.
4. **Guarantees** - By reducing repayment risks, guarantees allow lenders to offer financing to exporters' foreign customers with fixed or floating competitive rates. Goods and services sold on repayment terms of one year or more are eligible for loans, guarantees, and insurance.

Ex-Im Bank's financing programs are designed to help mitigate the risk for U.S. environmental companies and also offer competitive financing terms to international buyers for the purchase of U.S. made environmental goods and services. EX-IM Bank's active portfolio includes financing for U.S. exports of:

- Renewable energy equipment
- Energy efficiency technologies
- Wastewater treatment projects
- Air pollution technologies
- Waste management services
- Other various environmental goods and services

The means by which this assistance can be provided include products such as:

- Short-term working capital
- Export credit insurance
- Medium-term insurance
- Medium- to long-term loan guarantees
- Project and structured finance
- Long-term direct loans

Ex-Im Bank has had a more than 60 year working relationship with Brazil and has helped finance purchases for a wide range of sectors, including oil and gas, agriculture, transportation, telecommunications, and textiles.

5.4 MULTINATIONAL AND NATIONAL BANK FINANCING IN BRAZIL

The World Bank Group - The World Bank Group including the International Bank for Reconstruction and Development (IBRD - commonly known as the "World Bank") and the International Finance Corporation (IFC), has worked with both the public and private sectors in Brazil. The IBRD involvement in Brazil includes a current solid waste management project in association with Caixa Econômica Federal which is intended to support development of sound solid waste management practices throughout the country.

Through its experience and capabilities, the World Bank can serve the development of solid waste management projects by helping to ensure that the needs and concerns of all parties are included in the development process in addition to meeting the conditions of the World Bank's financing programs. In its funding assistance, the World Bank's technical and regional expertise is usually applied to building local government capacity to develop and sustain the supported projects. They also assist in the preparation of public-private partnerships and concession agreements, the conducting of transparent bidding processes, and ensuring of the financial and technical viability of subprojects. (This can be particularly important in developing waste to energy projects.) The World Bank can also bring considerable regional experience to bear on the sector, through lessons learned in environmental developments in Argentina, Colombia, Mexico, and elsewhere.

In its current solid waste management project in Brazil, the World Bank is providing financial support for infrastructure investments in solid waste disposal and treatment. Through a credit line of US$ 195 million, this component will finance public or private sector infrastructure investments to improve final solid waste disposal and treatment within comprehensive ISWM strategies, to reduce negative environmental and health impacts associated with improper solid

waste management. The project will assist states and municipalities in Brazil in the preparation of subprojects and institutional arrangements for private sector participation in waste treatment and final disposal. Carbon Finance opportunities will also be assessed and, where viable, integrated into subproject initiatives. The component supports three types of principal activities:

1. Construction and operation of sanitary landfills;
2. Closing of open dumps and management of associated environmental impacts; and
3. Development of alternative waste treatment facilities (e.g., transfer stations, composting and recycling facilities).

The IBRD has provided limited financial support for WTE in some of the developing countries in which it operates. The World Bank's position on WTE as well as incineration in general is provided in a report (Municipal Solid Waste Management: A Decision-Maker's Guide; 2000). Their stated position is that:

> *Municipal solid waste (MSW) incineration plants tend to be among the most expensive solid waste management options, and they require highly skilled personnel and careful maintenance. For these reasons, incineration tends to be a good choice only when other simpler, and less expensive choices are not available.*

The IFC's potential role, as defined on its web site, is provided below. In addition to financial loans, the IFC provides a range of advisory services to support private sector development.

> *IFC fosters sustainable economic growth in developing countries by financing private sector investment, mobilizing capital in the international financial markets, and providing advisory services to businesses and governments.*
>
> *IFC helps companies and financial institutions in emerging markets create jobs, generate tax revenues, improve corporate governance and environmental performance, and contribute to their local communities. The goal is to improve lives, especially for the people who most need the benefits of growth.*

While the IFC has a solid waste management specialist on staff and has assisted in the development of a number of solid waste management projects, PerformTech is not aware of any waste-to-energy projects that have received IFC assistance. However, there is no known formal policy limiting the IFC's participation in such projects.

Inter-American Development Bank - The Inter-American Development Bank (IDB) supports efforts by Latin American and Caribbean countries to reduce poverty and inequality. Established in 1959, the IDB is the largest source of development financing for Latin America and the Caribbean, with a strong evolving reform agenda that seeks to increase the IDB's development impact in the region. The IDB's shareholders are its 48 member countries, including 26 Latin

American and Caribbean borrowing members who have a majority ownership of the IDB. In recent years, the IDB has sought to support projects aimed at:

- Promoting stable and environmentally sustainable growth;
- Reducing poverty, promoting social inclusion, and enhancing social and regional equity;
- Supporting institutional strengthening and promoting democracy and citizen participation.

This has established a number of ongoing support priorities which include:

- Productivity and infrastructure, with an emphasis on small and medium-sized enterprises and the use of public-private partnerships for the construction and operation of new infrastructure;
- Poverty, equity, and workforce development, with a focus on programs for income distribution as short-term measures for poverty alleviation, and on education and health as sustainable means of improving equity;
- Living conditions and efficiency in cities, integrating measures to fight urban poverty with improvements in habitability, efficiency and environmental quality; and
- Institutional strengthening and modernization of the government, with an emphasis on subnational governments.

Specifically with regard to WTE, IDB has recently solicited a proposal from Columbia University's Earth Engineering Center (which is also the home of the previously referenced Waste to Energy Research and Technology Council - WTERT) to undertake an assessment of the potential for waste-to-energy applications in South America. The report is intended to develop case studies for Brazil, Mexico, and Argentina. The final report is expected to be available by May/June 2011. This project may be an indication of the IDB's growing interest in providing financial or other assistance to regional entities seeking to develop waste-to-energy facilities.

The Brazilian Development Bank - The Brazilian Development Bank (BNDES) is one of the main financing entities for development projects in Brazil. Since 1952, BNDES has played a major role in providing for the expansion of industry and infrastructure throughout the country. To accomplish this, BNDES offers a number of financial support mechanisms to both Brazilian companies and public agencies. In providing its financial support, BNDES has participated in many varied investment projects, as well as financing the acquisition of equipment and services for various purposes.

Recently, BNDES, in cooperation with the Ministry of Sports, has provided loans to municipalities and states to prepare projects for enhancement of solid waste collection and disposal services. This has been primarily focused on the municipalities that will host activities associated with the 2014 World Cup and 2016 Olympics. Further, BNDES has stated that they recognize that the new National Solid Waste Management Policy will require municipalities to develop comprehensive solid waste management plans that will provide further opportunities for BNDES financing and investments.

The conditions by which BNDES will provide financial support for potential waste-to-energy projects will need to be evaluated during any Feasibility Study undertaken through USTDA support. In particular, BNDES' financing rules associated with the involvement of foreign companies will need to be closely evaluated to fulfill USTDA's objective of promoting U.S. company involvement and realizing export potential.

Caixa Econômica Federal - The Caixa Econômica Federal (CAIXA or CEF), is a one of the largest government-owned financial institutions in Latin America. CAIXA was founded in January 1861 as Caixa Econômica e Monte de Socorro in Rio de Janeiro as a financial institution destined to collect and manage savings, mostly from the poor. Over the years, several similar institutions were created until most of them were merged into present-day Caixa in 1967.

Currently, Caixa is the second largest Brazilian bank and is present in thousands of Brazilian municipalities. Caixa has more than 32 million accounts, worth more than R$ 148 billion in savings or investment. Together with government pension funds and other governmental resources, Caixa controls more than R$ 386 billion (roughly about US$ 200 billion) in investments. Caixa is seen as a tool for public investment and expansion of access to financial services to the Brazilian public.

Caixa administers a Federal Guarantee Fund dedicated to private sector investments in municipal sanitation and solid waste projects. While the fund has been well-utilized for sanitation, Caixa has indicated that disbursements for solid waste projects have been low to date, due in part, to:

- *Fiscal and financial constraints at the municipal level that require private investments in the sector;*
- *Problems with the environmental licensing of landfills;*
- *Social issues related to the presence of informal sector workers ("waste pickers") working on open dump sites to be closed;*
- *Lack of local government capacity to prepare SWM and carbon finance projects that are commercially viable for the private sector; and*
- *A general mistrust between the private and public sectors.*

PerformTech believes that the above entities can provide the necessary financial mechanisms for financing of the proposed waste-to-energy facility in Santo Andre. However, this assumes that the project is determined to be technically and economically viable. Additionally, the financial strength and commercial success of private sector companies that may seek to develop the proposed project will be another important financing element. The proposed USTDA supported Feasibility Study in Santo Andre is intended to accurately determine potential risks and to determine the means for mitigating those risks. This will be important for establishing the ability to finance the proposed Santo Andre WTE project.

PerformTech also believes that the potential involvement of a regional utility such as EMAI can be extremely important in establishing sufficient project financial strength for support by the above financing entities.

6
U.S. EXPORT POTENTIAL

A key aspect of USTDA's interest in supporting the development of the proposed waste-to-energy project in Santo Andre is the potential that the project will create opportunities for the export of United States services and equipment to Brazil. On March 11, 2010, President Barack Obama issued an executive order creating the National Export Initiative (NEI), which aims to double U.S. exports over the next five years. The NEI recognizes that exports will play a critical role in catalyzing America's near- and long-term economic growth, and it represents the first time that the United States will have a government-wide export promotion strategy with focused attention from the President and his Cabinet. This may ultimately provide additional opportunities for U.S. service and equipment suppliers to compete in foreign countries. It also helps to emphasize the inherent benefits of USTDA's historical objectives in the various sectors that it provides development assistance.

It has been estimated that the environmental technologies market in Brazil is valued at approximately US$ 4.9 billion with solid waste management needs accounting for approximately US$ 2.5 billion of that amount. A recent study by the Brazilian Ministry of Environment and Caixa estimates an annual need of approximately US$ 550 million in capital investment in facilities (including landfills, transfer stations, recycling facilities, etc.) and equipment and about US$ 420 million in operations alone. The solid waste management sector in Brazil currently spends approximately US$ 2.2 billion annually and directly employs about 440,000 people. To this point, the private sector has concentrated its efforts in solid waste collection and street cleaning services. Privately operated landfills have been developed and receive about 15% of all solid waste collected in Brazil.

The export potential associated with municipal waste energy projects is primarily a function of three important factors including:

1. **Technical nature of individual projects** - The highly technical nature of individual waste-to-energy projects determines the specific systems and technologies utilized in their development. This includes potentially extensive (and costly) air emission control systems that allow these facilities to meet demanding regulatory standards such as those in the U.S. and the E.U. and which will, most than likely, be required in Brazil. (High capital cost projects (such as the proposed Santo Andre waste-to-energy facility) generally provide greater opportunity for the import of technologies not currently in use or available in Brazil or the region.)
2. **Local competition for supply of services and equipment** - The frequent use of a solid waste management technology or approach in any country will often lead to the development of local supply which, in turn, diminishes the need for potentially more costly imports from

other countries. To this point, waste-to-energy facilities have not been implemented in Brazil. As a result, many of the required systems and components are not readily available in the country. However, the strong emerging economy and industrial base in Brazil may ultimately have an impact in developing technology, equipment and service sources that will be locally available thereby reducing U.S. export potential in the future.

3. **Foreign competition for supply of services and equipment** - United States service and equipment suppliers must often compete with suppliers from other countries. The import/export position of the U.S. and other foreign suppliers in any country can be a significant factor in determining whether United States suppliers will be successful in providing services and equipment for proposed projects. This will be a major factor in exploring the export potential for waste-to-energy projects in Brazil given the strong trade relationship that exists between Brazil and a number of the countries of the European Union.

Given the lack of direct Brazilian experience in the development, design, construction and operations of waste-to-energy facilities, PerformTech believes that there will be significant opportunities for foreign companies (including U.S. suppliers) to provide services and technologies for these projects in the near term future. This is especially the case given the need to mitigate potential development risks in any capital intensive technical project such as the proposed WTE facility in Santo Andre.

The full export potential from any WTE projects in Brazil will be realized through two development paths. If U.S. waste-to-energy developers are successful in being selected to develop WTE projects in Brazil, they will have a tendency to gravitate to equipment and services that they are familiar with and which they believe will minimize their technical and resulting performance risks. In projects where the overall responsibility for design and construction rests with non-U.S. public or private entities, U.S. equipment and service suppliers may still have an opportunity to provide specific purpose systems, equipment and services for the developed waste-to-energy projects. For a conventional WTE design such as the predominant mass burn combustion approach, potential exports may be classified into the following service and equipment categories:

- Consulting and design services
- Combustion equipment
- Boilers
- Air pollution control systems
- Steam turbines and generators
- Control and monitoring systems

Further information concerning alternative WTE technologies can be found in Annex 5 of this DM report. This includes technologies which PerformTech classifies as commercially available (such as mass burn and refuse derived fuel systems) and those that are not yet fully commercialized such as gasification/pyrolysis and plasma based systems.

6.1 BASIS FOR U.S. EXPORT POTENTIAL IN WTE PROJECTS IN BRAZIL

Table 6.1 presents the estimated capital costs for the proposed waste-to-energy project in Santo Andre. Projected capital costs for the proposed WTE facility are based on the WTERT capital cost estimate of US$ 200,000 per daily ton of installed capacity. In addition, the table

also presents PerformTech's estimate of the high (60%) and low (30%) export potential associated with the proposed Santo Andre waste-to-energy project.

Table 6.1
CAPITAL COST AND EXPORT POTENTIAL

MUNICIPALITY	ESTIMATED SOLID WASTE GENERATION tonnes/day	ASSUMED DESIGN CAPACITY[1] tonnes/day	ESTIMATED CAPITAL COST[2] US$ Million	EXPORT POTENTIAL LOW[3] US$ Million	EXPORT POTENTIAL HIGH[4] US$ Million
Santo Andre	539	1,000	$ 200	$ 60	$ 120

Notes

1 Santo Andre assumed design capacity based on waste input from neighboring municiplity

2 Source: WTERT ($200,000/daily tonnage designed for mass burn technology)

3 Based on 30% of capital cost

4 Based on 60% of capital cost

In Santo Andre, PerformTech has assumed a design capacity of 1,000 tonnes per day similar to the project being developed in São Bernardo Campo. As is the case in that municipality, solid waste from outside of Santo Andre would be required for full utilization of the 1,000 tonnes per day design capacity. This would help to achieve an economy of scale that optimizes the project economic benefits. The evaluation of potential sources of solid waste outside of Santo Andre to be processed at the proposed WTE facility is an element of the proposed TOR contained in Annex 1 of this DM report.

6.2 POTENTIAL U.S. WASTE-TO-ENERGY SERVICE AND SYSTEM SUPPLIERS

The export potential to be realized by the Santo Andre WTE project is a function of the equipment and services to be provided by the U.S. companies that would seek to participate in the project. Some of the principal U.S. companies engaged in developing waste-to-energy projects at the scale required in Santo Andre include:

Major U.S. WTE Facility Developers

- Covanta Energy Corp.
- Energy Answers International
- Wheelabrator Technologies Inc.

Steam Turbines

- Dresser Rand
- Elliott Group
- General Electric
- Siemens-Westinghouse

Environmental Controls

- The Babcock & Wilcox Company
- Babcock Power Environmental, Inc.
- McGill Air Clean LLC.
- Wheelabrator Air Pollution

Boilers/Incinerators:

- AE&E Von Roll
- The Babcock & Wilcox Company
- Foster Wheeler
- Indeck Power Equipment Company

Electrical, Controls and Auxiliary Equipment

- Automated Control Systems
- Cooper Power Systems
- Eaton Electrical (Cutler-Hammer)
- GE Energy, and GE Power Systems
- Honeywell International Inc.
- Kohler Power Systems
- Motorola, Inc.
- Siemens-Westinghouse

also presents PerformTech's estimate of the high (60%) and low (30%) export potential associated with the proposed Santo Andre waste-to-energy project.

Table 6.1
CAPITAL COST AND EXPORT POTENTIAL

MUNICIPALITY	ESTIMATED SOLID WASTE GENERATION tonnes/day	ASSUMED DESIGN CAPACITY[1] tonnes/day	ESTIMATED CAPITAL COST[2] US$ Million	EXPORT POTENTIAL LOW[3] US$ Million	EXPORT POTENTIAL HIGH[4] US$ Million
Santo Andre	539	1,000	$ 200	$ 60	$ 120

Notes

1 Santo Andre assumed design capacity based on waste input from neighboring municiplity

2 Source: WTERT ($200,000/daily tonnage designed for mass burn technology)

3 Based on 30% of capital cost

4 Based on 60% of capital cost

In Santo Andre, PerformTech has assumed a design capacity of 1,000 tonnes per day similar to the project being developed in São Bernardo Campo. As is the case in that municipality, solid waste from outside of Santo Andre would be required for full utilization of the 1,000 tonnes per day design capacity. This would help to achieve an economy of scale that optimizes the project economic benefits. The evaluation of potential sources of solid waste outside of Santo Andre to be processed at the proposed WTE facility is an element of the proposed TOR contained in Annex 1 of this DM report.

The proposed Santo Andre Feasibility Study Terms of Reference includes an assessment of the existing municipal landfill for development of a landfill gas to energy facility where landfill gas would be utilized for generation of electricity. Export potential from this installation would is expected to include the flaring and turbine generation systems that would be conventional components of an active gas management system. (U.S sourced turbine generators are utilized as key components for the existing major landfill gas to energy system at the Bandierantes landfill in Sao Paulo.) PerformTech estimates that the potential export value for these primary components for a potential landfill gas to energy system at the existing Santo Andre landfill would be:

Flaring System – US$ 1 to 1.5 million

Turbine Generator Sets – US$ 4 to 5 million

6.2 POTENTIAL U.S. WASTE-TO-ENERGY SERVICE AND SYSTEM SUPPLIERS

The export potential to be realized by the Santo Andre WTE project is a function of the equipment and services to be provided by the U.S. companies that would seek to participate in the project. Some of the principal U.S. companies engaged in developing waste-to-energy projects at the scale required in Santo Andre include:

Major U.S. WTE Facility Developers

- Covanta Energy Corp.
- Energy Answers International
- Wheelabrator Technologies Inc.

Steam Turbines

- Dresser Rand
- Elliott Group
- General Electric
- Siemens-Westinghouse

Environmental Controls

- The Babcock & Wilcox Company
- Babcock Power Environmental, Inc.
- McGill Air Clean LLC.
- Wheelabrator Air Pollution

Boilers/Incinerators:

- AE&E Von Roll
- The Babcock & Wilcox Company
- Foster Wheeler
- Indeck Power Equipment Company

Electrical, Controls and Auxiliary Equipment

- Automated Control Systems
- Cooper Power Systems
- Eaton Electrical (Cutler-Hammer)
- GE Energy, and GE Power Systems
- Honeywell International Inc.
- Kohler Power Systems
- Motorola, Inc.
- Siemens-Westinghouse
- Square D Co. (Schneider Electric)

During the DM, PerformTech had discussions with some of the principal U.S. waste-to-energy developers to determine their interest in providing technologies and services in Brazil. As two of the major WTE companies in the United States, Covanta Energy Corp. and Energy Answers International both indicated that they would be interested in pursuing projects on a case-by-case basis if project conditions demonstrated that they could be competitive in establishing project positions. A further condition for their involvement would be a fair and objective procurement process such as that which would be required by USTDA or potential financing entities such as the World Bank.

In addition to the above, it is expected that there are a number of major U.S. construction companies that would be prepared to undertake the construction of the proposed facility in conjunction with the major WTE technology suppliers.

7
FOREIGN COMPETITION AND MARKET ENTRY ISSUES

The Definitional Mission sought to investigate the foreign competition and market entry issues that United States equipment and service suppliers will face if they are to be successful in providing services and equipment for the proposed waste-to-energy project in Santo Andre. In Brazil, U.S. service and equipment suppliers will face significant competition from suppliers from the European Union. Brazil's current overall trade relationships are shown in Table 7.1 which quantifies Brazil's trade relationships with its primary trade partners. Additional trade information is presented in Annex 3. While the United States has a strong trade relationship with Brazil, the combined countries of the European Union has an even stronger relationship as shown in Table 7.1.

In addition, PerformTech observed a number of other indications that European Union companies were actively pursuing the development of waste-to-energy projects in municipalities throughout Brazil. This includes:

- Indications of a number of trade missions to Europe for site visits to existing waste-to-energy facilities. (The recent trade mission to Europe by municipal officials from Santo Andre is an illustration of this point.)
- Participation by numerous European Union companies in government or donor supported solid waste management and trade association technical conferences in Brazil. (In a review of recent conference agendas, scant participation by U.S. companies was noted.)

7.1 POTENTIAL FOREIGN COMPETITORS

Many conventional waste to energy technologies originated in Europe. As a result, there are many European suppliers that are capable of providing the services and equipment necessary to implement waste to energy projects in Brazil. In particular, companies from France and Germany are expected to diligently pursue the subject projects. In addition, Japanese companies are also expected to demonstrate a strong interest.

Table 7.1

BRAZIL'S TRADE WITH MAIN PARTNERS (2009)

The Major Imports Partners

Nº	Partners	Million euro	%
	World (all countries	97 251,1	100,0%
1	EU27	22 580,9	23,2%
2	United States	16 059,0	16,5%
3	China	12 479,5	12,8%
4	Argentina	8 681,7	8,9%
5	Japan	4 285,4	4,4%
6	Nigeria	3 723,6	3,8%
7	South Korea	3 712,6	3,8%
8	Mexico	2 151,6	2,2%
9	Chile	1 936,4	2,0%
10	India	1 742,0	1,8%
11	Switzerland	1 589,9	1,6%
12	Canada	1 260,0	1,3%
13	Bolivia	1 116,2	1,1%
14	Saudi Arabia	1 100,8	1,1%
15	Russia	1 078,6	1,1%
16	Thailand	1 009,5	1,0%
17	Uruguay	969,1	1,0%
18	Algeria	961,2	1,0%
19	Malaysia	945,7	1,0%
20	Indonesia	792,1	0,8%
21	Libya	652,0	0,7%
22	Australia	646,5	0,7%
23	Iraq	628,4	0,6%
24	Singapore	540,9	0,6%
25	Israel	495,5	0,5%
26	Paraguay	454,4	0,5%
27	Colombia	442,0	0,5%
28	Venezuela	429,5	0,4%
29	Hong Kong	416,5	0,4%
30	Norway	391,1	0,4%
31	Belarus	377,1	0,4%
32	Peru	369,8	0,4%
33	South Africa	344,5	0,4%
34	Turkey	301,4	0,3%
35	Morocco	242,1	0,2%
36	Costa Rica	241,5	0,2%
37	Philippines	225,2	0,2%
38	Equatorial Guinea	202,1	0,2%
39	Vietnam	175,6	0,2%
40	Trinidad and Tobago	157,5	0,1%
41	Aruba	135,0	0,1%
42	Ukraine	128,5	0,1%
43	Angola	109,2	0,1%
44	United Arab Emirates	88,5	0,1%
45	North Korea	77,9	0,1%
46	Tunisia	68,0	0,1%
47	Egypt	61,3	0,1%
48	Bangladesh	59,4	0,1%
49	Ivory Coast	54,1	0,1%
50	Cuba	41,8	0,0%

The Major Export Partners

Nº	Partners	Million euro	%
	World (all countries	107 040,3	100,0%
1	EU27	24 122,8	22,5%
2	China	13 415,9	12,6%
3	United States	11 004,8	10,3%
4	Argentina	8 981,7	8,4%
5	Japan	3 087,0	2,9%
6	Venezuela	2 590,5	2,4%
7	India	2 235,9	2,1%
8	Russia	1 985,0	1,9%
9	Mexico	1 921,7	1,8%
10	Chile	1 900,6	1,8%
11	South Korea	1 876,8	1,8%
12	St. Lucia	1 716,3	1,6%
13	Switzerland	1 662,7	1,6%
14	Saudi Arabia	1 347,8	1,3%
15	Hong Kong	1 302,1	1,2%
16	Colombia	1 313,1	1,2%
17	Canada	1 232,8	1,2%
18	Paraguay	1 202,0	1,1%
19	United Arab Emirates	1 184,7	1,1%
20	Peru	1 051,7	1,0%
21	Egypt	1 015,4	0,9%
22	Angola	996,2	0,9%
23	Uruguay	947,7	0,9%
24	Singapore	930,0	0,9%
25	South Africa	911,0	0,9%
26	Iran	836,5	0,8%
27	Indonesia	815,3	0,8%
28	Nigeria	765,5	0,7%
29	Thailand	741,6	0,7%
30	Bolivia	655,7	0,6%
31	Netherlands Antille	641,3	0,6%
32	Malaysia	586,9	0,5%
33	Algeria	494,0	0,5%
34	Ecuador	450,3	0,4%
35	Norway	441,2	0,4%
36	Turkey	424,4	0,4%
37	Bangladesh	360,4	0,3%
38	Morocco	370,7	0,3%
39	Australia	340,7	0,3%
40	Yemen	272,5	0,3%
41	Kuwait	261,3	0,2%
42	Trinidad and Tobago	256,3	0,2%
43	Vietnam	240,5	0,2%
44	Lebanon	231,4	0,2%
45	Philippines	229,8	0,2%
46	Syria	215,4	0,2%
47	Dominican Republic	205,0	0,2%
48	Cuba	192,5	0,2%
49	Israel	191,1	0,2%
50	Costa Rica	175,4	0,2%

The Major Trade Partners

Nº	Partners	Million euro	%
	World (all countries	204 291,6	100,0%
1	EU27	46 700,4	22,9%
2	United States	27 394,2	13,4%
3	China	25 975,5	12,7%
4	Argentina	17 660,4	8,6%
5	Japan	7 372,7	3,6%
6	South Korea	5 589,3	2,7%
7	Nigeria	4 489,3	2,2%
8	Mexico	4 073,2	2,0%
9	India	4 038,9	2,0%
10	Chile	3 837,1	1,9%
11	Switzerland	3 252,6	1,6%
12	Russia	3 064,1	1,5%
13	Venezuela	3 020,0	1,5%
14	Canada	2 492,8	1,2%
15	Saudi Arabia	2 448,6	1,2%
16	Uruguay	1 916,7	0,9%
17	Bolivia	1 771,9	0,9%
18	Colombia	1 755,9	0,9%
19	Thailand	1 750,0	0,9%
20	Hong Kong	1 719,6	0,8%
21	St. Lucia	1 716,3	0,8%
22	Paraguay	1 656,7	0,8%
23	Indonesia	1 607,4	0,8%
24	Malaysia	1 532,6	0,8%
25	Singapore	1 470,9	0,7%
26	Algeria	1 455,5	0,7%
27	Peru	1 421,5	0,7%
28	United Arab Emirates	1 273,2	0,6%
29	South Africa	1 255,5	0,6%
30	Angola	1 107,4	0,5%
31	Egypt	1 030,7	0,5%
32	Australia	989,5	0,5%
33	Iran	854,0	0,4%
34	Norway	843,4	0,4%
35	Iraq	799,6	0,4%
36	Libya	792,6	0,4%
37	Turkey	725,8	0,4%
38	Israel	686,6	0,3%
39	Netherlands Antille	647,6	0,3%
40	Morocco	615,8	0,3%
41	Ecuador	466,1	0,2%
42	Philippines	451,1	0,2%
43	Bangladesh	439,7	0,2%
44	Vietnam	415,1	0,2%
45	Costa Rica	414,9	0,2%
46	Trinidad and Tobago	393,8	0,2%
47	Belarus	384,1	0,2%
48	Ukraine	292,5	0,1%
49	Yemen	272,5	0,1%
50	Kuwait	261,7	0,1%

8
DEVELOPMENT IMPACT

Brazil's strong economy and expanding urban centers have created a number of development issues that must be effectively addressed if the country is to continue growing and making progress in dealing with its problems particularly in its growing urban areas. The proposed waste-to-energy facility in Santo Andre is intended to achieve two important results. First, any system intended to assist in cost-effective and environmentally sound solid waste management will be important to Santo Andre's future. Additionally, the availability of energy to fuel the country's significant industrial base and economic growth is also critical to Brazil's future. As a result, PerformTech believes that the proposed waste-to-energy facility (if determined to be economically and technically viable) will have a positive development impact by helping Brazil continue its growth in a sustainable manner by demonstrating the viability of waste to energy applications in Brazil.

8.1 USTDA DEVELOPMENT IMPACT FACTORS

The proposed Terms of Reference developed for the Santo Andre Feasibility Study funded by USTDA will include a requirement that the Feasibility Study consultant define the development impacts of the proposed project. Development impact categories typically evaluated in USTDA supported Feasibility Studies include: 1) infrastructure, 2) market-oriented reform, 3) human capacity building, and 4) technology transfer and productivity improvement. Because of the general nature of waste-to-energy projects, three of these standard development impacts (infrastructure, human capacity building, and technology transfer and productivity improvement) are expected to apply. PerformTech believes that the Santo Andre WTE project proposed to USTDA, if implemented, will demonstrate a positive development impact based on the aforementioned criteria irrespective of whether U.S.-based service and technology suppliers are involved. This includes the following general findings and conclusions relative to USTDA priority development indicators:

8.2 INFRASTRUCTURE

The implementation of effective ISWM programs will provide a sound infrastructure base in an important environmental sector. This includes both the mandatory core ISWM services (collection and disposal) and the optional processing and recovery services such as those provided by the subject waste-to-energy project. The addition of a waste-to-energy facility to a municipality's ISWM program is an important and technically complex element that must be designed and operated as a "manufacturing" process where municipal solid waste is used as a processing feedstock to generate a product (captured energy converted to electricity). The need to establish a waste-to-energy project in a technical and economically sustainable manner will help to assure an optimization of the municipality's entire solid waste management infrastructure. This can have a major impact on the overall aesthetic and environmental

conditions in Santo Andre through better solid waste management as well as a major impact on the general health conditions of people in the municipality. While some controversy might be generated by the WTE project as a result of historical concerns about air emissions, PerformTech believes that current commercially available state-of-the-art WTE technologies and their environmental control systems are capable of meeting the most stringent regulations in the world in protecting public health.

8.3 TECHNICAL TRANSFER AND PRODUCTIVITY IMPROVEMENT

The implementation and sustained operation/maintenance of a waste-to-energy facility is a technically complex process that will require significant technology transfer to Brazil since waste-to-energy facilities have not been developed in the country to this point. Additionally, the production aspect of a typical waste-to-energy facility requires a strong level of processing productivity. This can create an ancillary positive impact on productivity on other elements of the ISWM program in the subject municipalities.

8.4 HUMAN CAPACITY BUILDING

The implementation of a waste-to-energy project in Santo Andre is expected to include operations and maintenance techniques training which will substantially increase the capability of the staff required to keep the facility operating over the long-term at their intended capacity and environmental performance levels. PerformTech expects that most of the staff involved in operating and maintaining the proposed Santo Andre WTE facility will be Brazilian. Another of the important contributions to human capacity building that a waste-to-energy facility will provide is recognition of the production (or "manufacturing") aspects of these facilities which can help introduce more business or productivity oriented concepts to the overall process of solid waste management in the municipalities where such facilities are implemented.

9
IMPACT ON THE ENVIRONMENT

9.1 THE ENVIRONMENTAL NATURE OF WASTE-TO-ENERGY PROJECT

The development of any solid waste management project that complies with sound international practices and stringent environmental standards inherently has a beneficial impact on the environment. Effective ISWM programs are aimed at providing cost effective public service in a manner that mitigates the historical environmental effects that have been created by improper solid waste management. It should be noted that, in the case of developing waste-to-energy projects, some controversy still exists relative to the view of the potential environmental dangers of such projects as a result of air emissions. There are a number of individuals and organizations throughout the world that remain concerned about air emissions that result from the combustion of various solid waste materials. However, objective evaluation of performance and environmental compliance data associated with existing state-of-the-art WTE facilities has shown that these facilities are capable of meeting the most stringent standards that exist throughout the world. In particular, the evolution of air emission rules and regulations in the United States and the European Union has led to major improvements in WTE technologies and, in particular, air pollution control systems. This has resulted in clear compliance to emerging high standards. In many cases, the increase stringency of environmental regulations has required the installation of upgraded and new environmental control systems at existing waste-to-energy facilities to assure their compliance. PerformTech expects that any new waste-to-energy facility developed in Santo Andre or any other location in Brazil will need to meet environmental standards that are consistent with prevailing standards in the United States and European Union. PerformTech further believes that state-of-the-art waste-to-energy facilities based on commercially available U.S. and E.U. technologies are capable of meeting the most exacting standards in the world.

9.2 POSITIVE IMPACTS OF THE PROPOSED WASTE-TO-ENERGY PROJECTS

PerformTech believes that the following positive environmental impacts will result from the proposed project:

1. Reduced carbon dioxide emissions when compared to other power generation technologies. Further, the combustion of municipal solid waste will conserve fossil fuels by generating electricity where one ton of MSW combusted for energy recovery offsets the use of approximately one barrel of oil or 0.25 tons of coal.
2. Waste-to-energy plants reduce the airspace required for landfilling by about 85% of the tonnage processed.
3. Reduced methane emissions from municipal solid waste landfills through the diversion of municipal solid waste to WTE facilities will have a positive impact on greenhouse gas

emission. The processing of the combustible fraction of municipal solid waste eliminates the placement of that material in landfills. Landfill gas is derived from the natural decomposition of biodegradable solid waste components within the landfill mass. Eliminating the combustible components will significantly diminish the generation of landfill gas which can consist of up to 50% methane. Each ton of municipal solid waste combusted rather than landfilled reduces greenhouse gas emissions by about 1.2 tons of carbon dioxide based on the eliminated discharge of methane associated with landfill gas.

4. The "production" aspect of the proposed Santo Andre waste-to-energy facility can help to instill a greater business-oriented perspective to the municipality's overall solid waste management program. This can lead to significant improvements in solid waste collection and disposal with its inherent environmental benefits.

9.3 POTENTIAL NEGATIVE IMPACTS OF THE PROPOSED WASTE-TO-ENERGY PROJECTS

PerformTech believes that the following potential negative environmental impacts could result from the implementation of the proposed WTE project:

1. Any building and site construction project will entail potentially negative environmental effects such as dust and erosion.
2. Depending on the location of the proposed waste-to-energy facility, additional truck traffic may be generated that must be effectively managed through existing or improved transportation infrastructure.
3. Careful management of facility ash residue is necessary because of the chemical characteristics of this residual material resulting from the combustion process.

<u>PerformTech believes that each of the above potential negative impacts can be effectively mitigated through sound design, construction and operating procedures.</u>

10
IMPACT ON U.S. LABOR

In a 2009 report related to the impact of exports on American jobs, the United States Department of Commerce International Trade Administration estimated that total U.S. exports in 2008 represented approximately 12.7% of the U.S. gross domestic product. This is the highest level in almost a century. The report further stated that foreign exports support jobs for over 10 million Americans which establish a strong basis for U.S. governmental support for export opportunities such as that provided by USTDA on an ongoing basis. Further, the Department of Commerce estimated that the 2008 export of goods and services was equivalent to approximately 6.9% of the total U.S. employment base. Manufacturing and professional/business services exports accounted for 27 and 11% respectively of this equivalency. The technical complexity and capital intensive nature of sound practice WTE applications will generally fit within these export categories.

10.1 BASIS FOR PROJECT IMPACT ON U.S. LABOR

Increasing the level of exports to Brazil for implementation of the proposed Santo Andre waste-to-energy project will have a beneficial impact on U.S. labor by creating new opportunities for the export of materials, equipment and services required for implementing the project. Today, an extensive number of U.S. companies, from large multinational businesses to start-up manufacturers, have the products, services, and technologies that address increasingly complex environmental standards and provide proven, cost-effective, and reliable solutions to environmental problems. Environmental technology design, fabrication and manufacture are high-wage, high-growth industries. Past survey data shows that about 80 percent of the companies involved in the environmental technology industry are small businesses.

Exports of environmental technology create high-wage U.S. jobs that will be a key source of employment expansion if American companies increasingly capitalize on international opportunities. In the past, the United States Environmental Protection Agency estimated that, for every $1 billion worth of exports, 17,000 U.S. jobs were created. In addition, the aforementioned Department of Commerce report established the export value of each export related job is approximately $165,000. Extrapolating this value of export jobs to the equipment and export potential identified for the proposed project, PerformTech estimates the support of approximately 360 to 720 jobs as a result of the potential exports that could be realized from the implementation of the waste-to-energy project in Santo Andre.

In evaluating the opportunities for export potential from the United States, PerformTech further believes that the project or the assistance that may be provided by USTDA should not cause or necessarily induce any U.S. based enterprise to relocate outside the United States nor will USTDA assistance be used to assist in the development of an export processing zone that could have an indirect negative impact on U. S. Jobs. In contrast, it is envisioned that the full

implementation of the prospective Santo Andre WTE facility may result in the creation of additional employment at U.S. based enterprises capable of providing the equipment, materials and services required in the development of the evaluated and other future projects. This, of course, assumes that U.S. firms pursue and are successful in securing contracts for their equipment or services in Brazil.

11 QUALIFICATIONS

A critical aspect of a successful Feasibility Study includes an evaluation of the qualifications and experience of the project team that will implement the proposed project. To be successful, the project team (including both the Santo Andre project sponsor and the consultant responsible for the Feasibility Study) must be qualified for planning, design, construction management and operating the solid waste facility. In addition, the project team should include people that are experienced in financial planning, institutional considerations, contract management, and relating to the prevailing conditions at the project locale.

In defining qualifications for establishing the sustainability of any solid waste management services and facilities, consideration needs to be given to the current technical capacity of the project sponsors to manage the development of solid waste projects. This is especially the case for a technically and institutionally complex waste-to-energy facility. To determine the qualifications of project sponsors in Santo Andre, PerformTech attempted to evaluate the manner by which their existing solid waste management infrastructure and practices were managed. In particular, PerformTech's investigation paid particular attention to the manner by which the entities responsible for solid waste management service delivery in Santo Andre established their performance accountability and monitoring. As a result of its investigation, PerformTech believes that potential project sponsors in Santo Andre are capable of administering a contractual and monitoring structure for the assured performance and sustainability of the proposed waste-to-energy facility.

If the subject waste-to-energy project is developed through conventional public-private partnership approaches (DBO, BOOT, etc.), the selected procurement approach will determine the responsibilities of the municipality in the project implementation process. Depending on who actually owns the proposed WTE facility, municipal responsibility could be limited to the guaranteed contracted provision of solid waste to support the function of the facility. PerformTech believes that the municipality of Santo Andre has the inherent qualifications to participate in the development and sustained operations of a waste-to-energy facility irrespective of the manner by which the WTE facility is developed. This could include responsibilities ranging from the simple supply of solid waste to a WTE facility owned by a private entity to the required contractual monitoring of economic, technical, and environmental performance associated with a facility owned by the municipality.

In considering the qualifications for the proposed Feasibility Study that may be supported by USTDA, PerformTech recommends that the U.S. consultant team's skill set include a number of capabilities that are based on the typical development aspects of technically complex waste-to-energy facilities. The recommended consultant capabilities are listed below. In addition, PerformTech has also provided a recommendation of the relative weight of each experience

criterion that should be the basis by which the project sponsors select a consultant to undertake the Feasibility Study. These are recommended to be the criteria by which consultant responses to a Request for Proposals (RFP) will be evaluated. The skill set and experience requirements are also included in the draft Terms of Reference presented in Section 13and Annex 1 of this DM report. The consultant capabilities should, at a minimum, include the following:

- Project management skills pertaining to the evaluation, design and implementation of municipal solid waste-to-energy projects (10%)
- Regional experience in Brazil or in comparable market economies in the region (15%)
- Experience related to solid waste-to-energy facility design, construction and operation (15%)
- Experience in and knowledge of various commercialized and emerging waste-to-energy technologies and systems that could be applicable for this project including technologies applicable to the recovery of energy from landfill gas (15%)
- Experience in the economic evaluation and financial modeling of solid waste management infrastructure projects (15%)
- Experience in power sector assessments and evaluations for potential sale of recovered energy (15%)
- Experience in and knowledge of the procedures used and requirements of financing agencies such as multilateral banks including, at a minimum, risk management, procurement procedures and project management requirements for financing (10%)
- Working knowledge of U.S. suppliers who may provide services and equipment for Brazil's solid waste sector, and in particular, waste-to-energy projects. (5%)

12 JUSTIFICATION

In considering any funding investment, USTDA must believe that there is sufficient justification for their participation. In the case of the waste-to-energy projects evaluated through this Definitional Mission, USTDA is being asked to provide support to specific solid waste management initiatives in Brazil. PerformTech's evaluation of the potential justification associated with each project recognizes that waste-to-energy projects are optional processes that do not necessarily fit into all municipal settings. While a detailed and effective Feasibility Study is important to define the technical, environmental and economic merit of a potential WTE project in Santo Andre, this does not necessarily justify a potential investment by USTDA in such a project.

The basic justification for USTDA support is that required USTDA procedures in providing assistance will create a linkage between the interest in a WTE project in Santo Andre with the ability of U.S. suppliers to meet project needs. In addition, USTDA provides the means for alerting U.S. suppliers of the project opportunities represented by the supported project and for helping to create a transparent, objective procurement process as the project moves forward. These are other justifications for potential USTDA support which are presented below.

12.1 ECONOMIC IMPLICATIONS

WTE project development in many worldwide locations has shown that the overall costs associated with waste-to-energy facilities built to international sound practice standards are often significantly higher than those associated with conventional disposal at even state-of-the-art landfills with significant environmental controls. While there are technical benefits associated with any WTE project (such as the recovery of energy and the reduction of the volume of solid waste to be disposed of in landfills), these normally will be derived at a relatively high cost when compared to other direct forms of solid waste disposal. USTDA support can provide the means for assessing the overall economic impact which will be an important element in promoting the development of the proposed project.

12.2 ENVIRONMENTAL IMPLICATIONS

Waste-to-energy facilities that are developed in accordance with United States or European Union standards are capable of meeting the most stringent environmental regulations. From an environmental perspective, WTE facilities can have significant benefits that include the reduction in the volume of solid waste placed in landfills and the mitigation of methane emissions that would result from these landfills if all of the solid waste were simply disposed of at the landfill facilities. While some controversy still exists relative to waste-to-energy technologies that utilize combustion as a core process, objective data on existing facilities indicates that such facilities can be developed to function with a minimal impact on the

environment. PerformTech believes that the environmental implications of the proposed waste-to-energy facility in Santo Andre justify the effort required to develop them. USTDA support can help to mitigate the opposition to facility development while emphasizing the potential environmental benefits.

2.3 ALTERNATIVE ENERGY GENERATION IMPLICATIONS

Brazil's growing economy has a continually increasing need for energy in all forms. As a result, municipal solid waste is now viewed as a potential source of renewable energy for the future. Alternatively, the energy content of solid waste would be lost if simply placed into a landfill for disposal. (Theoretically, some energy could still be derived if the solid waste were directly placed in the landfill through the eventual recovery and utilization of landfill gas once the solid waste had decomposed sufficiently to generate gas.) PerformTech believes that the value of the potential energy to be recovered from potential WTE facilities in Brazil (as illustrated by the proposed Santo Andre project) justifies the effort required to evaluate and develop state-of-the-art waste-to-energy facilities. However, in exploring both the environmental and alternative energy generation implications, close evaluation of the economic impact of achieving the environmental and energy recovery benefits is required. This will be an extremely important element of the proposed Santo Andre Feasibility Study. USTDA support can help to define the prospects for achieving solid waste energy recovery in an economically sustainable manner.

In deciding to provide financial support for Feasibility Studies in Brazil, USTDA is seeking to generate opportunities for U.S. companies to sell their services or equipment. For this investment by USTDA to be justified, the interest of U.S. companies in the proposed projects must be considered and, in some cases, stimulated. During the DM investigation, PerformTech had discussions with a number of U.S. waste-to-energy companies who indicated that, on a case-by-case basis, they would be interested in pursuing projects in Brazil so long as they were able to establish that an openly competitive standard would be used for selecting a contractor. USTDA's involvement in the Feasibility Study for the proposed Santo Andre project will help to provide some assurance to U.S. companies that an open, objective procurement process will be utilized to develop the proposed facility. This may stimulate their participation in resulting procurement process.

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15
FINDINGS AND RECOMMENDATIONS

15.1 FINDINGS AND CONCLUSIONS

Generally, PerformTech concludes that the project drivers for the development of waste to energy facilities in Brazil are significant and sufficient. Further, PerformTech believes that local conditions in Santo Andre justify potential USTDA support for their WTE project development initiatives. A summary of the sufficiency of project drivers is presented below:

- **The Regulatory Driver** - Environmental laws and regulations exist in Brazil that theoretically governs the management of solid waste from residential and commercial sources. The enactment of a National Solid Waste Management Policy in August 2010 will further strengthen the regulatory driver as additional rules and regulations are enacted as a result of the new policy. Accordingly, PerformTech views the regulatory driver to be sufficient for consideration of the evaluated project.
- **The Financial Driver** - Governmental support for waste-to-energy projects from both the solid waste management and power production investment perspective will help to assure that the proposed project can be financed. The long-term and growing interest in the development of municipal solid waste-to-energy projects throughout Brazil is based on an understanding of the contractual and institutional relationships that are necessary to achieve viable projects. PerformTech believes that there is significant precedence throughout the developed world to believe that if the proper technical and economic conditions exist, the Santo Andre WTE project can be financed.
- **The Technical/Environmental Driver** - The application of state-of-the-art conventional waste-to-energy technologies can accomplish the intended environmental and energy recovery benefits in a sound and sustainable manner. As a result of the state of development for conventional commercialized waste-to-energy technologies, PerformTech views this driver to be sufficient to support the Santo Andre project if technical and economic viability is established through an effective Feasibility Study.
- **The Political Driver** - The political driver is a function of the ability of the project sponsors to maintain political support for their implementation. Given the potential environmental and energy recovery benefits associated with a viable WTE project and the emphasis on improving solid waste management and

renewable energy supply throughout Brazil, PerformTech believes that the political driver is strong for support of the Santo Andre project. However, it should be noted that opposition to the implementation of the projects could exist particularly from the formal waste picker organizations who believe that waste-to-energy projects will detrimentally affect their livelihoods. PerformTech further believes that, with the recent national elections in Brazil, the current national energy priority policies should continue which will be a benefit to the development of waste-to-energy projects. Since the President-elect was formally the Minister of Mines and Energy in Brazil, this historical focus may provide a continuing interest in developing alternative energy projects such as those evaluated in this DM.

In addition to the above, PerformTech has based its recommendations on the ability of some of the proposed projects to meet USTDA's conventional support criteria. To this end, PerformTech concludes the following whether the proposed Santo Andre WTE project will:

- **Help improve environmental and solid waste management service and infrastructure conditions in Brazil and, through possible replication, in other countries in South America** - By its nature, the Santo Andre project is designed to enhance solid waste management conditions in the municipality. Worldwide experience demonstrates that state-of-the-art waste-to-energy facilities can comply with stringent environmental regulations such as those that currently exist in the United States and European Union. From a solid waste management perspective, waste-to-energy facilities serve as significant volume reduction processes thereby reducing the quantity of solid waste that must ultimately be placed into landfills. This volume reduction function can have a major environmental effect by reducing the need for landfill capacity and eliminating the discharge of landfill gas (with its high concentration of methane) which has been determined to be a major contributor to greenhouse gas emissions. This applies to the proposed Santo Andre waste-to-energy project if it is determined to be technically and economically viable through an effective Feasibility Study.

- **Be technically, financially and economically sound and based on commonly accepted best practices and sustainable approaches** - The Terms of Reference and budgets associated with the proposed Santo Andre Feasibility Study is aimed at utilizing sound practice approaches for developing a WTE facility. A USTDA supported Feasibility Study will define the manner by which waste-to-energy project objectives can be achieved through the application of sound practice and commercially available technologies as well as project development and procurement approaches. PerformTech believes that the technical objectives of the WTE project recommended for USTDA funding support can be achieved in a cost effective and sustainable manner subject to the findings of the proposed Feasibility Study.

- **Be a development priority for the local governments in Brazil** - As a result of the

recently enacted National Solid Waste Management Policy, PerformTech believes that any project that can enhance solid waste management in Brazil's urban centers will be a high governmental priority at the national, state and local levels. Similarly, the need for additional energy sources to support Brazil's continued economic growth will, most likely, create an energy focused development priority at the national, state and local levels.

- **Stimulate a meaningful level of exports of environmental equipment, technology and services from the United States to the region** - While waste-to-energy projects have not yet been developed in Brazil, some of the components and systems that comprise state-of-the-art WTE facilities may be locally available. However, there are still significant components that must be imported along with the services and expertise that are required to assure that developed facilities are designed and operated in a cost effective and sustainable manner. PerformTech believes that the level of potential exports associated with the Santo Andre project, if determined to be technically and economically viable, is sufficient to justify USTDA assistance.
- **Enhance the implementation process of the identified projects as a result of USTDA participation through full or partial funding** - Many municipalities throughout the world are struggling with dealing with all types of urban issues for which limited local resources must be applied. This is the case in many Brazilian municipalities where solid waste management processes are being upgraded and new facilities developed for effective collection, transfer and disposal of solid waste. Optional processes such as waste-to-energy facilities are not necessarily a core solid waste management service but can provide significant benefits to the municipalities where they are implemented. USTDA assistance in the evaluation of waste-to-energy projects can be important in helping to establish the technical and economic feasibility of such projects. In a similar parallel track, USTDA's assistance in supporting a Feasibility Study for the Santo Andre waste-to-energy facility can help to convince Brazilian power supply entities that such approaches are environmentally sound, technically effective, and cost effective to meet future energy needs.

15.2 RECOMMENDATIONS

Based on the above and on the findings previously outlined in this DM report, PerformTech recommends the following concerning each of the proposed projects evaluated during this Definitional Mission:

1. **São Bernardo de Campo** - During the DM, PerformTech learned that São Bernardo de Campo has already completed a Feasibility Study for a proposed 1,000 tonne per day waste-to-energy facility. As a result, PerformTech finds no basis for USTDA assistance to this municipality for their project.
2. **Brumadinho** - PerformTech does not recommend funding support by USTDA for this project as a result of its dependence on an emerging technology that has not yet been commercially established.

3. **Florianopolis** - During the DM investigation, PerformTech determined that the municipality of Florianopolis may have the required conditions for the development of a waste-to-energy facility. However, given the current position of Tractebel Energia and Veolia Environmment in key existing infrastructure associated with energy distribution and solid waste disposal in Florianopolis, PerformTech is not recommending funding assistance from USTDA. This is based on the existence of waste-to-energy development elements in the corporate structure of each of the above Florianopolis entities and the strong, possibly insurmountable, foreign competition that these companies would create for U.S. suppliers.
4. **Santo Andre** - PerformTech is recommending funding assistance from USTDA for completion of a Feasibility Study in the municipality of Santo Andre for its proposed waste-to-energy facility. Based on the Terms of Reference and budget presented in this DM report, PerformTech recommends that USTDA provide funding of $468,480 for this Feasibility Study. Further, PerformTech recommends that USTDA provide any assistance possible in supporting the possible cooperation between the municipality of Santo Andre and the regional energy utility (Empresa Metropolitana de Aguas e Energia S.A (EMAI)) for development of the project and its key elements. In a meeting facilitated by the USTDA regional representative, SEMASA (the municipality's solid waste management agency) and EMAI acknowledged an interest in working together for development of energy recovery applications in Santo Andre. The manner by which this cooperative relationship may evolve is one of the subjects to be evaluated through the recommended Terms of Reference for the proposed Feasibility Study. During initial conversations with SEMASA, EMAI also expressed an interest in exploring the possibility of recovering energy from the landfill gas derived from the municipality's landfill as an initial priority. As a result of the importance of the potential relationship between SEMASA and EMAI, PerformTech has included the landfill gas utilization investigation in the Terms of Reference and budget for the proposed Feasibility Study.
5. **São Paulo** - PerformTech is not recommending funding assistance for the municipality of São Paulo for a Feasibility Study for their proposed waste-to-energy facility or facilities. This is based on the status of the current concession contractual structure in São Paulo. Based on information provided to PerformTech, it does not appear that waste to energy facilities could be developed in Sao Paulo without the active support of the concession contractors. Meetings with representatives of the concession contractors demonstrated that they do not appear to have any interest in pursuing the development of waste to energy facilities in the municipality of São Paulo at this time. Accordingly, this lack of interest on the part of the concession contractors may preclude the development of waste-to-energy facilities until after the concession contract periods are over in 2024.

In evaluating and comparing the work required for accomplishing a Feasibility Study in Santo Andre, PerformTech concluded that there is significant overlap in the required work tasks and activities associated with any evaluation of a potential waste to energy facility in other municipalities. Accordingly, the results of the Santo Andre feasibility study, if supported by USTDA, can provide some meaningful information that may help to stimulate other development activities and initiatives in other regional municipalities that may, in turn, support similar project developments in the future. This could provide additional export potential for U.S. suppliers.

16
CONTACTS

Individuals that were contacted as part of the Brazil Energy Recovery and Solid Waste Management Project Definitional Mission are presented in the following table. All individuals provided input as part of PerformTech's data gathering effort for this Definitional Mission. While many of the people shown in the contacts listing were interviewed in person, others were communicated with through e-mail and or telephone calls.

Table 16.1
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Dr. Angelo Luiz Pavin Superintendente	Servico Municipal de Saneamente Ambiental de Santo Andre (SEMASA)	Av. Jose Caballero, 143 Santo Andre, SP - Brazil 09040-210	Tel 55-11-4433-9925	angelolp@semasa.sp.gov.br
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Mr. Giba Marson Secretario de Gesttao Ambiental	Prefeitura de São Bernardo do Campo	Rua Jacquet, 61 – 1o Andar – Rudge Ramos – São Bernardo do Campo – SP Brazil 09634-000	Tel 55-11-4367-6454	giba.marson@Sãobernardo.sp.gov.br
Mr. Mario Apolaro Junior Auditor-Fiscal Tributário Municipal	Secretaria Municipal de Finanças Prefeitura da Cicade de São Paulo	Viaduto do Chá, 15 - 12° andar - São Paulo - Brazil 01002-900		mariajr@prefeitura.sp,gov.br

Ms. Regina Nunes Auditor-Fiscal Tributário Municipal	Secretaria Finanças Prefeitura da Cicade de São Paulo	Viaduto do Chá, 15 - 12° andar - São Paulo - Brazil 01002-900		reginanunes@prefeitura.sp,gov.br
Ms. Marilza Sesoko Auditor-Fiscal Tributário Municipal	Secretaria Municipal de Finanças Prefeitura da Cicade de São Paulo	Viaduto do Chá, 15 - 12° andar - São Paulo - Brazil 01002-900	Tel 55-11-3113-9509	msesoko@prefeitura.sp,gov.br
Mr. Ted Michaels President	Energy Recovery Council	2020 North 14th Street Suite 220 Arlington, VA USA		tmichaels@energyrecoverycouncil.org
Mr. Horacio Terraza Senior Specialist on Water and Sanitation	Inter-American Development Bank	1300 New York Avenue, NW Washington, DC 20577 USA	Tel 202-623-3408	horaciot@iadb.org
Mr. Michel Layec Lead Energy Engineer	Latin America and Caribbean Region World Bank	1818 H Street, NW Washington, DC 20433 USA	Tel 202-473-3231	mlayec@worldbank.org
Ms. Jessica Lin Consultant, Energy Sector	Latin America and Caribbean Region World Bank	1818 H Street, NW Washington, DC 20433 USA	Tel 202-458-8601	jjlin@worldbank.org
Mr. Daniel Hoornweg Lead Urban Specialist, Cities and Climate Change	Finance, Economics and Urban Dept. World Bank	1818 H Street, NW Washington, DC 20433 USA	Tel 202-458 4731	dhoornweg@worldbank.org
Mr. Peter Cohen Consultant, Waste Pickers	Latin America and Caribbean Region World Bank	1818 H Street, NW Washington, DC 20433 USA	Tel 202-473-3231	Pcohen1@worldbank.org
Ms. Claudia Barrere	Carbon Finance Unit World Bank	1818 H Street, NW Washington, DC 20433 USA	Tel (202) 458-2907	cbarrera@worldbank.org
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Gary E. Blazek Director of Business Development	Indeck Keystone Energy, LLC	5340 Fryling Lane, Suite 200 Erie, PA 16510-4660	Tel (814) 464-1203 Fax (814) 897-1089	gblazek@indeck-keystone.com
Mr. Patrick Mahoney President	Energy Answers International, Inc.	79 North Pearl Street Albany, New York 12207	Tel (518) 434-1227 Fax (518) 436-6343	pmahoney@energyanswers.com
Rob Graham VP Business Development	Covanta Energy Corporation	40 Lane Road Fairfield, NJ 07004	Tel (973) 882-7300 Fax (973) 244-5540	rgraham@covantaenergy.com

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Work Task 13 - FINAL REPORT

Activity 13.1 - **Preparation of Final Report** - The Consultant shall prepare and deliver to the Grantee and USTDA a substantive and comprehensive final report of all work performed under these Terms of Reference. The Final Report shall be organized according to the above tasks, and shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall be prepared in accordance with Clause I of Annex II of the USTDA's Grant Agreement and any other criteria from the Grantee and USTDA. The final report shall be written in a manner that allows for effective decision-making on the part of the grantee in deciding whether to move forward with the proposed landfill gas recovery system and/or the waste to energy facility. The executive summary for the Final Report shall be written to assure that all pertinent facts, conclusions and recommendations are available to all interested parties. All reports shall be prepared and provided in accordance with the criteria are of Section 4 of this Terms of Reference

3. QUALIFICATION REQUIREMENTS

This assignment will be undertaken by a team of international and local experts made available by the Consultant in a field and support team composition that fully enables the satisfactory execution of work required to achieve the above work tasks and activities. The following are the minimum qualifications required for key personnel that the Consultant will specifically identify in their proposal and provide for this assignment:

- Regional experience in Brazil or at least experience in similar regions and circumstances will be advantageous. Fluency in English and Portuguese on the part of assigned field personnel is an advantage.
- Experience in landfill gas recovery system and waste-to-energy facility design, implementation and operation.
- Experience in solid waste management facility site investigation and technical/economic evaluation
- Experience in accurately estimating costs of construction and operations for the proposed landfill gas recovery system and waste-to-energy facility.
- Experience in the development of detailed financial models and proforma for understanding the financial aspects of the project.
- Experience in the development and management of a procurement process and required documents for the implementation of landfill gas recovery systems and waste-to-energy projects in accordance with sound international practice.
- Experience in evaluating solid waste energy recovery applications for potential carbon credit benefits and other economic impacts.

The Consultant's field and support team shall include at least an:

- Experienced project manager with a master degree in civil engineering or other relevant fields, and at least 15 years of professional in related works and experience from at least 3 international projects;
- Experienced and qualified civil/environmental engineer with a minimum of a bachelor of science degree and with at least 10 years of experience in landfill gas recovery system and solid waste-to-energy facility evaluation and design;
- Experienced and qualified financial/economic expert with at least 10 years of experience in the evaluation of construction and operating cost estimating and financial planning for landfill gas recovery system and waste-to-energy facility development.
- Experienced and qualified environmental and social impact assessment experts with at least 10 years of experience in the evaluation of solid waste management and waste-to-energy facility projects.
- Experienced and qualified personnel with at least 10 years of experience in the evaluation and quantification of solid waste management project risks and the development of procurement approaches to effectively mitigate and manage risk.

The Consultant's proposal in response to this Terms of Reference shall contain resumes for all key team members listed above. The stipulated key personnel shall be assigned to this assignment and will not be substituted without the written approval of the Grantee.

4. REPORTING REQUIREMENTS

The Consultant selected for this assignment will be required to provide periodic reports to the Grantee concerning the progress associated with the work tasks and activities listed above. All required reports will be submitted to the Grantee as draft reports and will be modified and resubmitted upon receipt of comments from the Grantee. At a minimum, these reports will include the following:

SCHEDULE FOR SUBMISSION OF DELIVERABLES AND REPORTS			
Report	Number of Copies		Submission Date
	Portuguese	English	
Consultant's Inception Work Plan	4 hard copies 2 CD's	4 hard copies 2 CD's	2 weeks after signing of Consultant contract
Progress and Activity Reports	4 hard copies 2 CD's	4 hard copies 2 CD's	Monthly
Risk Assessment and Procurement Report	4 hard copies 2 CD's	4 hard copies 2 CD's	4 months after signing of Consultant contract
Feasibility Study Final Report	4 hard copies 2 CD's	4 hard copies 2 CD's	10 months after signing of Consultant contract

5. LOCAL SERVICES AND FACILITIES TO BE PROVIDED BY GRANTEE AND CONSULTANT

The Grantee will arrange for access by the Consultant to all facilities that are relevant to the completion of the work which the Consultant deems necessary to visit in connection with performing their duties. This will include access to all key officials in the Government and any other agencies concerned with subjects related to the assignment. The Grantee will also provide the Consultant with access to all available data, information, maps, drawings, internal documents relevant to the consulting services and other related documents and environmental assessment reports relevant to solid waste management in the Project service area. All reference material provided to the Consultant will be loaned and will be returned at the completion of the assignment. The Consultant will be directly responsible for providing itself with an office with telephone, fax, internet access and other required services or infrastructure.

6. PERIOD AND SCHEDULE OF THE CONTRACT

It is envisioned that the work tasks and related activities defined in this TOR will be undertaken over a 12 month period from the date of signing the consulting agreement for this assignment. This time period will include all evaluation and design work necessary to provide all data and complete all activities listed in this Terms of Reference.

7. CONTRACTOR SELECTION CRITERIA

The Feasibility Study team's skill set shall include a number of defined capabilities. These capabilities are listed below. The relative weight of each experience criteria will be the basis by which a Consultant will be selected to undertake the Study.

- Project management skills pertaining to the evaluation, design and implementation of landfill gas recovery systems and municipal solid waste-to-energy projects (10%)
- Regional experience in Brazil or in comparable market economies in the region (15%)
- Experience related to landfill gas recovery system and waste-to-energy facility design, construction and operation (15%)
- Experience in and knowledge of various commercialized and emerging waste-to-energy technologies and systems that could be applicable for this project (15%)
- Experience in the economic evaluation and financial modeling of solid waste management infrastructure projects (15%)
- Experience in power sector assessments and evaluations for potential sale of recovered energy (15%)
- Experience in and knowledge of the procedures used and requirements of financing agencies such as multilateral banks including, at a minimum, risk

management, procurement procedures and project management requirements for financing (10%)

- Working knowledge of U.S. suppliers who may provide services and equipment for Brazil's solid waste sector, and in particular, landfill gas recovery and waste-to-energy projects. (5%)

Annex 2
Sponsor Letter of Support

Leo:

TOR approved.

All the best,

Rodrigo Mota

Country Representative, Brazil
US Trade and Development Agency
Phone: 55-11-5186-7335
Fax: 55-11-5186-7396
Mobile: 55-11-7575-9844
www.ustda.gov

From: lineucm@semasa.sp.gov.br <lineucm@semasa.sp.gov.br>
To: Mota, Rodrigo
Cc: Dr. Angelo <angeloip@semasa.sp.gov.br>
Sent: Wed Mar 23 17:24:50 2011
Subject: Re: USTDA- Parceria SEMASA/EMAE

Dr. Rodrigo
Conforme nosso contato telefônico na data de hoje, confirmo nosso interesse na continuidade do projeto.
Quanto ao texto do Termo de Referência não temos nada a opor, mesmo porque ao longo dos trabalhos consultivos e em razão da especificidade dos levantamentos
a serem realizados estaremos a disposição para os esclarecimentos e aditamentos, se necessário e possível.
Dessa forma, aprovamos o Termo de Referência para a continuidade do programa de estudos que visa parcerias, proposto por Vossas Senhorias.
Aproveito ainda para manifestar o interesse também no Projeto sobre "Àgua" que falamos pela manhã.
Solicito maiores informações sobre os projetos disponíveis e coloco-me à disposição para o que for necessário ao inicio das tratativas, haja vista e é do conhecimento de Vossas Senhorias que o SEMASA é a autarquia municipal encarregada da gestão, no Município de Santo André, da àgua distribuída no município, além das funções de gestão ambiental.
Att.
Dr. Lineu Carlos Cunha Mattos
Coordenador de Assuntos Jurídicos
SEMASA

Annex 3
Brazil Country Trade Fact Sheet

COUNTRY FACT SHEET: BRAZIL

U.S. Ambassador to Brazil: Thomas Shannon
Brazilian Ambassador to the United States: Mauro Vieira

PROFILE

Population: 191.9 million*
Capital: Brasilia
Government: Federative Republic

Next Election Scheduled: 2010
Head of Government: Luiz Inacio Lula da Silva (President)

ECONOMY

- **2008 Nominal GDP** (Current US$ billions): 1,572.8
- **2008 Nominal GDP Per Capita** (Current US$): 8,295*

	2006	2007	2008
Real GDP Growth Rate (%)	3.9	5.7	5.1
Real GDP Per Capita Growth Rate (%)*	2.5	4.5	4.0
CPI (%)	4.2	3.6	5.7
Unemployment (%)[4]	10.0	9.3	7.9

- **Economic Mix in 2007**[1]: 18% Manufacturing; 66% Services; 6% Agriculture.

FOREIGN MERCHANDISE TRADE (US$ billions)	2006	2007	2008
Brazil Exports to World	137.5	160.6	197.9
Brazil Imports from World	91.4	120.6	173.2
U.S. Exports to Brazil	18.9	24.2	32.3
U.S. Imports from Brazil	26.4	25.6	30.5
U.S. Trade Balance with Brazil	-7.5	-1.4	1.8

- **Rank of Brazil as U.S. Export Market in 2008:** 16th Largest (0.5% of U.S. exports).
- **Principal U.S. Exports to Brazil in 2008:** Machinery (21%); Aircraft, Spacecraft (17%); Electric Machinery (11%); Mineral Fuel, Oil (7%); Organic Chemicals (7%); Plastics (6%).
- **Principal U.S. Imports from Brazil in 2008:** Mineral Fuel, Oil (29%); Iron, Steel (14%); Machinery (9%); Aircraft, Spacecraft (8%); Wood (3%).

FOREIGN DIRECT INVESTMENT (US$ billions)	2006	2007	2008
U.S. FDI in Brazil	33.1	47.8	45.5
FDI into U.S. from Brazil	-1.1	-1.8	-0.8

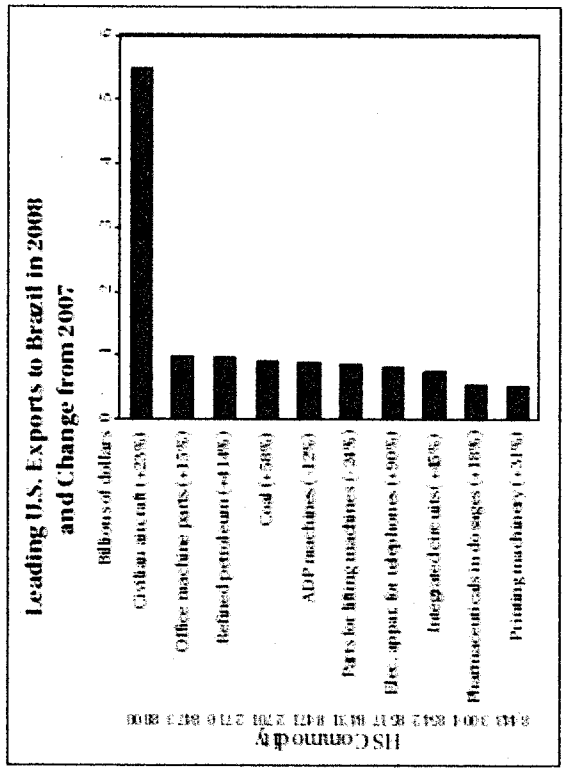
- **Principal Suppliers of Foreign Investment to Brazil:** United States, Netherlands, Cayman Islands, Switzerland, Spain, Canada.

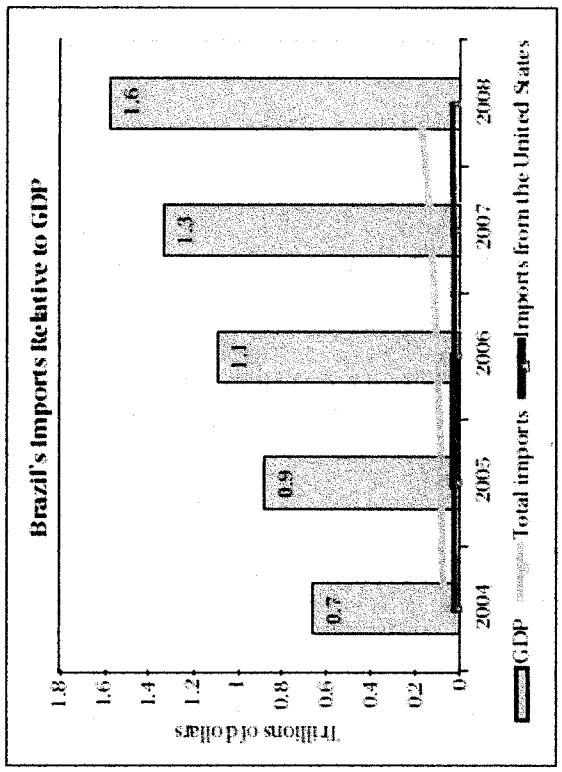
DOING BUSINESS RANKING

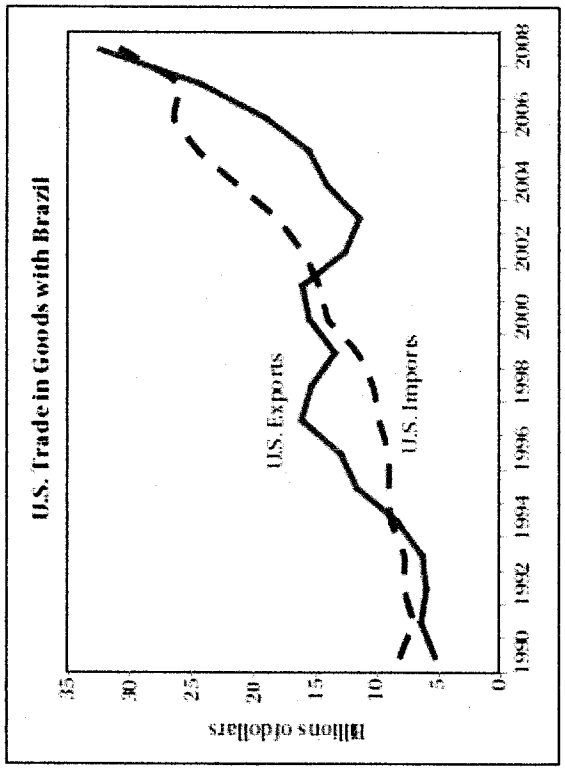
- **World Bank Doing Business in 2010 Rank:** 129 of 183 (127 in 2009).

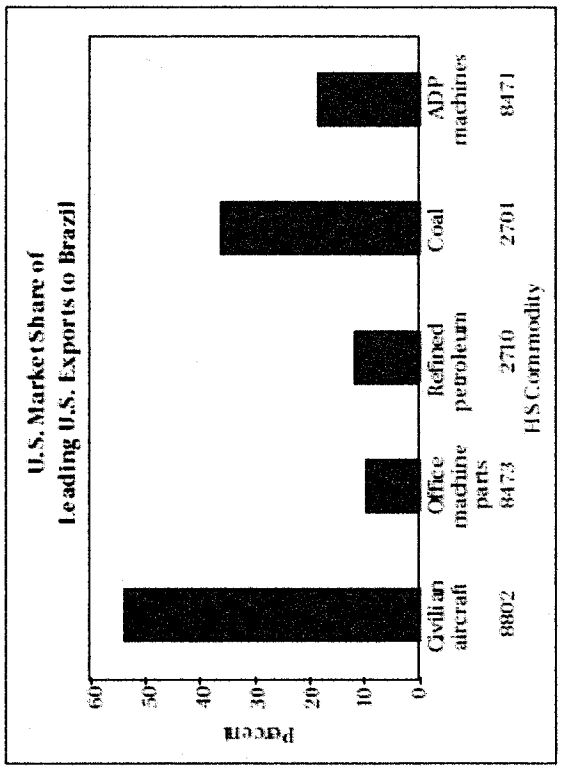
COMMERCIAL OFFICER INFORMATION

Senior Commercial Officer: Danny Devito
Commerce Desk Officer: Maria Cameron (202) 482-0475
Lorrie Fussell (202) 482-4157


Leading U.S. Exports to Brazil in 2008
and Change from 2007
Billions of dollars
0
1
2
3
4
5
6
Civilian aircraft (+23%)
Office machine parts (+13%)
Refined petroleum (+414%)
Coal (+58%)
ADP machines (-12%)
Parts for lifting machines (-38%)
Elec. appar. for telephones (+90%)
Integrated circuits (+45%)
Pharmaceuticals in dosages (+18%)
Printing machinery (+31%)
HS Commodity


Brazil's Imports Relative to GDP
Trillions of dollars
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
0.7
0.9
1.1
1.3
1.6
2004
2005
2006
2007
2008
GDP
Total imports
Imports from the United States


U.S. Trade in Goods with Brazil
Billions of dollars
0
5
10
15
20
25
30
35
U.S. Exports
U.S. Imports
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008


U.S. Market Share of
Leading U.S. Exports to Brazil
Percent
0
10
20
30
40
50
60
Civilian aircraft
Office machine parts
Refined petroleum
Coal
ADP machines
8802
8473
2710
2701
8471
HS Commodity

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Annex 5
Integrated Solid Waste Management Alternatives

Solid waste management is one of the key priorities for municipalities throughout the world. This priority results from the fact that improper solid waste management is often one of the most visible problems in a municipality. Additionally, solid waste collection and disposal is often one of the major elements of municipal budgets. As a result, proper solid waste management is a prerequisite for effective communities. However, as is the case in many countries throughout the world, many municipalities are struggling with developing ISWM programs that are environmentally sound, cost-effective and sustainable. Similarly, many municipalities in other countries are struggling with the means for providing even the mandatory services (collection and disposal). PerformTech's observation is that this is not the case in Brazil where significant progress has been made in developing core services. This establishes the basis for believing that the proposed a waste-to-energy facilities can have an acceptable priority in development.

Conceptually, the DM assessment was undertaken within an overall objective of developing waste-to-energy facilities as a component of effective Integrated Solid Waste Management (ISWM) programs in each of the reference cities. Based on international sound practice and standards, ISWM is defined as:

> *"A form of solid waste management where an appropriate technology is applied in a sustainable manner for various components of the solid waste stream".*

Through this definition, the authors of this report recognize that energy recovery is only one of the solid waste processing options that may be developed as part of an effective ISWM program. Other processes such as compost production and enhanced recycling may be more practical alternatives in some instances than technically complex and costly waste-to-energy systems. PerformTech recognizes that any initiative or program aimed at energy recovery from municipal solid waste must be placed in a proper perspective and position within the commonly accepted priority order for solid waste management choices and activities that define ISWM. This priority order is shown in Figure A-1 which places energy recovery at a lower priority position than other potential ISWM initiatives aimed at reducing the amount of solid waste generated or recovering solid waste components through recycling and/or

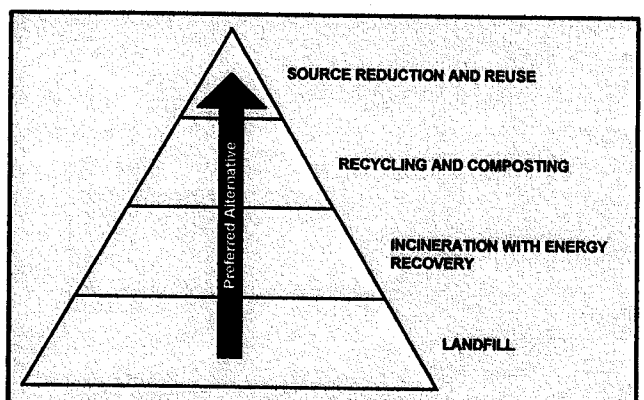
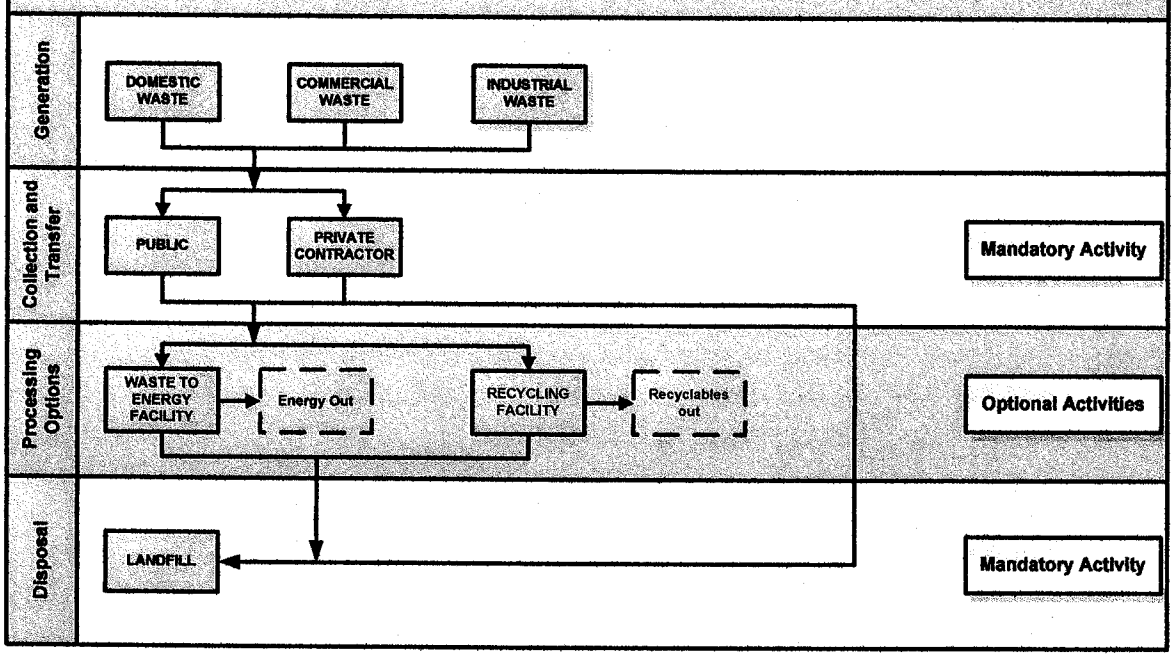


Figure A-1
SOLID WASTE MANAGEMENT HIERARCHY

composting. While this hierarchy of choices may have originally reflected the environmental concern that existed relative to the potential environmental effect of solid waste incineration, it still applies today because of the high cost and complexity often associated with such systems.

Further, as illustrated in Figure A-2 below, PerformTech recognizes that each municipality's collection and disposal programs are mandatory processes that must be optimized and achieved in a thorough, environmentally sound and cost effective manner. While important, materials and energy recovery programs and facilities are, for the most part, optional activities that should only be implemented **if the proper conditions exist to make them technically and economically feasible and sustainable**. This is especially the case for capital intensive waste-to-energy projects since careful planning and the existence of proper development conditions are prerequisites if such projects are to be successful (as defined by their durability, reliability, technical/cost effectiveness and sustainability). This establishes the importance of an effective Feasibility Study in considering such applications.

Figure A-2 INTEGRATED SOLID WASTE MANAGEMENT PROCESSES



From an overall perspective, waste-to-energy facilities (such as those envisioned by the Brazilian municipalities who have requested assistance from USTDA) are only one potential element of effective Integrated Solid Waste Management programs. The schematic shown in Figure A-2 presents a basic model which illustrates the processes involved in the ISWM approach. For any ISWM program to be successful, all of its individual processes must be developed in an effective and sustainable manner so as to provide ongoing and sustainable results at the desired level of service. There are alternative technologies available for accomplishing the different elements of an effective ISWM program. While solid waste collection and disposal are core mandatory service elements, the means for recovering solid

waste components or value are important to optimize solid waste management programs but must be considered as optional processes.

Historically, municipal solid waste management programs consisted primarily of a means for collecting solid waste and providing for its disposal. Generally, in many countries, recycling or recovery of materials was accomplished through the informal sector by scavenging either within the collection system or at disposal facilities. In recent decades, however, the evolving complexity of solid waste disposal with the need to mitigate environmental effects of improper disposal has created a situation where the resulting increase in disposal costs has created a greater interest in systems and processes aimed at diverting solid waste components. In addition, many countries have adopted laws and regulations that are aimed at increasing the level of recovery of solid waste materials for economic or environmental reasons. From a solid waste management perspective, waste-to-energy facilities are a means for recovering a valuable component (energy) of the solid waste stream while significantly reducing (by about 85%) the volume of solid waste that will ultimately require disposal at a landfill.

If the proper conditions exist, elected officials and solid waste managers in the reference municipalities may seek to develop an optional processing function (such as a waste-to-energy facility) as a means of enhancing their solid waste management services. Normally, their reasons for doing this will be a desire to reduce the amount of solid waste requiring disposal and/or to desire to recover the inherent value of solid waste stream components either in the form of recovered materials with recycle value or as captured energy content. While the perception often exists that the recovery of energy and materials will help decrease the overall cost of solid waste management, experience has shown that this is often, and most likely, not the case. The economic reality of recovery projects requires a close consideration of all relevant development factors so as to meet the objectives of what drives the development of the facility in the first place. A further discussion of energy recovery project drivers is presented in this DM report since they also serve as a basis for PerformTech's recommendations to USTDA relative to the merits of USTDA support of the proposed projects.

The effect of local conditions and the extent of incentives for developing optional recovery processes may also create interest on the part of private sector companies that may seek to develop processing facilities because they perceive that there are sufficient business reasons to do so. This is the case in one of the evaluated projects where the information for the DM evaluation was provided by a United States company seeking to develop an energy recovery facility in Brumadinho. Irrespective of who develops an energy recovery project, public or private developers have a number of technology choices that they can make to achieve the desired energy recovery results. Careful planning that accurately defines the solid waste management conditions in a municipality helps determine which technologies or approaches are feasible and which may be the most technically feasible or cost effective for achieving a recovery objective.

Careful planning and investigation will also help to identify the major risks that may be associated with these ventures and assist in developing the means to mitigate them. Risk identification and mitigation are important elements of recovery project Feasibility Studies since worldwide experience has shown that there are significant risks associated with such

facilities and that, if these risks are not properly managed, a recovery project may fail (as many have in the past). Historically, the failure of recovery facilities was usually caused by one or more of the following reasons:

- Inability or unwillingness to pay the full processing fee which results in insufficient revenue to cover loan payments and costs associated with effective operation and maintenance.
- Operation and maintenance failures including lack of skilled workers or poor plant management, operations and maintenance practices.
- Problems with solid waste characteristics and quantities.
- Inadequate or ineffective institutional arrangements to support the management or financial requirements of the facility.
- Overly optimistic projections by system and equipment vendors whose primary interest may be to sell equipment and not necessarily to develop sustainable projects and results.

The need to investigate and manage these considerations must be important elements of a Feasibility Study and, as a result, are factored into PerformTech's review of the project opportunities and in the Terms of Reference developed for the project recommended for USTDA assistance. As will be presented in this report, there are many common elements to evaluating waste-to-energy applications.

2.2.1 Waste-to-Energy Approaches

History has shown that, in addition to the direct value of certain typical solid waste components (paper, metal, etc.), there is energy value inherent to a typical municipal solid waste stream that can be recovered. The technology and manner by which this energy is recovered can vary significantly. Figure A-3 presents a general schematic of the optional processing alternatives available for the treatment of municipal solid waste. As shown, some of these approaches are designed for both recovery of materials as well as energy while others are primarily aimed at energy recovery. Some technical approaches, such as mass burn, are very well developed and commercialized as a result of an extensive number of facilities built throughout the world. Other technologies such as plasma or gasification based systems are not as well

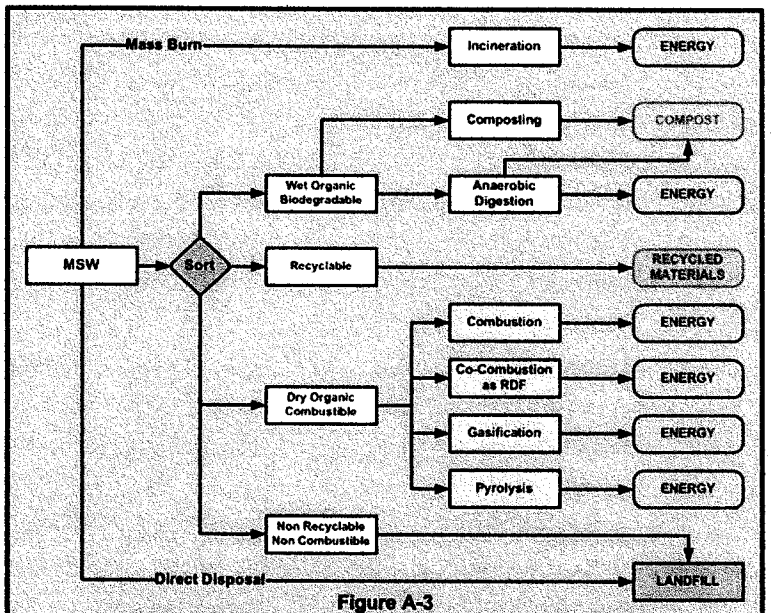


Figure A-3
SOLID WASTE PROCESSING ALTERNATIVES AND OUTPUTS

developed and, in some cases, have yet to be proven at a commercial scale for the processing of municipal solid waste.

The lowest line (labeled Direct Disposal) on the Figure A-3 schematic represents the current practice in most Brazilian municipalities where solid waste is collected and transported directly to landfills for disposal. The top line (labeled Mass Burn) represents a common practice in many industrialized country urban areas where solid waste is collected and transported directly to mass burn facilities for combustion and energy recovery followed by ash residue transport to landfills for disposal. ("Mass burn" is a term applied to a combustion process where the solid waste is combusted in the form that it is collected without significant preprocessing.)

As shown, all of the other processing approaches represented in the schematic require solid waste sorting to some degree that allow components of the solid waste stream to be diverted to a technology or management approach best suited for them. Typically, the sorting process can be accomplished in two ways. Post collection sorting is accomplished through mechanical or manual means. Scavenger activity at Brazilian landfills is an example of post collection sorting although it is often not performed under the control of the agency operating the disposal site. Sorting can also be accomplished through source separation which is a common practice in many industrialized counties. Through source separation, waste generators are responsible for separating their waste materials into recoverable and non-recoverable streams. This approach requires independent collection of each stream with its inherent increased collection costs. One advantage of source separation is that the segregated materials are typically of much better quality after separation since they do not become contaminated through contact with other less desirable components in the solid waste stream such as food waste. This usually helps increase the value of recovered materials to markets. Source separation already occurs in a limited manner in Brazil where some specific waste streams such as traditional market waste (which is very high in organic content) are diverted for compost production.

One key factor in developing waste-to-energy facilities in any particular locale is the physical characteristics of the typical municipal solid waste from which energy is to be recovered. In many developing countries, the generally high organic content of the solid waste stream makes it difficult to effectively combust the materials for energy recovery. Generally, the characteristics and resulting combustibility of a municipal solid waste stream are somewhat related to prevailing economic conditions in a country. Low income countries (where significant informal recycling is practiced or where consumable packaging is influenced by a lack of refrigeration to store food

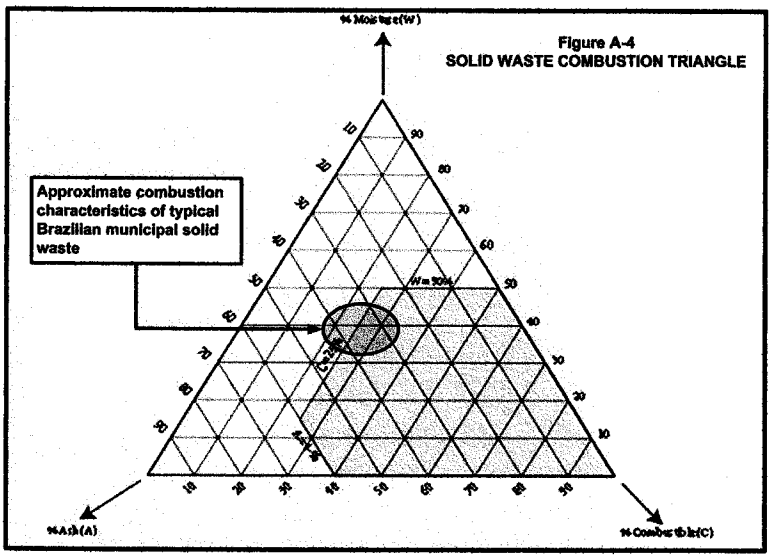


Figure A-4
SOLID WASTE COMBUSTION TRIANGLE

materials) will typically have a solid waste stream with a higher organic content than that experienced in industrialized countries such as the U.S. and the countries of the European Union. Figure A-4 presents a generalized combustibility triangle where the dark shaded area represents general solid waste characteristics that are readily adaptable to combustion-based technologies. The solid waste typically generated in many developing countries will often fall outside of the shaded area thereby creating a questionable opportunity for recovering energy without significant preprocessing of the solid waste or the use of a supplemental fuel. PerformTech believes that, given the evolving industrialized nature of Brazil, the typical municipal solid waste stream characteristics may be sufficient to support conventional waste-to-energy applications. Typical solid waste compositions comparing municipal solid waste in Brazil to other countries is shown in Table 2.1. As shown, the typical solid waste characteristics in Brazil are similar to that in a number of European countries where waste-to-energy facilities are commonly used for waste processing. The further evaluation of this issue is an important basis for the proposed feasibility study recommended in this DM report and is an important element of the recommended TORs.

From an ISWM perspective, waste-to-energy systems accomplish two important functions. They recover a valuable commodity (energy and, in some configurations, materials) while significantly reducing the amount of solid waste that must eventually be placed into a landfill. However, this does not mean to imply that waste-to-energy systems automatically become a practical ISWM solution for all municipalities based on commonly accepted sound practice criteria. As previously described, energy recovery facilities are optional ISWM program components and a municipality can have an effective solid waste management program even if it only has a properly designed and functioning collection program and disposal facility. However, there are social and environmental benefits to capturing the energy and materials content of the solid waste stream while decreasing the total amount of waste requiring disposal. The key issue becomes the cost at which these benefits are derived. As a result, one of the important objectives of the feasibility studies is to determine the overall economics associated with implementing such facilities and to compare those costs to alternative approaches.

The physical and demographic characteristics of any prospective location (and its resulting solid waste stream) affect the applicability of any ISWM processing approach (including development of waste-to-energy facilities) and help to define whether a desired approach is a sound practice. Common site specific factors and limitations that define sound practice choices include the:

1. Availability of financial resources to implement and sustain new or enhanced processes when compared to previous substandard practices
2. Relative cost of resources (capital, labor, etc.)
3. Level of technological development (availability and competence of local equipment and services, etc.)
4. Level of human resource development in the municipal solid waste field (trained and competent technicians, managers, etc.) and in society in general (effective labor, etc.)

5. Physical conditions of collection areas (residences and commercial establishments, container or collection locations, access roads, etc.)
6. Physical conditions and environmental effects of existing disposal areas (topography, soil characteristics, hydrogeology and the type/proximity of water bodies.)
7. General climatic conditions that may influence specific system design features (temperature, rainfall, prevailing winds, etc.)
8. Specific environmental sensitivities of the region (such as the extent of existing air pollution or the condition of water bodies near disposal areas, etc.)
9. Solid waste characteristics (volume, composition, density, moisture content, combustibility, recyclable content, and the inclusion of hazardous or biomedical waste in the municipal solid waste stream.)
10. Existence or effectiveness of laws and regulations and the level of their enforcement
11. Extent and effect of informal practices (solid waste scavenging in collection systems and at disposal areas, for example.)
12. Political support or opposition to available solid waste management alternatives

Defining these factors and determining their relative strengths is an important basis for the proposed feasibility study. The local aspects of these factors determine the technical and economic feasibility of any processing application and form the basis for the analysis, conclusions and recommendations to be developed as a result of a thorough Feasibility Study..

To be successful (and subject to compliance with the commonly accepted sound practice standards), the optional processing function of a waste to energy application need to have sufficient "**drivers**" for their implementation. In this case, a "driver" is defined as the underlying reason that the effort is made to develop a particular service, program or facility. Implementation of a processing system may be a function of single or multiple drivers including the following:

- **Regulatory** – (*Is the optional activity or facility required or advanced by existing laws and regulations?)* In countries such as the U.S. and the countries of the E.U., strictly enforced and stringent regulations exist for all types of solid waste activities. For example, landfills must be designed, constructed and operated at a high standard of environmental control (liners, leachate collection, gas management, groundwater monitoring, etc.) that significantly affects both the cost of disposal and the diminishing availability of approved landfill airspace. (Airspace is a term referring to the approved volume of a landfill for placement of solid waste as determined by its design and permit conditions. Available airspace can also be translated to a remaining time frame for remaining capacity based on an expected rate of solid waste placement.) With a steadily decreasing volume of approved landfill airspace in the U.S and E.U., the means for reducing the amount of solid waste requiring disposal has become increasingly important. Additionally, the current E.U. Landfill Directives require treatment of municipal solid waste to reduce or eliminate its organic content prior to placement into a landfill. Some solid waste processing technologies that

recover energy inherently accomplish this purpose. Therefore, a strong regulatory driver is established in the E.U. and U.S. pushing the implementation of waste processing facilities which, in some cases, are no longer optional.

- **Economic** – (*Are there overall savings that will be realized as a result of the optional activity or facility?*) The economic driver is based on the premise that there is an economic gain to be realized as a result of an activity or facility. For example, because of the high cost of landfill disposal in the U.S. and E.U., there may be a significant economic driver for reducing the amount of solid waste requiring disposal. Along with the evolving environmental standards in Brazil, higher costs for effective disposal services and facilities will occur which can enhance the economic driver for a processing facility that provides significant divergence of solid waste from landfill disposal. In addition, the economic driver from an energy recovery perspective can be the direct value of the recoverable energy. Given its state of development and evolving industrialized economy, the value of any additional energy source, particularly a relatively renewable energy source such as municipal solid waste, can provide significant economic value as Brazil attempts to increase its power production base for future needs. Because of the high capital costs of typical waste to energy applications, the economic driver needs to be closely evaluated.
- **Environmental** – (*Will environmental conditions be improved as a result of the optional activity or facility?*) Similar to the economic driver, an environmental driver is based on the premise that environmental benefits can be gained by diverting as much solid waste as possible from disposal and that some of the means for processing and diverting solid waste materials are more environmentally suitable than landfills. However, this premise must include the environmental balance that may exist by eliminating some disposal need while developing a system that may create its own environmental issues and concerns. The ongoing controversy about air emissions associated with solid waste energy recovery through incineration, for example, provides a good illustration of this required environmental balance. The implementation of a solid waste processing facility can have a significant positive environmental impact so long as the facility is designed, operated and maintained to a reasonable standard.
- **Political** – (*Does the optional activity or facility have the strong support of political leadership to a point where it drives the implementation of the initiative?*) In some cases, political leaders have been forceful in pushing for the implementation of specific technologies or processes. This can significantly drive a project toward implementation since the elected officials may be instrumental in assuring that sufficient financial resources are provided for project development and construction. Conversely, public concern about a specific issue associated with some types of energy recovery (such as air emissions from incinerators, for example) can lead political leaders to oppose certain project approaches irrespective of the strength of the other drivers.

3.2 AVAILABLE WASTE-TO-ENERGY TECHNOLOGIES

For baseline purposes, the following presents a brief description of the technologies and processes which can achieve the recovery of energy content from municipal solid waste.

3.2.1 Incineration - Many large cities throughout the world use mass burn incineration as a fundamental process for recovering energy and reducing the volume of solid waste requiring disposal. In Asia, there is limited experience with waste incineration outside of the industrialized countries of Japan, Singapore, and Taiwan where a high proportion of municipal solid waste streams is processed in this manner. A typical mass burn facility configuration is shown in Figure A-5 which also shows the air pollution control systems normally required in such facilities to meet the stringent air pollution control regulations that exist in many industrialized countries.

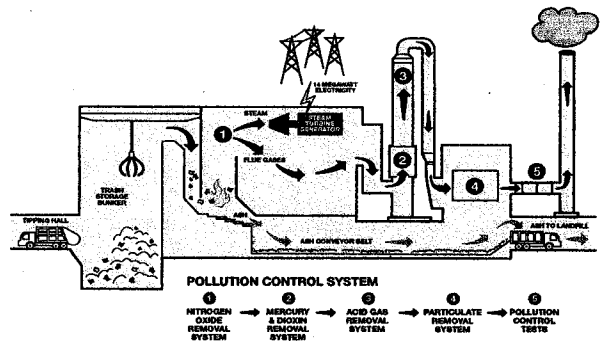


Figure A-5
CONVENTIONAL MASS BURN FACILITY CONFIGURATION

Alternatively, "Refuse Derived Fuel" (RDF) systems have also been used to recover energy through combustion. In this case, however, the solid waste stream is mechanically processed prior to combustion to derive a "fuel" from the combustible portion of the solid waste stream that is more adaptable to conventional combustion application such as solid fuel boilers or cement kilns. (Typical RDF forms derived from municipal solid waste are shown in Figure A-6.) The RDF may be combusted at the processing facility through dedicated boilers for energy recovery or, in some cases, transported to another offsite location where it can be combusted as an alternative fuel source. In these later cases, RDF may be co-combusted with other fuels such as coal or biomass in facilities that are capable of handling both.

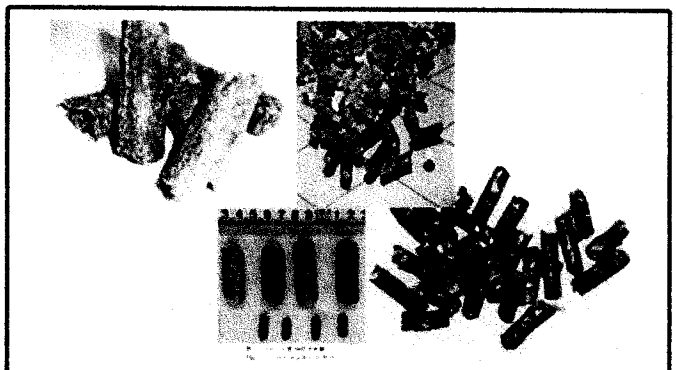


Figure 10
TYPES OF REFUSE DERIVED FUEL

For many years, the development of mass burn waste-to-energy facilities (and, to some degree, the combustion of RDF) has been controversial because of ongoing concern about the environmental effects of air emissions and ash residue from the combustion process. In particular, the emission of trace organic compounds such as dioxin in incinerator exhaust gases became and remains a focal point of considerable opposition to incineration with the result that some countries (such as the Republic of the Philippines, for example) have banned the incineration of mixed municipal solid waste altogether. In recent years, however, much has been learned about MSW combustion and the means for effectively controlling all types of emissions from incineration facilities. New mass burn facilities, as well as older facilities with upgraded air pollution control systems, are meeting rigorous air emission standards such as

those that exist in the United States and the European Union. However, costly and technically complex air pollution control systems such as that shown in Figure A-5 are necessary to meet these standards and contribute to the overall high costs of waste to energy applications.

3.2.2 Gasification/Pyrolysis – Gasification is a thermochemical process that produces a gaseous, fuel-rich products through two main stages. In the first stage, the volatile content of the solid waste biomass is vaporized and removed at temperatures around 600°C, leaving behind carbon and ash. Thereafter, the remaining carbon content is reacted with either steam or hydrogen to produce a synthetic gas. Gasification ultimately converts the carbonaceous materials into methane, carbon monoxide and hydrogen by thermally reacting a raw material (such as municipal solid waste) at high temperatures with a controlled amount of oxygen and/or steam. The resulting gas mixture derived from the process is called synthesis gas or "syngas" and is itself a fuel which can then be combusted to generate electricity through different power generating equipment such as steam boilers, reciprocating engines, combined cycle turbines and fuel cells.

The nature of the feedstock for a gasification system is an important factor in the design of gasification reactors since the degree of homogeneity of the material to be processed affects the efficiency of the reactions that must occur. Raw MSW is typically first processed into an RDF form which results in a more homogenous feedstock before being fed into the gasifier. The cost of processing RDF often makes up a significant part of the total costs of a gasification system and may account for up to 50% of the total capital costs associated with such systems.

The theoretical advantage of gasification is that using the syngas for energy recovery is potentially more efficient and flexible than the direct combustion of the original solid waste. Syngas may be burned directly in internal combustion engines, used to produce methanol, or converted into a synthetic fuel. Gasification relies on chemical processes at elevated temperatures (>600°C), which distinguishes it from biological processes such as anaerobic digestion that also produce biogas. Pyrolysis is a similar process to gasification that accomplishes the same general oxidation result but without the use of any oxygen to support the chemical conversion process. Key aspects of pyrolysis and gasification technologies include the following:

Gasification

- Non-commercial systems that have been proven technically at a pilot or laboratory scale but not at a commercial or financially sustainable scale
- Can be seen as a process between pyrolysis and incineration as it involves partial oxidation.
- Exothermic process (some heat is required to initialize and sustain the gasification process).
- Oxygen is added but at low amounts not sufficient for full oxidation and full combustion.
- Temperatures are above 650°C
- Main end product is syngas which typically has a thermal value of about 1/5 that of natural gas

- Other process end product is solid residue of non-combustible materials (ash) which contains low level of carbon

Pyrolysis

- Non-commercial systems that have been proven technically at laboratory or pilot scale but not at a commercial scale for municipal solid waste
- Thermal degradation of organic materials through use of indirect, external source of heat
- Temperatures between 300 to 850°C are maintained for several seconds in the absence of oxygen.
- Process output is char, oil and syngas composed primarily of O_2, CO, CO_2, CH_4 and complex hydrocarbons.
- Syngas can be utilized for energy production or can be condensed to produce oils and waxes

While there is commercial scale experience in utilizing gasification or pyrolysis on homogeneous feedstock materials such as coal or some forms of biomass, full scale commercial experience in using this technology on mixed or separated municipal solid waste is limited. This may contribute to the overall risk associated with utilizing this technology for recovering energy from the municipal solid waste stream in Brazilian municipalities.

3.2.3 Mechanical Biological Treatment – Mechanical Biological Treatment (MBT) is a processing design where solid waste is treated through both mechanical and biological means. This technology has been extensively used in the E.U. Through the mechanical component of an MBT facility, the solid waste material is segregated into individual material components and streams that include marketable material output (metal, plastic, glass, etc.) that can be directly sold to recycled material markets. Additionally, mechanical processing can result in the production of refuse derived fuel which makes use of dry organic content (paper, cardboard, etc.) from the solid waste stream. The RDF fraction can amount to about 45% of the waste coming into an MBT plant for processing depending on the composition of the solid waste stream to be processed. With a calorific value of 12.5 to 14 MJ/Mg, the RDF derived from an MBT facility processing municipal solid waste is a better fuel than low-grade coal. Once produced, RDF can be used in a number of ways including:

- On-site in an integrated thermal conversion system such as a boiler;
- Off-site at a remote facility as an alternative fuel;
- Co-combustion in coal fired boilers;
- Co-incineration in cement kilns;
- Co-gasification with coal or biomass.

The biological component system of the MBT process is used to treat the organic fraction resulting from the mechanical processing system in a variety of ways. The biodegradable organic component can be aerobically treated to produce compost through windrow or in-vessel composting. Alternatively, the biodegradable component can also be subjected to an anaerobic digestion (AD) process which results in the biological production of biogas (which has a significant proportion of methane derived from the digestion process). Anaerobic digestion

occurs in the absence of oxygen and in the presence of anaerobic microorganisms. It is facilitated by a series of metabolic interactions among various groups of microorganisms. This biogas can then be combusted for generation of electricity or for another direct energy use.

The digestible waste is shredded before it is fed into a digester for a specified retention time. A heat exchanger is usually required to regulate the temperature in the digesting vessel. The digestion process normally takes place in a wet environment and in the absence of any air where organic materials are broken down under anaerobic conditions to produce a gas. The biogas output of the AD process consists of methane (50 to 70%), carbon dioxide (30 to 45%) and small proportions of other gases such as hydrogen sulfide. Finally, the residue from the digester can be dewatered and further processed to produce compost.

The biological and chemical process in anaerobic digestion normally occurs in three phases as illustrated in Figure A-7. Through this process, complex organics in the biodegradable content of the solid waste stream are broken down in multiple stages until biogas is generated with its high concentration of methane which provides its "fuel" function. Waste digestion occurs through three main processes, namely hydrolysis, acidogenesis and methanogenesis. In hydrolysis, the first group of microorganisms secretes enzymes which reduce polymeric materials to monomers such as glucose and amino acids. Thereafter, in acidogenesis, the second group of microorganisms converts the monomers to volatile fatty acids, hydrogen and acetic acid. Finally, the third group of bacteria works in methanogenesis to convert hydrogen, carbon dioxide and acetate to methane gas. All three AD biological processes take place in large digesters that are maintained at temperatures ranging from 30°C to 65°C. These enclosed reactors help to control the anaerobic biological process and to collect all of the biogas fuel produced. The yield of biogas depends on the composition of the solid waste feedstock and the physical conditions within the reactor. Modern anaerobic digestion treatment processes are engineered to closely monitor control the reaction conditions to optimize digestion rate and resulting fuel production. Key technical aspects of an AD system include the following:

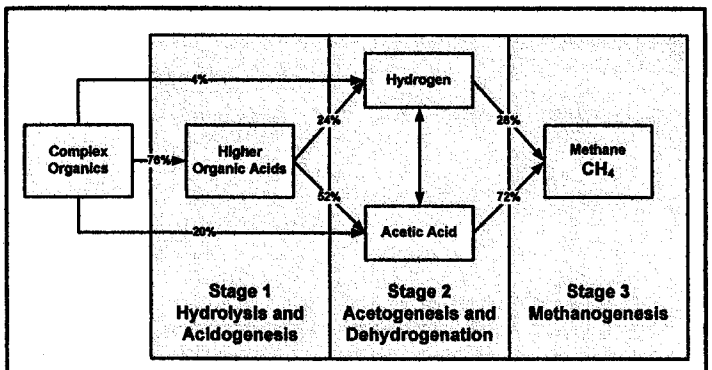


Figure A-7
CONVERSION OF ORGANICS TO BIOGAS (Methane and Carbon Dioxide)

- Well developed technology for domestic sewage and organic wastes treatment, but not for mixed MSW as of yet
- Biological conversion of biodegradable organic materials in the absence of oxygen
- Methane gas generated and used for electricity/energy generation or flared
- The stabilized solid residue following digestion typically averages 40-60% by weight of the AD system feedstock. This material can be used as soil conditioner after dewatering.

- The actual decomposition reaction that occurs in an AD system is similar to what happens in a landfill mass where placed solid waste decomposes and landfill gas is generated which is also high (about 50%) in methane content.

3.2.4 Landfill Gas To Energy - As a result of current landfill regulations in some industrialized countries or the need to control or prevent release of methane emissions from disposal facilities, landfill gas recovery projects have been developed at many landfills throughout the world. While many of these landfill gas recovery facilities have been designed to use the energy value of the recovered gas to generate electricity, some landfill gas recovery projects were developed to simply combust the gas after it is collected through use of a flare system. (While a greenhouse gas emission (carbon dioxide) may result from the combustion of landfill gas through a flare system, net environmental benefits are derived since the process eliminates the emission of methane which is a significantly more potent greenhouse gas than the carbon dioxide emitted from a flare system.) The typical configuration of an active landfill gas management system is shown in Figure A-8 which illustrates the means for collecting gas from the accumulated landfill solid waste mass and combusting it through a flare or energy recovery system.

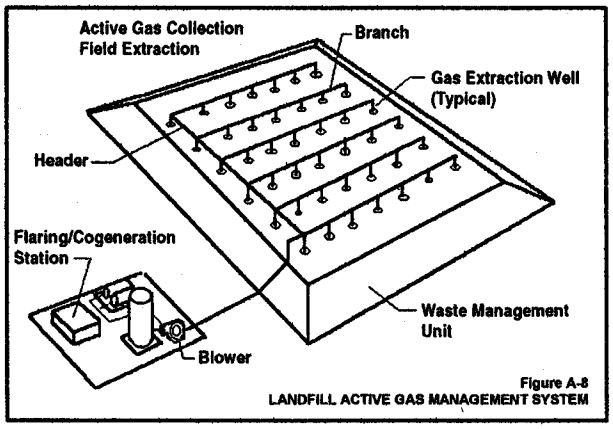


Figure A-8
LANDFILL ACTIVE GAS MANAGEMENT SYSTEM

Landfill gas is generated within the accumulated landfill solid waste mass through the same general biological process shown in Figure A-7 with the result that typical landfill gas has a high concentration of methane which establishes its combustibility and potential energy value. After steady-state decomposition conditions are reached in a landfill, gas is generated at a relatively consistent rate and composition (which primarily consist of methane (45 to 65%), carbon dioxide (25 to 40%), and nitrogen (10 to 20%)).

Annex 6
Trade Associations and Consultants

In accordance with the Definitional Mission Terms of Reference, PerformTech is required to provide a listing of United States organizations that would have an interest in the WTE projects in Brazil. Accordingly, the following include a partial listing of environmental and solid waste management focused associations and consulting firms that could provide the equipment materials and services for the development of the projects. A partial listing of WTE technology and equipment suppliers is shown in Section 7 of this DM report.

American Consulting Engineers Council
1015 15th Street, NW
Washington, DC 20005

Environmental Industry Association
4301 Connecticut Ave. N.W.
Suite 300 Washington, DC 20008

Environmental Technology Council
915 15th Street, N.W. Fifth Floor
Washington, DC 20005

Water and Solid Waste Equipment Manufacturers Association
P. O. Box 17402
Dulles International Airport
Washington, DC 20041

Environmental Export Council
1835 K Street N.W. - Suite 805
Washington, DC 20006

Integrated Waste Services Association
1401 H Street N.W. - Suite 205
Washington, DC 20036

Manufacturers of Emissions Controls Association
1707 L Street, N.W., #570
Washington, DC 20036

Air and Waste Management Assoc.
Municipal Waste Committee
Fort Duquesne Boulevard
P.O. Box 2861
Pittsburgh, PA 15230
(412) 232-3444; Fax: (412) 232-3450
Web Site: www.awma.org

Aluminum Association
900 19th Street, NW - Suite 300
Washington, DC 20006
(202) 862-5100; Fax: (202) 862-5164
Web Site: www.aluminum.org

American Society of Mechanical Engineers - Solid Waste Processing Division
345 East 47th Street
New York, NY 10017-2392
(212) 705-7722; Fax: (212) 705-7674

Association of State & Territorial Solid Waste Management Officials
444 North Capitol Street, NW - Suite 315
Washington, DC 20001
(202) 624-5828; Fax: (202) 624-7875
E-mail: swmkerry@sso.org
Web Site: www.astswmo.org

American Society for Testing & Materials
c/o Old Dominion Engineering Services Company
13900 Elmstead Road
Midlothian, VA 23113
(804) 794-6437; Fax: (804) 794-5160

Composting Council
114 South Pitt Street
Alexandria, VA 22314-3112
(703) 739-2401, Fax: (703) 739-2407
E-mail: comcouncil@aol.com
www.composter.com/composting council

Cornell Waste Management Institute
Center for the Environment
100 Rice Hall - Cornell University
Ithaca, NY 14853-5601
(607) 255-1187; Fax (607) 255-8207
E-mail: cwm@cornell.edu
Web Site: www.cfe.cornell.edu/wmi/

Council of State Governments
Center for the Environment
P.O. Box 11910
Lexington, KY 40578-1910
(606) 244-8000, Fax: (606) 244-8001
E-mail: info@csg.org
Web Site: www.csg.org

Environmental Defense Fund
257 Park Avenue, South
New York, NY 10010
(212) 505-2100; Fax: (212) 505-2375
E-mail: members@edf.org

Institute of Scrap Recycling Industries
1325 G Street, NW - Suite 1000
Washington, DC 20005
(202) 737-1770; Fax: (202) 626-0900
Web Site: www.isri.org

Environmental Industries Association
(Formerly: National SWM Assoc.)
4915 Auburn Avenue - Suite 303
Bethesda, MD 20814
(301) 961-4999, Fax: (301) 961-3094
E-mail: eiacom@aol.com
Web Site: www.envasns.org

Integrated Waste Services Association
1401 H Street, NW - Suite 220
Washington, DC 20005
(202) 467-6240; Fax: (202) 467-6225
E-mail: iwsa@ix.netcom.com

International City/County Management Association
777 North Capitol Street, NE - Suite 500
Washington, DC 200024201
(202) 289-4262, Fax: (202) 962-3500
Web Site: www.icma.org

Keep America Beautiful, Incorporated
1010 Washington Boulevard
Stamford CT 06901
(203) 32i-8987; Fax: (203) 325-9199
Web Site: www.kab.org

North American Hazardous Materials Management Assoc.
15 Barre Street
Montpelier, VT 05602
(802) 223-9000; Fax: (802) 223-0269
E-mail: NAHMMA@aol.com

Solid Waste Association of North America - SWANA
1100 Wayne Avenue - Suite700, P.O. Box7219
Silver Spring, MD 20907-7219
(301) 585-2898; Fax: (301) 589-7068
E-mail: swana@milkern.com
Web Site: www.swana.org

The Waste Watch Center
16 Haverill Street
Andover, MA 01810
(508) 470-3044; Fax: (508) 470-3384
National Recycling Coalition
1727 King Street - Suite 105
Alexandria, VA 22314
(703) 683-9025; Fax: (703) 683-9026

National Solid Waste Management Association
(see: Environmental Industry Association)

Natural Resources Defense Council
40 West 20th Street
New York, NY 10011
(212) 727-2700; Fax: (212) 727-1773
Web Site: www.nrdc.org

U.S. Conference of Mayors
Municipal Waste Management Association
1620 "I" (Eye) Street, NW - 6th Floor
Washington, DC 20006
(202) 293-7330; Fax: (202) 293-2352
Web Site: www.usmayors.org

Waste to Energy Research and Technology Council - WTERT
Earth Engineering Center, Columbia University
500 West 120th St., Room 926 Mudd Building
New York, NY 10027, U.S.A.
Tel: (212) 854-9136; Fax: (212) 854-5213

PARTIAL LISTING OF U.S. CONSULTING FIRMS TO PROVIDE ENGINEERING SERVICES

ABB Environmental Services, Inc.
107 Audubon Road
Wakefield, MA 01880
617-245-6606

Black & Veatch
P. O. Box 8405
Kansas City, MO 64114
913 339-2222

Brown and Root Environmental
661 Anderson Drive
Pittsburgh, PA 15220
412-921-8688

Brown Vence and Associates
120 Montgomey St. Suite 1000
San Francisco CA 94104
415-434-0900

Camp Dresser & McKee, Inc.
One Cambridge Center
Cambridge, MA 02142
617-452-6000

Greeley and Hansen
100 S. Wacker Drive
Chicago, IL 60606
312-558-9000

Hazen & Sawyer, P.C.
730 Broadway
New York, NY 10003
212-777-8400

Metcalf & Eddy
617-246-5200

Montgomery Watson
Pasadena, CA
818-796-9141

O'Brien & Gere Engineers
5000 Brittonfield Parkway
Syracuse, NY 13221-4873
215-437-6100

Parsons Engineering Science, Inc.
One Penn Plaza
New York, NY 10119
212-465-5000

Roy F. Weston, Inc.
One Van deGraff Drive
Burlington, MA 01803
617-229-2050

R.W. Beck
The Corporation Center
550 Cochituate
Framingham MA 01701
508-935-1600

T.Y. Lin International
Jacksonville, Florida
904-725-8388

UGC Consulting
6200 S. Syracuse Way, Suite 222
Englewood, CO 80111
303-773-6166

URS Consultants, Inc.
606 Virginia Beach Blvd.
Virginia Beach, VA 23482-5631
757-499-4222

Wehran Engineering Corporation
6 Riverside Drive
Andover, MA 01810
508-682-1980

Black & Veatch
8400 Ward Parkway
Kansas City, MO 64114
(913) 339-2222, (913) 339-7677 (FAX)

Camp Dresser & Mckee Inc.
One Cambridge Place - 50 Hampshire Street
Cambridge, MA 02139
(617) 452-6000, (617) 452-8000 (FAX)

Brown and Caldwell, Inc.
3480 Buskirk Ave.
Pleasant Hill, CA 94523
(800) 727-2224, (925) 937-9026 (FAX)

Burns and McDonnell, Inc.
9400 Ward Parkway
Kansas City, MO 64114
(816) 333-9400, (816) 333-3690 (FAX)

Dames and Moore Group
911 Wilshire Blvd., Suite 700
Los Angeles, CA 90017
(213) 996-2200, (213) 996-2290 (FAX)

Durr Environmental, Inc.
31285 Durr Drive
Wixom, MI 48393
(248) 668-5200, (248) 926-6570

EarthTech.
100 W. Broadway
Suite 5000
Long Beach, CA 90802
(562) 951-2000, (562) 495-2825 (FAX)

Foster Wheeler Environmental Corp.
8 Peach Tree Hill Rd.
Livingston, NJ 07039
(923) 597-7028, (923) 597-7590 (FAX)

GE Infrastructure
Trevose, Pennsylvania
(215) 355-3300 (215) 953-5524

Millenium Science Engineering, Inc.
1364 Beverly Rd, Suite 302
McLean, VA 22101
(703) 734-1090, (703) 734-1093 (FAX)

O'Brien & Gere
5000 Brittonfield Parkway
P.O. Box 4762
Syracuse, NY 13221
(315) 437-8800, (315) 463-7440 (FAX)

Parsons Engineering Science
100 W. Walnut St. Suite T-922
Pasadena, CA 91124
(626) 440-6000, (626) 440-6177 (FAX)

Radian International
P.O. Box 201088
Austin, TX 78720-1088
(512) 419-5065, (512) 419-5474 (FAX)

Stearns & Wheeler, Inc.
1 Remington Park Drive
Casanovia, NY 13035
(315) 655-8161, (315) 655-4180 (FAX)

Malcolm Pirnie, Inc
104 Corporate Park Drive
White Plains, NY 10602
(914) 694-2100, (914) 694-9286 (FAX)

Environmental Resources Management
855 Springdale Drive
Exton, PA 19341
(800) 544-3117, (610) 524-7335 (FAX)

Woodward Clyde
1501 4th Ave. Suite 1500
Seattle, WA 98101
(206) 343-7933, (206) 343-0513 (FAX)

CH_2M Hill
6060 S. Willow Drive
Greenwood Village, CO 80111-5142
(303) 771-0900, (303) 846-2231 (FAX)

Roy F. Weston, Inc.
1400 Weston Way
P.O. Box 2653
Westchester, PA 19380
(610) 701-3000, 610) 701-3124 (FAX)

Westech Engineering, Inc.
3625 South West Temple
Salt Lake City, UT 84115
(801) 265-1000, (801) 265-1080 (FAX)

International Resources Group
1211 Connecticut Ave., Suite 700
Washington DC 20036
(202) 289-0100, (202) 289-7601 (FAX)

HDR, Inc.
8404 Indian Hills Drive
Omaha, NE 68114-4098
Phone: (402) 399-1000; (800) 366-4411
Fax: (402) 399-1238

Chemonics International
1133 20th St. NW, Suite 600
Washington DC 20036
(202) 955-3330, (202) 855-3400 (FAX)

Gershman, Brickner & Bratton, Inc.
8550 Arlington Blvd., Suite 304
Fairfax , VA 22031
Phone: (703) 573-5800
Toll Free: (800) 573-5801
Fax: (703) 698-1306

ANNEX 3

U.S. TRADE AND DEVELOPMENT AGENCY
Arlington, VA 22209-2131

NATIONALITY, SOURCE, AND ORIGIN REQUIREMENTS

The purpose of USTDA's nationality, source, and origin requirements is to assure the maximum practicable participation of American contractors, technology, equipment and materials in the prefeasibility, feasibility, and implementation stages of a project.

USTDA STANDARD RULE (GRANT AGREEMENT STANDARD LANGUAGE):

Except as USTDA may otherwise agree, each of the following provisions shall apply to the delivery of goods and services funded by USTDA under this Grant Agreement: (a) for professional services, the Contractor must be either a U.S. firm or U.S. individual; (b) the Contractor may use U.S. subcontractors without limitation, but the use of subcontractors from host country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the subcontract; (c) employees of U.S. Contractor or U.S. subcontractor firms responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for implementation of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in host country are not subject to the above restrictions. USTDA will make available further details concerning these standards of eligibility upon request.

NATIONALITY:

1) Rule

Except as USTDA may otherwise agree, the Contractor for USTDA funded activities must be either a U.S. firm or a U.S. individual. Prime contractors may utilize U.S.

subcontractors without limitation, but the use of host country subcontractors is limited to 20% of the USTDA grant amount.

2) Application

Accordingly, only a U.S. firm or U.S. individual may submit proposals on USTDA funded activities. Although those proposals may include subcontracting arrangements with host country firms or individuals for up to 20% of the USTDA grant amount, they may not include subcontracts with third country entities. U.S. firms submitting proposals must ensure that the professional services funded by the USTDA grant, to the extent not subcontracted to host country entities, are supplied by employees of the firm or employees of U.S. subcontractor firms who are U.S. individuals.

Interested U.S. firms and consultants who submit proposals must meet USTDA nationality requirements as of the due date for the submission of proposals and, if selected, must continue to meet such requirements throughout the duration of the USTDA-financed activity. These nationality provisions apply to whatever portion of the Terms of Reference is funded with the USTDA grant.

3) Definitions

A "U.S. individual" is (a) a U.S. citizen, or (b) a non-U.S. citizen lawfully admitted for permanent residence in the U.S. (a green card holder).

A "U.S. firm" is a privately owned firm which is incorporated in the U.S., with its principal place of business in the U.S., and which is either (a) more than 50% owned by U.S. individuals, or (b) has been incorporated in the U.S. for more than three (3) years prior to the issuance date of the request for proposals; has performed similar services in the U.S. for that three (3) year period; employs U.S. citizens in more than half of its permanent full-time positions in the U.S.; and has the existing capability in the U.S. to perform the work in question.

A partnership, organized in the U.S. with its principal place of business in the U.S., may also qualify as a "U.S. firm" as would a joint venture organized or incorporated in the United States consisting entirely of U.S. firms and/or U.S. individuals.

A nonprofit organization, such as an educational institution, foundation, or association may also qualify as a "U.S. firm" if it is incorporated in the United States and managed by a governing body, a majority of whose members are U.S. individuals.

SOURCE AND ORIGIN:

1) Rule

In addition to the nationality requirement stated above, any goods (e.g., equipment and materials) and services related to their shipment (e.g., international transportation and insurance) funded under the USTDA Grant Agreement must have their source and origin in the United States, unless USTDA otherwise agrees. However, necessary purchases of goods and project support services which are unavailable from a U.S. source (e.g., local food, housing and transportation) are eligible without specific USTDA approval.

2) Application

Accordingly, the prime contractor must be able to demonstrate that all goods and services purchased in the host country to carry out the Terms of Reference for a USTDA Grant Agreement that were not of U.S. source and origin were unavailable in the United States.

3) Definitions

"Source" means the country from which shipment is made.

"Origin" means the place of production, through manufacturing, assembly or otherwise.

Questions regarding these nationality, source and origin requirements may be addressed to the USTDA Office of General Counsel.

ANNEX 4

Brazil 2011-510/9A

RECEIVED
JUN 28 2011
U.S. TRADE AND DEVELOPMENT AGENCY

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GRANT AGREEMENT

This Grant Agreement is entered into between the Government of the United States of America, acting through the U.S. Trade and Development Agency ("USTDA") and the Municipality of Santo Andre, acting through the Servico Municipal de Saneamento Ambiental de Santo Andre ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Grant Agreement a feasibility study ("Study") on the proposed Santo Andre Waste to Energy and Landfill Gas Recovery Facility Project ("Project") in Brazil ("Host Country"). The cost of the goods and services required for the preparation of the study, in the amount of US$469,000 ("USTDA Grant") will be paid directly by USTDA.

1. USTDA Funding

The funding to be provided under this Grant Agreement shall be used to fund the costs of an Agreement of Understanding to Perform the Feasibility Study ("Agreement of Understanding") between the Grantee and the U.S. firm selected by the Grantee ("U.S. Firm") under which the U.S. Firm will perform the Study. Payment to the U.S. Firm will be made directly by USTDA on behalf of the Grantee with the USTDA Grant funds provided under this Grant Agreement.

2. Terms of Reference

The Terms of Reference for the Study ("Terms of Reference") are attached as Annex I and are hereby made a part of this Grant Agreement. The Study will examine the technical, financial, environmental and other critical aspects of the proposed Project. The Terms of Reference shall also be included in the Agreement of Understanding.

3. Standards of Conduct

USTDA and the Grantee recognize the existence of standards of conduct for public officials, and commercial entities, in their respective countries. The parties to this Grant Agreement and the U.S. Firm shall observe these standards, which include not accepting payment of money or anything of value, directly or indirectly, from any person for the purpose of illegally or improperly inducing anyone to take any action favorable to any party in connection with the Study.

4. Grantee Responsibilities

The Grantee shall undertake its best efforts to provide reasonable support for the U.S. Firm, such as local transportation, office space and secretarial support.

5. USTDA as Financier

(A) USTDA Approval of Competitive Selection Procedures

Selection of the U.S. Firm shall be carried out by the Grantee according to its established procedures for the competitive selection of contractors with advance notice of the procurement published online through *Federal Business Opportunities (www.fedbizopps.gov)*. Upon request, the Grantee will submit these contracting procedures and related documents to USTDA for information and/or approval.

(B) USTDA Approval of U.S. Firm Selection

The Grantee shall notify USTDA at the address of record set forth in Article 17 below upon selection of the U.S. Firm to perform the Study. Upon approval of this selection by USTDA, the Grantee and the U.S. Firm shall then enter into an Agreement of Understanding. The Grantee shall notify in writing the U.S. firms that submitted unsuccessful proposals to perform the Study that they were not selected.

(C) USTDA Approval of the Agreement of Understanding

The Grantee and the U.S. Firm shall enter into the Agreement of Understanding. The Agreement of Understanding, and any amendments thereto, including assignments and changes in the Terms of Reference, must be approved by USTDA in writing. To expedite this approval, the Grantee (or the U.S. Firm on the Grantee's behalf) shall transmit to USTDA, at the address set forth in Article 17 below, a photocopy of an English and Portuguese language version of the signed Agreement of Understanding or a final negotiated draft version of the Agreement of Understanding.

(D) USTDA Not a Party to the Agreement of Understanding

It is understood by the parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of the Agreement of Understanding and any amendments thereto, including assignments, the selection of all contractors, the Terms of Reference, the Final Report (as defined in Clause I of Annex II), and any and all documents related to any agreement of understanding funded under the Grant Agreement. The parties hereto further understand and agree that USTDA, in reserving the foregoing approval rights, has acted solely as an intermediate financing entity to assure the proper use of United States Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval rights shall be made as a financier in the course of funding the Study and shall not be construed as making USTDA a party to the Agreement of Understanding. The parties hereto understand and agree that USTDA may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project with the parties to the Agreement of Understanding or any sub-agreement, jointly or separately, without thereby incurring any responsibility or liability to such parties.

Any approval or failure to approve by USTDA shall not bar the Grantee or USTDA from asserting any right they might have against the U.S. Firm, or relieve the U.S. Firm of any liability which the U.S. Firm might otherwise have to the Grantee or USTDA.

(E) Grant Agreement Controlling

Regardless of USTDA approval, the rights and obligations of any party to the Agreement of Understanding or any sub-agreement thereunder must be consistent with this Grant Agreement. In the event of any inconsistency between the Grant Agreement and the Agreement of Understanding or any sub-agreement funded by the Grant Agreement, the Grant Agreement shall be controlling.

6. Disbursement Procedures

(A) USTDA Approval of Agreement of Understanding Required

USTDA will make disbursements of USTDA Grant funds directly to the U.S. Firm only after USTDA approves the Agreement of Understanding.

(B) U.S. Firm Invoice Requirements

The U.S. Firm should request disbursement of USTDA Grant funds by USTDA to the U.S. Firm for performance of the Study by submitting invoices in accordance with the procedures set forth in the USTDA Mandatory Clauses in Annex II. The Grantee shall not be responsible for any payment to the U.S. Firm under this Grant Agreement.

7. Effective Date

The effective date of this Grant Agreement ("Effective Date") shall be the date of signature by both parties or, if the parties sign on different dates, the date of the last signature.

8. Study Schedule

(A) Study Completion Date

The completion date for the Study, which is December 31, 2012, is the date by which the parties estimate that the Study will have been completed.

(B) Time Limitation on Disbursement of USTDA Grant Funds

Except as USTDA may otherwise agree, (a) no USTDA funds may be disbursed under this Grant Agreement for goods and services which are provided prior to the Effective Date; and (b) all funds made available under the Grant Agreement must be disbursed within four (4) years from the Effective Date.

9. USTDA Mandatory Clauses

The Agreement of Understanding and any other agreement funded under this Grant Agreement shall include the USTDA mandatory clauses set forth in Annex II. All sub-agreements funded or partially funded with USTDA Grant funds shall include the USTDA mandatory clauses, except for clauses B(1), G, H, I and J.

10. Use of U.S. Carriers

(A) Air

Transportation by air of persons or property funded under the Grant Agreement shall be on U.S. flag carriers in accordance with the Fly America Act, 49 U.S.C. 40118, to the extent service by such carriers is available, as provided under applicable U.S. Government regulations.

(B) Marine

Transportation by sea of property funded under the Grant Agreement shall be on U.S. carriers in accordance with U.S. cargo preference law.

11. Nationality, Source and Origin

Except as USTDA may otherwise agree, the following provisions shall govern the delivery of goods and services funded by USTDA under the Grant Agreement: (a) for professional services, the U.S. Firm must be either a U.S. firm or U.S. individual; (b) the U.S. Firm may use U.S. subcontractors without limitation, but the use of subcontractors from Host Country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the sub-agreement; (c) employees of the U.S. Firm or U.S. subcontractors responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for performance of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions. USTDA will make available further details concerning these provisions upon request.

12. Taxes

USTDA funds provided under the Grant Agreement shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in Host Country. Neither the Grantee nor the U.S. Firm will seek reimbursement from USTDA for such taxes, tariffs, duties, fees or other levies.

13. Cooperation Between Parties and Follow-Up

The parties will cooperate to assure that the purposes of this Grant Agreement are accomplished. For five (5) years following receipt by USTDA of the Final Report, the Grantee agrees to respond to any reasonable inquiries from USTDA about the status of the Project.

14. Implementation Letters

To assist the Grantee in the implementation of the Study, USTDA may, from time to time, issue implementation letters that will provide additional information about matters covered by the Grant Agreement. The parties may also use jointly agreed upon implementation letters to confirm and record their mutual understanding of matters covered by the Grant Agreement.

15. Recordkeeping and Audit

The Grantee agrees to maintain books, records and other documents relating to the Study and the Grant Agreement adequate to demonstrate implementation of its responsibilities under the Grant Agreement, including the selection of U.S. Firms, receipt and approval of the Agreement of Understanding deliverables, and approval or disapproval of U.S. firm invoices for payment by USTDA. Such books, records, and other documents shall be separately maintained for three (3) years after the date of the final disbursement by USTDA. The Grantee shall afford USTDA or its authorized representatives the opportunity at reasonable times to review books, records and other documents relating to the Study and the Grant Agreement.

16. Representation of Parties

For all purposes relevant to this Grant Agreement, the Government of the United States of America will be represented by the U. S. Ambassador to Host Country or USTDA and Grantee will be represented by the Superintendent of SEMASA. The parties hereto may, by written notice, designate additional representatives for all purposes under this Grant Agreement.

17. Addresses of Record for Parties

Any notice, request, document or other communication submitted by either party to the other under the Grant Agreement shall be in writing or through a wire or electronic medium which produces a tangible record of the transmission, such as a telegram, cable or facsimile, and will be deemed duly given or sent when delivered to such party at the following:

To: Semasa

Av. José Caballero, 143
Santo Andre, SP 09040-210
Brazil

Phone: 011 55 (11) 4433-9925
Fax: 011 55 (11) 4433-9600
Email:

To: U.S. Trade and Development Agency
1000 Wilson Boulevard, Suite 1600
Arlington, Virginia 22209-3901
USA

Phone: (703) 875-4357
Fax: (703) 875-4009

All such communications shall be in English, as well as Portuguese, unless the parties otherwise agree in writing. In addition, the Grantee shall provide the Commercial Section of the U.S. Embassy in Host Country with a copy of each communication sent to USTDA.

Any communication relating to this Grant Agreement shall include the following fiscal data:

Appropriation No.: 1111/121001
Activity No.: 2011-51019A

18. Termination

Either party may terminate this Grant Agreement by giving the other party thirty (30) days advance written notice. The termination of this Grant Agreement will end any obligations of the parties to provide financial or other resources for the Study, except for payments which they are committed to make pursuant to noncancellable commitments entered into with third parties prior to the written notice of termination.

19. Non-waiver of Rights and Remedies

No delay in exercising any right or remedy accruing to either party in connection with this Grant Agreement shall be construed as a waiver of such right or remedy.

20. U.S. Technology and Equipment

By funding this Study, USTDA seeks to promote the project objectives of the Host Country through the use of U.S. technology, goods, and services. In recognition of this purpose, although the Grantee is not required by any means to adopt the recommendations or implement the project, it agrees that it will allow U.S. suppliers to compete in the procurement of technology, goods and services needed for Project implementation.

The information of this grant agreement will be published in the municipality's official newspaper, as well as be submitted to the State of Sao Paulo Audit Court and Santo Andre Municipal Chamber, according to local legislation.

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IN WITNESS WHEREOF, the Government of the United States of America and the Grantee, each acting through its duly authorized representative, have caused this Grant Agreement to be signed in the English and Portuguese languages in their names and delivered as of the day and year written below. In the event of any conflict between the English and Portuguese versions of this Grant Agreement, the English language version shall govern.

For the Government of the United States of America

By: _____
Thomas Kelly
Consul General
United States Consulate in Sao Paulo

For the Servico Municipal de Saneamento Ambiental de Santo Andre

By: _____
Aidan Ravin
Mayor
Municipality of Santo Andre

By: _____
Gabrielle Mandel
Country Manager
U.S. Trade and Development Agency

By: _____
Angelo Pavin
Superintendent
SEMASA

Date: 27.06.11

Date: 27.06.11

Annex I -- Terms of Reference

Annex II -- USTDA Mandatory Clauses

Annex I

Terms of Reference

Objective

The objective of this Study is to evaluate the technical and economic feasibility of developing solid waste derived energy recovery facilities in the municipality of Santo Andre in Brazil. The facilities that will be the subject of this feasibility study will include 1) a landfill gas recovery project at the existing municipal landfill in Santo Andre and; 2) a conventional waste to energy (WTE) facility for processing municipal solid waste (MSW) generated in the municipality. To the degree required, each of these will be separately evaluated during the investigation.

The overall evaluation will be undertaken within the context of a possible working partnership or other form of relationship between the municipality (as represented by its solid waste management - Servico Municipal de Saneamento Ambiental de Santo Andre (SEMASA)) and the local energy utility (Empresa Metropolitana de Aguas e Energia S.A. (EMAE).

The Study tasks are as follows:

Task 1: Feasibility Study Inception Plan and Schedule

Within two weeks of signing the contract for the Study, the U.S. Firm shall submit to SEMASA a detailed Feasibility Study Inception Plan and Schedule. This plan and schedule shall present detailed information concerning the U.S. Firm's approach to accomplishing the Study, to allow SEMASA to plan and schedule all activities required to support the U.S. Firm's efforts.

(All required reports submitted to SEMASA by the U.S. Firm as defined in these Terms of Reference shall be submitted in draft form for comment and return prior to finalization by the U.S. Firm.)

Deliverable #1:
The U.S. Firm shall provide SEMASA with a Feasibility Study Inception Plan and Schedule. The Plan and Schedule shall be provided to SEMASA in English and in Portuguese.

Task 2: Data Collection and Review

Some data may be in Portuguese, and it will be the U.S. Firm's responsibility to translate the information for its use, if needed.

Task 2.1: Kick off Meeting - The U.S. Firm shall travel to the municipality of Santo Andre for a kick-off meeting with SEMASA to 1) review the Feasibility Study Inception Plan and Schedule; 2) gather initial project information; and 3) observe solid waste management conditions in the Project service area.

Task 2.2: Initial Data Acquisition - The U.S. Firm shall acquire all relevant reports and data required to determine the feasibility of the proposed landfill gas recovery system and waste-to-energy facility. At a minimum, this information shall include:

- reports and data pertaining to solid waste management in the Project service area;
- plans and physical/technical data related to the existing Santo Andre landfill;
- past feasibility analyses or investigations;
- energy supply and utilization data for the region;
- current relevant institutional relationships;
- economic data concerning current solid waste management practices;
- financial data associated with SEMASA; and
- any other information deemed relevant to the completion of the Study.

Task 2.3: Data Needs and Gaps Identification - As a result of the initial investigation and acquisition of initial Project data, the U.S. Firm shall identify additional data that must be developed to successfully complete the Study. The identification of data needs and gaps shall also include a definition of the assistance that will need to be provided by SEMASA in securing this necessary information. This shall include any required physical property and topographical surveys of the landfill site for evaluation of the landfill gas recovery system, if they do not already exist.

Task 2.4: Statutory and Regulatory Requirements Review - The U.S. Firm shall investigate all applicable existing and pending statutory and regulatory requirements applicable to the proposed facilities. This shall include current and proposed regulatory requirements from all relevant local, state and national governmental sources. To achieve this review, the U.S. Firm shall meet with all applicable regulatory agencies to advise them of the Study and to solicit their input into the investigation.

Task 3: Evaluation of Existing Project Development Conditions

Task 3.1: Solid Waste Stream Characteristics - Quantity - The U.S. Firm shall investigate the existing solid waste stream and characteristics for the WTE Project service area to determine the quantity of municipal solid waste that will be available for processing at any new waste-to-energy facility. This investigation shall include review of any available physical data associated with the current means of solid waste management. If actual physical data (scale weight data, etc.) is not available, the U.S. Firm shall investigate and project solid waste quantities based on unit generation rates applicable to the region and population (current and projected) to determine the required solid waste throughput at the proposed WTE facility. This projection shall assume a WTE Project service life of 20 years. The U.S. Firm shall also evaluate other regional sources of solid

waste that could provide input feedstock for the proposed WTE facility. This shall include an identification of any institutional impediments that could prevent solid waste from outside of the municipality to be brought to the proposed WTE facility.

Task 3.2: Solid Waste Stream Characteristics - Composition – Due to its importance to the design and function of the proposed waste-to-energy facility, the U.S. Firm shall investigate the physical characteristics of the existing solid waste stream to be processed. At a minimum, this shall include a determination of typical municipal solid waste composition and energy/organic content based on any previous physical analyses. If necessary, the U.S. Firm shall, with the assistance of SEMASA, undertake a physical assessment of solid waste composition based on sound international standards for such investigations.

Task 3.3: Energy Supply and Value - The U.S. Firm shall investigate current energy supply and utilization conditions in the Project service area. At a minimum, this shall include:

- characterization of current energy supply and demand in the Project service area as well as projected energy supply and utilization in the future;
- energy value for determining potential revenues for the proposed facility;
- current alternative/renewable energy procurement policies in the region; and
- any existing power purchase agreements executed in the region that may be relevant to the potential for such an agreement with the proposed waste-to-energy facility.

At a minimum, the U.S. Firm shall meet with any applicable power supply organizations in the Project service area to determine their interest and policies associated with the potential procurement of electric power from the proposed landfill gas recovery system and WTE facility. If possible, the U.S. Firm shall obtain letters of interest and energy purchase terms from the potential purchasers of electric power derived from the proposed facility. In particular, the U.S. Firm shall meet Empresa Metropolitana de Aguas e Energia S.A. (EMAE) to solicit their input into the feasibility of the proposed project and their potential role in its development or financing. Existing experience and conditions associated with the sale of recovered energy from the Bandierantes landfill in São Paulo state shall be evaluated by the U.S. Firm to determine the potential applicability of this approach to landfill gas recovery in Santo Andre.

Task 4: Evaluation of Alternative Waste to Energy Technologies

Task 4.1: Review of Alternative Technologies - The U.S. Firm shall review and characterize alternative technologies available for achieving the recovery of energy from the municipal solid waste in the region in the proposed WTE facility. This characterization shall include all commercially available and emerging approaches that may be applicable to the proposed waste-to-energy facility.

Task 4.2: Technology Risk Assessment - The U.S. Firm shall provide a risk assessment for the various technologies available for the proposed WTE facility. At a minimum, this assessment shall include any risk issues that must be borne by the agency implementing

the facility or that may be mitigated through various technology procurement approaches. This risk assessment shall utilize worldwide experience in the application of the various technologies deemed practical for the waste-to-energy application.

Task 4.3: WTE Facility Siting Criteria – If a site has not been designated for the proposed WTE facility, the U.S. Firm shall recommend detailed siting criteria for the proposed facility. This shall include all site requirements that will allow the successful design and construction of the proposed facility. At a minimum, the U.S. Firm shall recommend criteria associated with:

- site access;
- traffic management;
- land area requirements;
- support utility infrastructure;
- energy interface;
- environmental aspects; and
- any other condition that can affect the successful location, design and construction of the proposed facility.

This criterion may be used by SEMASA to evaluate potential locations for the proposed facility if a site has not already been determined. If a site has been identified, the U.S. Firm will review the physical aspects of the proposed site to determine that it is sufficient for the proposed WTE application.

Task 4.4: Recommended Facility Performance Criteria - The U.S. Firm shall develop target WTE facility performance criteria based on commercially available technological approaches and historical performance in other locations. This performance criterion shall be utilized for evaluating potential project requirements and outputs and for the initial environmental impact assessment element of this Study. All recommended WTE facility performance criteria shall be consistent with international sound practice and current experience in existing waste-to-energy applications.

Task 5: Evaluation of Landfill Gas Recovery System Technologies

Task 5.1: Evaluation of the Current Landfill Gas Management System - The U.S. Firm shall evaluate the design and performance of the existing landfill gas management system to establish a technical baseline for implementation of the proposed landfill gas recovery system. This evaluation of the current system shall also include an assessment of its impact on the potential for deriving carbon credit benefits through the development of a gas recovery system.

Task 5.2: Technical Definition of the Required Landfill Gas Recovery System - Based on the physical characteristics and historical use of the landfill site, the U.S. Firm shall define the required system for collection and processing of generated landfill gas to achieve energy recovery. At a minimum, this shall include the technical definition of all landfill gas collection components and processing systems including all combustion and electrical generation components.

Deliverable #2: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Tasks 3-5. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 6: Preliminary Environmental and Social Impact Assessment

Task 6.1: Identification of Potential Environmental and Social Effects – The U.S. Firm shall conduct a preliminary environmental impact study for the implementation of the Project with reference to local requirements and multi-lateral lending agencies (such as the World Bank). This review shall identify potential negative impacts of the Project. The U.S. Firm shall briefly discuss the extent to which potential negative impacts can be mitigated, and develop plans for full environmental impact assessment or other studies in anticipation of the Project moving forward to the implementation stage, if necessary.

The U.S. Firm shall prepare a preliminary Environmental and Social Impact Assessment (ESIA) based on the WTE technology recommended. In the ESIA, the U.S. Firm shall identify, and propose remedies for any potential air, water, or noise pollution increases that may result from the WTE Project. The chief objective of this task is to ensure that the proposed WTE Project will comply with the all required regulatory environmental criteria and international sound practice. At a minimum, this will include all environmental effects related to air, water (surface and groundwater), land-use, traffic, etc. It shall also include all potential social effects related to Project impact on formal and informal waste collection and recycling programs in the Project service area. The U.S. Firm shall also identify any potential environmental and social effects associated with the proposed landfill gas recovery and utilization system.

Task 6.2: Mitigation of Potential Environmental and Social Effects - The U.S. Firm shall provide recommendations for mitigating any identified potential environmental and social effects associated with both the proposed landfill gas recovery system and new WTE facility. These recommendations shall be sufficiently detailed to provide input into the design and procurement of each project element. Mitigation techniques will also be presented in sufficient detail for presentation to the public and to provide a means for SEMASA to answer any potential questions associated with the environmental and social impact of the proposed landfill gas recovery system and WTE facility. This information will be presented in a manner that would allow independent development of either Project element.

Task 7: Developmental Impact Evaluation

Task 7.1: Determine Project Development Impact - The U.S. Firm shall provide a detailed Developmental Impact Assessment (DIA) outlining the economic and social

developmental outcomes of the proposed landfill gas recovery system and WTE facility Project elements and how the Host Country will benefit in the long term from implementation of the Project. This information shall be presented in a form that assumes the independent development of each project element. For the DIA, the U.S. Firm shall, at a minimum, address the following;

•**Infrastructure:** A summary of the foreseeable impacts on infrastructure with justifications.

•**Market-Oriented Reforms:** A brief description of regulatory or institutional changes the project might lead to.

•**Human Capacity Building:** A description of the number and type of jobs that would be created to construct, procure and operate the facilities, including subcontracted and outsourced positions. A brief description of the training program(s) required to prepare/qualify the candidates for these positions.

•**Technology Transfer and Spin-Off Effects:** A description of any advanced technologies that will be implemented in the host country for the first time as a part of the project elements. A brief evaluation of the project as a technology demonstrator to other users in the host country.

Task 8: Legal and Institutional Framework Review and Recommendations

Task 8.1: Legal and Institutional Framework Review - The U.S. Firm shall review the existing regulatory and legal framework to reflect the latest developments in the following:

- renewable Energy and MSW related laws of Brazil;
- permitting and licensing requirements with the government of Brazil;
- local building codes;
- local right-of-way; and
- zoning ordinances.

All of these should be taken into account before either of the Project elements moves into the implementation stage. Any problematic or lengthy permitting and licensing issues must be identified at this stage. This review shall be based on an assumption that the landfill gas recovery system and the new WTE facility will be developed as independent projects.

Task 8.2: Legal and Institutional Framework Recommendation - Based on the analysis of the existing legal and institutional framework affecting solid waste management in the Project service area, the U.S. Firm shall recommend any modifications that are required for the effective implementation and management of the proposed Project elements to provide an effective means for monitoring the performance of the landfill gas recovery system and proposed WTE facility after implementation.

Task 9: Economic and Financial Analysis

Task 9.1: Economic Analysis - Having recommended the most suitable WTE technology and defined the required landfill gas recovery system, the U.S. Firm shall prepare independent cost estimates for each element. The U.S. Firm's estimates shall include a detailed breakdown of equipment and materials for all major WTE components, including, but not limited to:

- waste handling system;
- air pollution control;
- water treatment system;
- boilers;
- large bore and high pressure steam piping;
- steam turbine;
- condenser;
- mechanical and electrical systems;
- instrumentation and controls; and
- electrical interconnection.

The cost of land acquisition and cost of financing should be determined and added to the cost estimate at this stage. The economic analysis will also include a detailed breakdown of anticipated operational and maintenance costs associated with the proposed facility. At a minimum, this will include all costs associated with staffing, consumables, maintenance, residue disposal, and any other costs that influence the operation and maintenance of the facility on an ongoing basis. All cost estimates will be based on assuring the sustainable function of the facility over its design life. A similar cost estimate and economic analysis will also be prepared for the defined landfill gas recovery and processing system which will be independently analyzed.

Task 9.2: Financial Analysis for WTE Facility - For the WTE technology recommended, the U.S. Firm shall conduct a financial analysis based on current and future (i.e. expected) parameters such as the:

- tipping fees;
- electricity tariff rates;
- interest rates; and
- financing costs.

The U.S. Firm shall calculate net present value, payback period, and internal rate of return for the alternative development and procurement scenarios. In undertaking the financial analysis, the U.S. Firm shall also review current solid waste management cost recovery practices to determine their impact on the proposed facility. The financial analysis shall seek to evaluate the economic and financial performance of the proposed facility over its full 20 year service life. Inflationary factors including, at a minimum, increasing costs/revenues and the potential variation in the quantity of solid waste to be processed shall be taken into consideration. This shall also include the potential

economic impact of additional solid waste from outside of the project service area.

Task 9.3: Financial Analysis for Landfill Gas Recovery System - For the landfill gas recovery system, the U.S. Firm shall conduct a financial analysis based on current and future (i.e. expected) parameters such as the electricity tariff rates, interest rates and financing costs. The U.S. Firm shall calculate net present value, payback period, and internal rate of return for the alternative development and procurement scenarios. The financial analysis shall seek to evaluate the economic and financial performance of the proposed landfill gas recovery system over a 20 year service life. Inflationary factors including, at a minimum, increasing costs/revenues and the potential variation in the quantity of landfill gas to be processed shall be taken into consideration. The financial analysis shall also include an assessment of the potential for achieving carbon credit benefits and their effect on the financial and economic feasibility of the proposed system.

Deliverable #3: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Tasks 6-9. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 10: Risk Management and Procurement Analysis

Task 10.1: Definition of Project Risks - the U.S. Firm shall review and define the project risks that may influence the feasibility or ongoing function of the proposed landfill gas recovery system and WTE facility. The intent of the risk identification activity is to define the processes by which project risk can be managed or mitigated for each project element. In addition to identifying risk management processes, the U.S. Firm shall assess and recommend who should be responsible for assuring the proper management of project risk. For the assessment of project risk and mitigation, the proposed landfill gas recovery system and WTE facility shall be treated as independent elements.

Task 10.2: Project Risk Mitigation Approaches - The U.S. Firm shall evaluate alternative project procurement approaches on the basis of potential risk mitigation. At a minimum, this shall include all procurement approaches commonly used for constructing municipal infrastructure that may be capital intensive. Procurement approaches to be considered shall include, among others, private ownership or the utilization of a Design/Build/ Operate (DBO) or Build/Own/Operate/Transfer (BOOT) approaches.

Task 10.3: Alternative Project Procurement Processes - The U.S. Firm shall evaluate alternative project procurement approaches and recommend the approach that will provide an optimum and sustainable landfill gas recovery system and waste-to-energy facility at the least risk to SEMASA and the government that it represents. This will include a possible development relationship between the municipality of Santo Andre and Empresa Metropolitana de Aguas e Energia S.A (EMAE). The U.S. Firm shall recommend alternative approaches by which SEMASA and EMAE can form the

necessary relationship to develop, finance and operate the proposed project elements.

Task 10.4: Risk Assessment and Procurement Report - The U.S. Firm shall prepare and present to SEMASA a Risk Assessment and Procurement Report. This report shall clearly present a description and quantification of the potential risks associated with each element of the Project and the means by which they can be mitigated or managed. In addition, the report shall provide a description of alternative project procurement approaches that may provide a means for effectively managing Project risk. This report shall be used by SEMASA to select the procurement approach that will serve as the basis for other work associated with this Study including, but not limited to, the financial analysis and the preparation of draft tender documents for implementation of the Project. For the purpose of the risk assessment and procurement report, the landfill gas recovery system and the WTE facility shall be treated as independent elements.

Deliverable #4: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Task 10. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 11: Financing Options Review

Task 11.1: Financing Alternatives - The U.S. Firm shall review all available means for financing the proposed Project elements based on the evaluated alternative procurement approaches. (For the purpose of this review, the landfill gas recovery system and the proposed WTE facility shall be treated as independent elements). It shall be the U.S. Firm's responsibility to obtain Letters of Interest (LOI) from potential lender(s). The current terms and conditions for each of the potential sources of funding need to be clearly stated in the LOIs. At a minimum, financing alternatives associated with the World Bank, Inter-American Development Bank, the Brazilian Development Bank and other multinational or national institutions shall be considered. Financing alternatives shall also be evaluated within the context of a potential development relationship between SEMASA and EMAE.

Deliverable #5: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Task 11. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 12: Procurement Plan Development

Task 12.1: Recommended Procurement Approach - For the landfill gas recovery system and WTE facility, the U.S. Firm shall recommend the best procurement approaches for developing each project element. The U.S. Firm shall provide a detailed description of all aspects of the recommended procurement approach including, but not limited to, the responsibilities and requirements of the implementing agency. This description shall also include an assessment of the existing technical and institutional capacity within the implementing agency to manage the recommended procurement

process. For the purpose of developing a procurement plan, the proposed landfill gas recovery system and WTE facility shall be treated as independent elements.

Deliverable #6: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Task 12. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 13: Final Report

The U.S. Firm shall prepare and provide a comprehensive Final Report to SEMASA, which shall contain an Executive Summary, key findings, recommendations and conclusions of the Study, and shall incorporate all other documents and/or reports provided pursuant to Tasks 1 through 12 above. Each task of these Terms of Reference shall form a separate chapter of the Final Report.

The U.S. Firm shall also identify the availability of potential U.S. sources of supply and prepare a U.S. supplier list which shall outline potential U.S. sources for procurement of goods and services necessary to develop the solid waste derived energy recovery facilities. The list shall include business name, point of contact, address, telephone and fax numbers for each commercial source, as well as a general description of products and services that may be procured

The U.S. Firm shall ensure that the Final Report is submitted in accordance with Clause I of Annex II of the Grant Agreement. The U.S. Firm shall provide four (4) hard copies and one (1) electronic version of both the confidential and public versions of the Final Report to SEMASA in Portuguese and one (1) hard copy of both the confidential and public versions of the Final Report in English. The U.S. Firm shall provide a copy to USTDA and the U.S. Consulate in Sao Paulo in English in accordance with Clause I of Annex II of the Grant Agreement.

Notes:

(1) The U.S. Firm is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of these Terms of Reference.

(2) The U.S. Firm and SEMASA shall be careful to ensure that the public version of the Final Report contains no security or confidential information.

(3) SEMASA and USTDA shall have an irrevocable, worldwide, royalty-free, non-exclusive right to use and distribute the Final Report and all work product that is developed under these Terms of Reference.

Annex II

USTDA Mandatory Agreement of Understanding Clauses

A. USTDA Mandatory Clauses Controlling

The parties to this Agreement of Understanding to Perform the Feasibility Study ("Agreement of Understanding") acknowledge that this Agreement of Understanding is funded in whole or in part by the U.S. Trade and Development Agency ("USTDA") under the Grant Agreement between the Government of the United States of America acting through USTDA and the Servico Municipal de Saneamento Ambiental de Santo Andre ("Client"), dated _____ ("Grant Agreement"). The Client has selected _____ ("U.S. Firm") to perform the Study ("Study") for the Santo Andre Waste to Energy and Landfill Gas Recovery Facility Project ("Project") in Brazil ("Host Country"). Notwithstanding any other provisions of this Agreement of Understanding, the following USTDA Mandatory Agreement of Understanding Clauses shall govern. All sub-agreements entered into by the U.S. Firm funded or partially funded with USTDA Grant funds shall include these USTDA Mandatory Agreement of UnderstandingClauses, except for clauses B(1), G, H, I and J. In addition, in the event of any inconsistency between the Grant Agreement and the Agreement of Understanding or sub-agreement thereunder, the Grant Agreement shall be controlling.

B. USTDA as Financier

(1) USTDA Approval of Agreement of Understanding

All agreements of understanding funded under the Grant Agreement, and any amendments thereto, including assignments and changes in the Terms of Reference, must be approved by USTDA in writing in order to be effective with respect to the expenditure of USTDA Grant funds. USTDA will not authorize the disbursement of USTDA Grant funds until the Agreement of Understanding has been formally approved by USTDA or until the Agreement of Understanding conforms to modifications required by USTDA during the Agreement of Understanding review process.

(2) USTDA Not a Party to the Agreement of Understanding

It is understood by the parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of this Agreement of Understanding and amendments thereto, including assignments, the selection of all U.S. Firms, the Terms of Reference, the Final Report, and any and all documents related to any Agreement of Understanding funded under the Grant Agreement. The parties hereto further understand and agree that USTDA, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of United States Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval rights shall be made as an intermediate financier in the

course of financing the Study and shall not be construed as making USTDA a party to the Agreement of Understanding. The parties hereto understand and agree that USTDA may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project with the parties to the Agreement of Understanding or any sub-agreement, jointly or separately, without thereby incurring any responsibility or liability to such parties. Any approval or failure to approve by USTDA shall not bar the Client or USTDA from asserting any right they might have against the U.S. Firm, or relieve the U.S. Firm of any liability which the U.S. Firm might otherwise have to the Client or USTDA.

C. Nationality, Source and Origin

Except as USTDA may otherwise agree, the following provisions shall govern the delivery of goods and services funded by USTDA under the Grant Agreement: (a) for professional services, the U.S. Firm must be either a U.S. firm or U.S. individual; (b) the U.S. Firm may use U.S. subcontractors without limitation, but the use of subcontractors from Host Country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the sub-agreement; (c) employees of the U.S. Firm or U.S. subcontractors responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for performance of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions. USTDA will make available further details concerning these provisions upon request.

D. Recordkeeping and Audit

The U.S. Firm and subcontractors funded under the Grant Agreement shall maintain, in accordance with generally accepted accounting procedures, books, records and other documents sufficient to reflect properly all transactions under or in connection with the Agreement of Understanding. These books, records and other documents shall clearly identify and track the use and expenditure of USTDA funds separately from other funding sources. Such books, records and documents shall be maintained during the Agreement of Understanding term and for a period of three (3) years after final disbursement by USTDA. The U.S. Firm and subcontractors shall afford USTDA, or its authorized representatives, the opportunity at reasonable times for inspection and audit of such books, records and other documentation.

E. U.S. Carriers

(1) Air

Transportation by air of persons or property funded under the Grant Agreement shall be on U.S. flag carriers in accordance with the Fly America Act, 49 U.S.C. 40118, to the extent service by such carriers is available, as provided under applicable U.S. Government regulations.

(2) Marine

Transportation by sea of property funded under the Grant Agreement shall be on U.S. carriers in accordance with U.S. cargo preference law.

F. Workman's Compensation Insurance

The U.S. Firm shall provide adequate Workman's Compensation Insurance coverage for work performed under this Agreement of Understanding.

G. Reporting Requirements

The U.S. Firm shall advise USTDA by letter as to the status of the Project on March 1st annually for a period of two (2) years after completion of the Study. In addition, if at any time the U.S. Firm receives follow-on work from the Client, the U.S. Firm shall so notify USTDA and designate the U.S. Firm's contact point including name, telephone and fax number. Since this information may be made publicly available by USTDA, any information which is confidential shall be designated as such by the U.S. Firm and provided separately to USTDA. USTDA will maintain the confidentiality of such information in accordance with applicable law.

H. Disbursement Procedures

(1) USTDA Approval of Agreement of Understanding

Disbursement of Grant funds will be made only after USTDA approval of this Agreement of Understanding. To make this review in a timely fashion, USTDA must receive from either the Client or the U.S. Firm a photocopy of an English and Portuguese language version of a signed Agreement of Understanding or a final negotiated draft version to the attention of the General Counsel's office at USTDA's address listed in Clause M below.

(2) Payment Schedule Requirements

A payment schedule for disbursement of Grant funds to the U.S. Firm shall be included in this Agreement of Understanding. Such payment schedule must conform to the following USTDA requirements: (1) up to twenty percent (20%) of the total USTDA Grant amount may be used as a mobilization payment; (2) all other payments, with the exception of the final payment, shall be based upon Agreement of Understanding performance milestones; and (3) the final payment may be no less than fifteen percent (15%) of the total USTDA Grant amount, payable upon receipt by USTDA of an approved Final Report in accordance with the specifications and quantities set forth in Clause I below. Invoicing procedures for all payments are described below.

(3) U.S. Firm Invoice Requirements

USTDA will make all disbursements of USTDA Grant funds directly to the U.S. Firm. The U.S. Firm must provide USTDA with an ACH Vendor Enrollment Form (available from USTDA) with the first invoice. The Client shall request disbursement of funds by USTDA to the U.S. Firm for performance of the contract by submitting the following to USTDA:

(a) U.S. Firm's Invoice

The U.S. Firm's invoice shall include reference to an item listed in the Agreement of Understanding payment schedule, the requested payment amount, and an appropriate certification by the U.S. Firm, as follows:

(i) For a mobilization payment (if any):

"As a condition for this mobilization payment, the U.S. Firm certifies that it will perform all work in accordance with the terms of its Agreement of Understanding with the Client. To the extent that the U.S. Firm does not comply with the terms and conditions of the Agreement of Understanding, including the USTDA mandatory provisions contained therein, it will, upon USTDA's request, make an appropriate refund to USTDA. "

(ii) For Agreement of Understanding performance milestone payments:

"The U.S. Firm has performed the work described in this invoice in accordance with the terms of its Agreement of Understanding with the Client and is entitled to payment thereunder. To the extent the U.S. Firm has not complied with the terms and conditions of the Agreement of Understanding, including the USTDA mandatory provisions contained therein, it will, upon USTDA's request, make an appropriate refund to USTDA."

(iii) For final payment:

"The U.S. Firm has performed the work described in this invoice in accordance with the terms of its Agreement of Understanding with the Client and is entitled to payment thereunder. Specifically, the U.S. Firm has submitted the Final Report to the Client, as required by the Agreement of Understanding, and received the Client's approval of the Final Report. To the extent the U.S. Firm has not complied with the terms and conditions of the Agreement of Understanding, including the USTDA mandatory provisions contained therein, it will, upon USTDA's request, make an appropriate refund to USTDA."

(b) Client's Approval of the U.S. Firm's Invoice

(i) The invoice for a mobilization payment must be approved in writing by the Client.

(ii) For Agreement of Understanding performance milestone payments, the following certification by the Client must be provided on the invoice or separately:

"The services for which disbursement is requested by the U.S. Firm have been performed satisfactorily, in accordance with applicable Agreement of Understanding provisions and the terms and conditions of the USTDA Grant Agreement."

(iii) For final payment, the following certification by the Client must be provided on the invoice or separately:

"The services for which disbursement is requested by the U.S. Firm have been performed satisfactorily, in accordance with applicable Agreement of Understanding provisions and terms and conditions of the USTDA Grant Agreement. The Final Report submitted by the U.S. Firm has been reviewed and approved by the Client. "

(c) USTDA Address for Disbursement Requests

Requests for disbursement shall be submitted by courier or mail to the attention of the Finance Department at USTDA's address listed in Clause M below.

(4) Termination

In the event that the Agreement of Understanding is terminated prior to completion, the U.S. Firm will be eligible, subject to USTDA approval, for reasonable and documented costs which have been incurred in performing the Terms of Reference prior to termination, as well as reasonable wind down expenses. Reimbursement for such costs shall not exceed the total amount of undisbursed Grant funds. Likewise, in

the event of such termination, USTDA is entitled to receive from the U.S. Firm all USTDA Grant funds previously disbursed to the U.S. Firm (including but not limited to mobilization payments) which exceed the reasonable and documented costs incurred in performing the Terms of Reference prior to termination.

I. USTDA Final Report

(1) Definition

"Final Report" shall mean the Final Report described in the attached Annex I Terms of Reference or, if no such "Final Report" is described therein, "Final Report" shall mean a substantive and comprehensive report of work performed in accordance with the attached Annex I Terms of Reference, including any documents delivered to the Client.

(2) Final Report Submission Requirements

The U.S. Firm shall provide the following to USTDA:

(a) One (1) complete version of the Final Report for USTDA's records. This version shall have been approved by the Client in writing and must be in the English language. It is the responsibility of the U.S. Firm to ensure that confidential information, if any, contained in this version be clearly marked. USTDA will maintain the confidentiality of such information in accordance with applicable law.

and

(b) One (1) copy of the Final Report suitable for public distribution ("Public Version"). The Public Version shall have been approved by the Client in writing and must be in the English and Portuguese languages. As this version will be available for public distribution, it must not contain any confidential information. If the report in (a) above contains no confidential information, it may be used as the Public Version. In any event, the Public Version must be informative and contain sufficient Project detail to be useful to prospective equipment and service providers.

and

(c) Two (2) CD-ROMs, each containing a complete copy of the Public Version of the Final Report. The electronic files on the CD-ROMs shall be submitted in a commonly accessible read-only format. As these CD-ROMs will be available for public distribution, they must not contain any confidential information. It is the responsibility of the U.S. Firm to ensure that no confidential information is contained on the CD-ROMs.

The U.S. Firm shall also provide one (1) copy of the Public Version of the Final Report to the Foreign Commercial Service Officer or the Economic Section of the U.S. Embassy in Host Country for informational purposes.

(3) Final Report Presentation

All Final Reports submitted to USTDA must be paginated and include the following:

(a) The front cover of every Final Report shall contain the name of the Client, the name of the U.S. Firm who prepared the report, a report title, USTDA's logo, USTDA's mailing and delivery addresses. If the complete version of the Final Report contains confidential information, the U.S. Firm shall be responsible for labeling the front cover of that version of the Final Report with the term "Confidential Version." The U.S. Firm shall be responsible for labeling the front cover of the Public Version of the Final Report with the term "Public Version." The front cover of every Final Report shall also contain the following disclaimer:

> "This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the U. S. Government. The opinions, findings, conclusions or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of USTDA. USTDA makes no representation about, nor does it accept responsibility for, the accuracy or completeness of the information contained in this report."

(b) The inside front cover of every Final Report shall contain USTDA's logo, USTDA's mailing and delivery addresses, and USTDA's mission statement. Camera-ready copy of USTDA Final Report specifications will be available from USTDA upon request.

(c) The U.S. Firm shall affix to the front of the CD-ROM a label identifying the Host Country, USTDA Activity Number, the name of the Client, the name of the U.S. Firm who prepared the report, a report title and the following language:

> "The U.S. Firm certifies that this CD-ROM contains the Public Version of the Final Report and that all contents are suitable for public distribution."

(d) The U.S. Firm and any subcontractors that perform work pursuant to the Grant Agreement must be clearly identified in the Final Report. Business name, point of contact, address, telephone and fax numbers shall be included for U.S. Firm and each subcontractors.

(e) The Final Report, while aiming at optimum specifications and characteristics for the Project, shall identify the availability of prospective U.S. sources of supply. Business name, point of contact, address, telephone and fax numbers shall be included for each commercial source.

(f) The Final Report shall be accompanied by a letter or other notation by the Client which states that the Client approves the Final Report. A certification by the Client to this effect provided on or with the invoice for final payment will meet this requirement.

J. Modifications

All changes, modifications, assignments or amendments to this Agreement of Understanding, including the appendices, shall be made only by written agreement by the parties hereto, subject to written USTDA approval.

K. Study Schedule

(1) Study Completion Date

The completion date for the Study, which is December 31, 2012, is the date by which the parties estimate that the Study will have been completed.

(2) Time Limitation on Disbursement of USTDA Grant Funds

Except as USTDA may otherwise agree, (a) no USTDA funds may be disbursed under this Agreement of Understanding for goods and services which are provided prior to the Effective Date of the Grant Agreement; and (b) all funds made available under the Grant Agreement must be disbursed within four (4) years from the Effective Date of the Grant Agreement.

L. Business Practices

The U.S. Firm agrees not to pay, promise to pay, or authorize the payment of any money or anything of value, directly or indirectly, to any person (whether a governmental official or private individual) for the purpose of illegally or improperly inducing anyone to take any action favorable to any party in connection with the Study. The Client agrees not to receive any such payment. The U.S. Firm and the Client agree that each will require that any agent or representative hired to represent them in connection with the Study will comply with this paragraph and all laws which apply to activities and obligations of each party under this Agreement of Understanding, including but not limited to those laws and obligations dealing with improper payments as described above.

M. USTDA Address and Fiscal Data

Any communication with USTDA regarding this Agreement of Understanding shall be sent to the following address and include the fiscal data listed below:

U.S. Trade and Development Agency
1000 Wilson Boulevard, Suite 1600
Arlington, Virginia 22209-3901
USA

Phone: (703) 875-4357
Fax: (703) 875-4009

Fiscal Data:

Appropriation No.:	1111/121001
Activity No.:	2011-51019A
Reservation No.:	2011188
Grant No.:	GH201151188

N. Definitions

All capitalized terms not otherwise defined herein shall have the meaning set forth in the Grant Agreement.

O. Taxes

USTDA funds provided under the Grant Agreement shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in Host Country. Neither the Client nor the U.S. Firm will seek reimbursement from USTDA for such taxes, tariffs, duties, fees or other levies.

TERMO DE COOPERAÇÃO

Este Termo de Cooperação é celebrado entre o Governo dos Estados Unidos da América, por intermédio da Agência de Comércio e Desenvolvimento dos EUA ("USTDA") e o Município de Santo André, por intermédio do Serviço Municipal de Saneamento Ambiental de Santo André ("Favorecido"). Ao abrigo deste Termo de Cooperação, a USTDA concorda em fornecer ao Favorecido um Estudo de Viabilidade ("Estudo") do Projeto proposto de uma Estação de Tratamento de Resíduos para Produção de Energia e Recuperação de Gás de Aterro de Santo André, no Brasil ("País Beneficiado"). O custo dos bens e serviços necessários para a elaboração do Estudo no valor de US$469.000,00 ("Doação da USTDA") será pago diretamente pela USTDA.

1. Financiamento da USTDA

O financiamento a ser concedido ao abrigo deste Termo de Cooperação será utilizado para cobrir os custos de um Acordo de Entendimento para a Realização do Estudo de Viabilidade ("Acordo de Entendimento") entre o Favorecido e a Empresa Norte-Americana escolhida pelo Favorecido ("Empresa Norte-Americana") através do qual a Empresa Norte-Americana realizará o Estudo. O pagamento à Empresa Norte-Americana será feito diretamente pela USTDA, em nome do Favorecido, com os recursos doados pela USTDA ao abrigo deste Termo de Cooperação.

2. Termos de Referência

Os Termos de Referência do Estudo ("Termos de Referência") constam do Anexo I, que passa a fazer parte deste Termo de Cooperação. O Estudo analisará o aspecto técnico, financeiro, ambiental e outros aspectos importantes do Projeto proposto. Os Termos de Referência também serão incluídos no Acordo de Entendimento.

3. Padrões de Conduta

A USTDA e o Favorecido reconhecem a existência de normas de conduta para funcionários públicos e entidades comerciais em seus respectivos países. As partes deste Termo de Cooperação e a Empresa Norte-Americana deverão observar essas normas, que incluem não aceitar pagamento de dinheiro ou qualquer coisa de valor de qualquer pessoa, direta ou indiretamente, com o objetivo de induzir ilegalmente ou indevidamente qualquer pessoa a fazer qualquer ação favorável a quaisquer das partes em relação ao Estudo.

4. Responsabilidades do Favorecido

O Favorecido envidará seus melhores esforços para fornecer suporte razoável à Empresa Norte-Americana, tal como transporte local, escritório e apoio administrativo.

5. A USTDA como Financiadora

(A) Aprovação da USTDA para Procedimentos de Licitação

A seleção da Empresa Norte-Americana será realizada pelo Favorecido de acordo com os seus procedimentos de seleção de fornecedores com anúncio antecipado da aquisição publicado online no endereço das Oportunidades Federais de Negócios [*Federal Business Opportunities*] (www.fedbizopps.gov). Mediante pedido, o Favorecido apresentará estes procedimentos de contratação e documentos relacionados à USTDA para informação e/ou aprovação.

(B) Aprovação da Seleção da Empresa Norte-Americana pela USTDA

Após a escolha da Empresa Norte-Americana que realizará o Estudo, o Favorecido deverá notificar a USTDA no endereço oficial informado na Cláusula 17. Após a aprovação da escolha pela USTDA, o Favorecido e a Empresa Norte-Americana celebrarão um Acordo de Entendimento. O Favorecido notificará por escrito as demais Empresas Norte-Americanas que apresentaram propostas não vencedoras para realizar o Estudo de que não foram selecionadas.

(C) Aprovação do Acordo de Entendimento pela USTDA

O Favorecido e a Empresa Norte-Americana celebrarão um Acordo de Entendimento. O Acordo de Entendimento e suas respectivas alterações, incluindo cessões e modificações nos Termos de Referência, devem ser aprovados pela USTDA por escrito. Para agilizar essa aprovação, o Favorecido (ou a Empresa Norte-Americana em nome do Favorecido) transmitirá à USTDA, no endereço indicado na Cláusula 17 abaixo, uma cópia de uma versão bilíngüe nos idiomas Inglês e português do Acordo de Entendimento ou uma versão preliminar do Acordo de Entendimento.

(D) A USTDA Não é uma das Partes no Acordo de Entendimento

Fica estabelecido entre as partes que a USTDA reserva-se determinados direitos, incluindo, mas não limitado ao direito de aprovar os termos do Acordo de Entendimento e quaisquer alterações, incluindo cessões, seleção de todos os fornecedores, Termos de Referência, Relatório Final (conforme definido na Cláusula 1 do Anexo II), e todos e quaisquer documentos relacionados a qualquer acordo de entendimento financiado no âmbito do Termo de Cooperação. As partes do presente instrumento também compreendem e concordam que a USTDA, ao reservar os mencionados direitos de aprovação, age apenas como uma entidade intermediária de financiamento para garantir a boa utilização dos fundos do Governo dos Estados Unidos, e que qualquer decisão da USTDA para exercer ou não esses direitos de aprovação será tomada na qualidade de financiadora no decorrer do financiamento Estudo, e não deverá ser interpretada como a fazer da USTDA uma das partes do

Acordo de Entendimento. As partes do presente instrumento entendem e concordam que a USTDA pode, de tempos em tempos, exercer os direitos de aprovação mencionados anteriormente, ou discutir assuntos relacionados a esses direitos e ao Projeto com as partes do Acordo de Entendimento ou de qualquer subcontrato, conjunta ou separadamente, sem incorrer em qualquer responsabilidade ou obrigação para tais partes. Qualquer aprovação ou não aprovação pela USTDA não impedirá o Favorecido ou a USTDA de exigir qualquer direito que possam ter em relação à Empresa Norte-Americana, ou de isentá-la de qualquer responsabilidade que a mesma possa ter perante o Favorecido ou a USTDA.

(E) Controle do Termo de Cooperação

Independentemente de aprovação da USTDA, os direitos e obrigações de quaisquer das partes do Acordo de Entendimento ou qualquer respectivo subcontrato devem ser consistentes com este Termo de Cooperação. Em caso de qualquer inconsistência entre o Termo de Cooperação e o Acordo de Entendimento ou qualquer subcontrato financiado ao abrigo do Termo de Cooperação, o Termo de Cooperação prevalecerá.

6. Procedimentos de desembolso

(A) Exigência de Aprovação da USTDA para o Acordo de Entendimento

A USTDA fará desembolsos dos fundos da Doação da USTDA diretamente à Empresa Norte-Americana somente após sua aprovação do Acordo de Entendimento.

(B) Exigências de Fatura da Empresa Norte-Americana

A Empresa Norte-Americana deverá solicitar o desembolso de fundos da Doação da USTDA pela USTDA à Empresa Norte-Americana pela realização do Estudo através da apresentação de faturas de acordo com os procedimentos previstos nas Cláusulas Obrigatórias da USTDA contidas no Anexo II. O Favorecido não será responsável por qualquer pagamento à Empresa Norte-Americana ao abrigo deste Termo de Cooperação.

7. Data de Vigência.

A data de vigência deste Termo de Cooperação ("Data de Vigência") será a data da sua assinatura por ambas as partes ou, se as partes assinarem em datas diferentes, a data da última assinatura.

8. Cronograma do Estudo

(A) Data de Conclusão do Estudo

A data de conclusão do Estudo é 31 de dezembro de 2012 e é a data prevista pelas partes para término do Estudo.

(B) Prazo de Prescrição para Desembolso dos Fundos da Doação da USTDA

Salvo acordo em contrário com a USTDA, (a) nenhum fundo da USTDA poderá ser desembolsado ao abrigo deste Termo de Cooperação em pagamento de bens e serviços prestados antes da Data de Vigência, e (b) todos os fundos disponibilizados ao abrigo do Termo de Cooperação deverão ser desembolsados no prazo de 4 (quatro) anos a partir da Data de Vigência.

9. Cláusulas Obrigatórias da USTDA

O Acordo de Entendimento e qualquer outro acordo financiado ao abrigo deste Termo de Cooperação incluirão as cláusulas obrigatórias da USTDA estipuladas no Anexo II. Todos os subcontratos integralmente ou parcialmente financiados com recursos da Doação da USTDA devem incluir as cláusulas obrigatórias da USTDA, exceto as cláusulas B(1), G, H, I e J.

10. Uso de Empresas de Transporte Norte-americanas

(A) Aéreo

O transporte aéreo de pessoas ou bens financiados no âmbito do Termo de Cooperação deve ser realizado por companhias aéreas de bandeira norte-americana de acordo com o *Fly America Act*, Título 49 do USC 40118 [Lei Federal de Transporte Aéreo Pago pelo Governo], na medida em que esse serviço de transporte seja oferecido por tais companhias, conforme previsto na regulamentação aplicável do Governo dos EUA.

(B) Marítimo

O transporte marítimo de bens financiados ao abrigo do Termo de Cooperação será realizado por empresas norte-americanas de transporte, de acordo com o disposto na lei de preferência de carga norte-americana.

11. Nacionalidade, Fonte e Origem

Exceto acordo em contrário da USTDA, as seguintes disposições regerão a entrega de bens e serviços financiados pela USTDA ao abrigo do Termo de Cooperação: (a) para os serviços profissionais, a Empresa Norte-Americana deverá ser uma pessoa jurídica ou física norte-americana; (b) a Empresa Norte-Americana pode utilizar subcontratados norte-americanos sem limitação, mas a utilização de subcontratados do País Beneficiado não poderá exceder 20% (vinte por cento) do valor da Doação da USTDA e poderá ser feita apenas para serviços específicos dos Termos de Referência identificados no subcontrato; (c) os funcionários da Empresa ou subcontratados norte-americanos responsáveis pelos serviços profissionais devem ser cidadãos norte-americanos ou cidadãos de outros países legalmente aceitos para residência permanente nos Estados Unidos; (d) os bens adquiridos para a execução do Estudo e respectivos serviços de

entrega (por ex., transporte internacional e seguro) devem se de nacionalidade, fonte e origem norte-americana; e (e) os bens e serviços inerentes ao apoio do Estudo (por ex., hospedagem local, alimentação e transporte) no País Beneficiado não estão sujeitos às restrições acima. Mediante pedido, a USTDA disponibilizará maiores detalhes relativos a estas disposições.

12. Impostos

Os fundos da USTDA fornecidos ao abrigo do Termo de Cooperação não serão utilizados para pagar quaisquer impostos, tarifas, taxas ou outros encargos exigidos por leis vigentes no País Beneficiado. Nem o Favorecido nem a Empresa Norte-Americana solicitarão reembolso à USTDA desses impostos, tarifas, taxas ou outros encargos.

13. Cooperação Entre as Partes e Acompanhamento

As Partes cooperarão para garantir que os objetivos deste Termo de Cooperação sejam alcançados. Durante 5 (cinco) anos após o recebimento do Relatório Final pela USTDA, o Favorecido se compromete a responder a quaisquer consultas pertinentes da USTDA sobre o andamento do Projeto.

14. Cartas de execução

Para auxiliar o Favorecido na execução do Estudo, a USTDA poderá, de tempos em tempos, emitir cartas de execução fornecendo informações adicionais sobre os assuntos cobertos pelo Termo de Cooperação. As partes também podem utilizar cartas de execução acordadas conjuntamente para confirmar e registrar seu entendimento mútuo das questões abrangidas pelo mencionado Acordo.

15. Manutenção de registros e Auditoria

O Favorecido se compromete a manter livros, registros e outros documentos relativos ao Estudo e ao Termo de Cooperação de forma adequada para demonstrar o cumprimento das suas responsabilidades ao abrigo do Termo de Cooperação, incluindo a seleção de Empresas Norte-Americanas, recebimento e aprovação dos resultados práticos do Acordo de Entendimento e aprovação ou não aprovação das faturas da Empresa Norte-Americana para pagamento pela USTDA. Tais livros, registros e outros documentos deverão ser mantidos separadamente por 3 (três) anos após a data do desembolso final pela USTDA. O Favorecido proporcionará à USTDA ou seus representantes autorizados a oportunidade de analisar os livros, registros e outros documentos relativos ao Estudo e ao Termo de Cooperação.

16. Declaração das Partes

Para todos os efeitos pertinentes a este Termo de Cooperação, o Governo dos Estados Unidos da América será representado pelo Embaixador dos EUA no País Beneficiado, ou a USTDA e o Favorecido serão representados pelo Superintendente do SEMASA. Através de notificação por escrito, as partes podem designar outros representantes para todos os efeitos deste Termo de Cooperação.

17. Endereços Oficiais das Partes

Toda notificação, solicitação, documento ou outras comunicações enviadas por quaisquer das partes à outra parte ao abrigo do Termo de Cooperação devem ser feitas por escrito ou através de um meio eletrônico que produza um registro tangível da transmissão, como um telegrama, cabo ou fac-símile, e serão consideradas devidamente entregues ou enviadas, quando entregues à parte destinatária nos seguintes endereços:

Para o Semasa:
Av. José Caballero, 143
Santo André, SP 09040-210
Brasil

Tel.: 011 55 (11) 4433-9925
Fax: 011 55 (11) 4433-9600
Email:

Para a U.S. Trade e Development Agency:
1000 Wilson Boulevard, Suite 1600
Arlington, Virginia 22209-3901
USA

Tel: (703) 875-4357
Fax: (703) 875-4009.

Todas as comunicações serão em inglês e português, salvo acordo em contrário entre as partes. Além disso, o Favorecido deverá fornecer uma cópia de cada comunicação enviada à USTDA à Divisão Comercial da Embaixada dos EUA no País Beneficiado.

Qualquer comunicação relativa a este Termo de Cooperação deve incluir os seguintes dados fiscais:

Dotação orçamentária nº:	1111/121001
Atividade nº:	2011-51019A
Reserva nº:	2011188
Doação nº:	GH201151188

18. Rescisão

Qualquer parte poderá rescindir este Termo de Cooperação através de notificação por escrito à outra parte com antecedência de 30 (trinta) dias. A rescisão deste Termo de Cooperação cancelará quaisquer obrigações das partes em fornecer recursos financeiros ou outros recursos para o Estudo, com exceção de pagamentos que as partes já estejam comprometidas a fazer de acordo com compromissos não canceláveis assumidos com terceiros antes da notificação de rescisão por escrito.

19. Não Renúncia de Direitos e Reparações

Nenhum atraso no exercício de qualquer direito ou reparação que couber a qualquer parte em relação a este Termo de Cooperação será interpretado como uma renúncia a tal direito ou reparação.

20. Tecnologia e Equipamentos Norte-americanos

Através do financiamento deste Estudo, a USTDA busca promover os objetivos do Projeto do País Beneficiado através do uso de tecnologia, bens e serviços norte-americanos. Em reconhecimento desta finalidade, embora o Favorecido não seja exigido por qualquer meio a adotar as recomendações ou implementar o Projeto, ele concorda que irá permitir que os fornecedores norte-americanos participem da licitação para aquisição de tecnologia, bens e serviços necessários para a execução do Projeto.

As informações deste Termo de Cooperação serão publicadas no diário oficial do município, e submetidas ao Tribunal de Contas do Estado de São Paulo e à Câmara Municipal de Santo André, nos termos da legislação local.

[RESTANTE DA PÁGINA INTENCIONALMENTE DEIXADO EM BRANCO].

E, por estarem assim justos e acordados, o Governo dos Estados Unidos da América e o Favorecido, cada um atuando através de seu representante devidamente autorizado, assinam este Termo de Cooperação nos idiomas inglês e português, formalizado na data indicada abaixo. Em caso de conflito entre as versões em inglês e português deste Termo de Cooperação, prevalecerá a versão em inglês.

Pelo Governo dos Estados Unidos da América

por: _____
Thomas Kelly
Cônsul Geral
Consulado dos Estados Unidos em São Paulo

Pelo Serviço Municipal de Saneamento Ambiental de Santo André

por: _____
Aidan Ravin
Prefeito
Município de Santo André

Por: _____
Gabrielle Mandel
Gerente Nacional
USTDA - Agência de Comércio e Desenvolvimento dos EUA

Por: _____
Angelo Pavin
Superintendente
SEMASA

Data: 27.06.11

Data: 27.06.11

Anexo I -- Termos de Referência

Anexo II – Cláusulas Obrigatórias da USTDA

ANNEX 5

Annex I

Terms of Reference

Objective

The objective of this Study is to evaluate the technical and economic feasibility of developing solid waste derived energy recovery facilities in the municipality of Santo Andre in Brazil. The facilities that will be the subject of this feasibility study will include 1) a landfill gas recovery project at the existing municipal landfill in Santo Andre and; 2) a conventional waste to energy (WTE) facility for processing municipal solid waste (MSW) generated in the municipality. To the degree required, each of these will be separately evaluated during the investigation.

The overall evaluation will be undertaken within the context of a possible working partnership or other form of relationship between the municipality (as represented by its solid waste management - Servico Municipal de Saneamento Ambiental de Santo Andre (SEMASA)) and the local energy utility (Empresa Metropolitana de Aguas e Energia S.A. (EMAE).

The Study tasks are as follows:

Task 1: Feasibility Study Inception Plan and Schedule

Within two weeks of signing the contract for the Study, the U.S. Firm shall submit to SEMASA a detailed Feasibility Study Inception Plan and Schedule. This plan and schedule shall present detailed information concerning the U.S. Firm's approach to accomplishing the Study, to allow SEMASA to plan and schedule all activities required to support the U.S. Firm's efforts.

(All required reports submitted to SEMASA by the U.S. Firm as defined in these Terms of Reference shall be submitted in draft form for comment and return prior to finalization by the U.S. Firm.)

Deliverable #1:
The U.S. Firm shall provide SEMASA with a Feasibility Study Inception Plan and Schedule. The Plan and Schedule shall be provided to SEMASA in English and in Portuguese.

Task 2: Data Collection and Review

Some data may be in Portuguese, and it will be the U.S. Firm's responsibility to translate the information for its use, if needed.

Task 2.1: Kick off Meeting - The U.S. Firm shall travel to the municipality of Santo Andre for a kick-off meeting with SEMASA to 1) review the Feasibility Study Inception Plan and Schedule; 2) gather initial project information; and 3) observe solid waste management conditions in the Project service area.

Task 2.2: Initial Data Acquisition - The U.S. Firm shall acquire all relevant reports and data required to determine the feasibility of the proposed landfill gas recovery system and waste-to-energy facility. At a minimum, this information shall include:

- reports and data pertaining to solid waste management in the Project service area;
- plans and physical/technical data related to the existing Santo Andre landfill;
- past feasibility analyses or investigations;
- energy supply and utilization data for the region;
- current relevant institutional relationships;
- economic data concerning current solid waste management practices;
- financial data associated with SEMASA; and
- any other information deemed relevant to the completion of the Study.

Task 2.3: Data Needs and Gaps Identification - As a result of the initial investigation and acquisition of initial Project data, the U.S. Firm shall identify additional data that must be developed to successfully complete the Study. The identification of data needs and gaps shall also include a definition of the assistance that will need to be provided by SEMASA in securing this necessary information. This shall include any required physical property and topographical surveys of the landfill site for evaluation of the landfill gas recovery system, if they do not already exist.

Task 2.4: Statutory and Regulatory Requirements Review - The U.S. Firm shall investigate all applicable existing and pending statutory and regulatory requirements applicable to the proposed facilities. This shall include current and proposed regulatory requirements from all relevant local, state and national governmental sources. To achieve this review, the U.S. Firm shall meet with all applicable regulatory agencies to advise them of the Study and to solicit their input into the investigation.

Task 3: Evaluation of Existing Project Development Conditions

Task 3.1: Solid Waste Stream Characteristics - Quantity - The U.S. Firm shall investigate the existing solid waste stream and characteristics for the WTE Project service area to determine the quantity of municipal solid waste that will be available for processing at any new waste-to-energy facility. This investigation shall include review of any available physical data associated with the current means of solid waste management. If actual physical data (scale weight data, etc.) is not available, the U.S. Firm shall investigate and project solid waste quantities based on unit generation rates applicable to the region and population (current and projected) to determine the required solid waste throughput at the proposed WTE facility. This projection shall assume a WTE Project service life of 20 years. The U.S. Firm shall also evaluate other regional sources of solid

waste that could provide input feedstock for the proposed WTE facility. This shall include an identification of any institutional impediments that could prevent solid waste from outside of the municipality to be brought to the proposed WTE facility.

Task 3.2: Solid Waste Stream Characteristics - Composition – Due to its importance to the design and function of the proposed waste-to-energy facility, the U.S. Firm shall investigate the physical characteristics of the existing solid waste stream to be processed. At a minimum, this shall include a determination of typical municipal solid waste composition and energy/organic content based on any previous physical analyses. If necessary, the U.S. Firm shall, with the assistance of SEMASA, undertake a physical assessment of solid waste composition based on sound international standards for such investigations.

Task 3.3: Energy Supply and Value - The U.S. Firm shall investigate current energy supply and utilization conditions in the Project service area. At a minimum, this shall include:

- characterization of current energy supply and demand in the Project service area as well as projected energy supply and utilization in the future;
- energy value for determining potential revenues for the proposed facility;
- current alternative/renewable energy procurement policies in the region; and
- any existing power purchase agreements executed in the region that may be relevant to the potential for such an agreement with the proposed waste-to-energy facility.

At a minimum, the U.S. Firm shall meet with any applicable power supply organizations in the Project service area to determine their interest and policies associated with the potential procurement of electric power from the proposed landfill gas recovery system and WTE facility. If possible, the U.S. Firm shall obtain letters of interest and energy purchase terms from the potential purchasers of electric power derived from the proposed facility. In particular, the U.S. Firm shall meet Empresa Metropolitana de Aguas e Energia S.A. (EMAE) to solicit their input into the feasibility of the proposed project and their potential role in its development or financing. Existing experience and conditions associated with the sale of recovered energy from the Bandierantes landfill in São Paulo state shall be evaluated by the U.S. Firm to determine the potential applicability of this approach to landfill gas recovery in Santo Andre.

Task 4: Evaluation of Alternative Waste to Energy Technologies

Task 4.1: Review of Alternative Technologies - The U.S. Firm shall review and characterize alternative technologies available for achieving the recovery of energy from the municipal solid waste in the region in the proposed WTE facility. This characterization shall include all commercially available and emerging approaches that may be applicable to the proposed waste-to-energy facility.

Task 4.2: Technology Risk Assessment - The U.S. Firm shall provide a risk assessment for the various technologies available for the proposed WTE facility. At a minimum, this assessment shall include any risk issues that must be borne by the agency implementing

the facility or that may be mitigated through various technology procurement approaches. This risk assessment shall utilize worldwide experience in the application of the various technologies deemed practical for the waste-to-energy application.

Task 4.3: WTE Facility Siting Criteria – If a site has not been designated for the proposed WTE facility, the U.S. Firm shall recommend detailed siting criteria for the proposed facility. This shall include all site requirements that will allow the successful design and construction of the proposed facility. At a minimum, the U.S. Firm shall recommend criteria associated with:

- site access;
- traffic management;
- land area requirements;
- support utility infrastructure;
- energy interface;
- environmental aspects; and
- any other condition that can affect the successful location, design and construction of the proposed facility.

This criterion may be used by SEMASA to evaluate potential locations for the proposed facility if a site has not already been determined. If a site has been identified, the U.S. Firm will review the physical aspects of the proposed site to determine that it is sufficient for the proposed WTE application.

Task 4.4: Recommended Facility Performance Criteria - The U.S. Firm shall develop target WTE facility performance criteria based on commercially available technological approaches and historical performance in other locations. This performance criterion shall be utilized for evaluating potential project requirements and outputs and for the initial environmental impact assessment element of this Study. All recommended WTE facility performance criteria shall be consistent with international sound practice and current experience in existing waste-to-energy applications.

Task 5: Evaluation of Landfill Gas Recovery System Technologies

Task 5.1: Evaluation of the Current Landfill Gas Management System - The U.S. Firm shall evaluate the design and performance of the existing landfill gas management system to establish a technical baseline for implementation of the proposed landfill gas recovery system. This evaluation of the current system shall also include an assessment of its impact on the potential for deriving carbon credit benefits through the development of a gas recovery system.

Task 5.2: Technical Definition of the Required Landfill Gas Recovery System - Based on the physical characteristics and historical use of the landfill site, the U.S. Firm shall define the required system for collection and processing of generated landfill gas to achieve energy recovery. At a minimum, this shall include the technical definition of all landfill gas collection components and processing systems including all combustion and electrical generation components.

Deliverable #2: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Tasks 3-5. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 6: Preliminary Environmental and Social Impact Assessment

Task 6.1: Identification of Potential Environmental and Social Effects – The U.S. Firm shall conduct a preliminary environmental impact study for the implementation of the Project with reference to local requirements and multi-lateral lending agencies (such as the World Bank). This review shall identify potential negative impacts of the Project. The U.S. Firm shall briefly discuss the extent to which potential negative impacts can be mitigated, and develop plans for full environmental impact assessment or other studies in anticipation of the Project moving forward to the implementation stage, if necessary.

The U.S. Firm shall prepare a preliminary Environmental and Social Impact Assessment (ESIA) based on the WTE technology recommended. In the ESIA, the U.S. Firm shall identify, and propose remedies for any potential air, water, or noise pollution increases that may result from the WTE Project. The chief objective of this task is to ensure that the proposed WTE Project will comply with the all required regulatory environmental criteria and international sound practice. At a minimum, this will include all environmental effects related to air, water (surface and groundwater), land-use, traffic, etc. It shall also include all potential social effects related to Project impact on formal and informal waste collection and recycling programs in the Project service area. The U.S. Firm shall also identify any potential environmental and social effects associated with the proposed landfill gas recovery and utilization system.

Task 6.2: Mitigation of Potential Environmental and Social Effects - The U.S. Firm shall provide recommendations for mitigating any identified potential environmental and social effects associated with both the proposed landfill gas recovery system and new WTE facility. These recommendations shall be sufficiently detailed to provide input into the design and procurement of each project element. Mitigation techniques will also be presented in sufficient detail for presentation to the public and to provide a means for SEMASA to answer any potential questions associated with the environmental and social impact of the proposed landfill gas recovery system and WTE facility. This information will be presented in a manner that would allow independent development of either Project element.

Task 7: Developmental Impact Evaluation

Task 7.1: Determine Project Development Impact - The U.S. Firm shall provide a detailed Developmental Impact Assessment (DIA) outlining the economic and social

developmental outcomes of the proposed landfill gas recovery system and WTE facility Project elements and how the Host Country will benefit in the long term from implementation of the Project. This information shall be presented in a form that assumes the independent development of each project element. For the DIA, the U.S. Firm shall, at a minimum, address the following;

•**Infrastructure:** A summary of the foreseeable impacts on infrastructure with justifications.

•**Market-Oriented Reforms:** A brief description of regulatory or institutional changes the project might lead to.

•**Human Capacity Building:** A description of the number and type of jobs that would be created to construct, procure and operate the facilities, including subcontracted and outsourced positions. A brief description of the training program(s) required to prepare/qualify the candidates for these positions.

•**Technology Transfer and Spin-Off Effects:** A description of any advanced technologies that will be implemented in the host country for the first time as a part of the project elements. A brief evaluation of the project as a technology demonstrator to other users in the host country.

Task 8: Legal and Institutional Framework Review and Recommendations

Task 8.1: Legal and Institutional Framework Review - The U.S. Firm shall review the existing regulatory and legal framework to reflect the latest developments in the following:

- renewable Energy and MSW related laws of Brazil;
- permitting and licensing requirements with the government of Brazil;
- local building codes;
- local right-of-way; and
- zoning ordinances.

All of these should be taken into account before either of the Project elements moves into the implementation stage. Any problematic or lengthy permitting and licensing issues must be identified at this stage. This review shall be based on an assumption that the landfill gas recovery system and the new WTE facility will be developed as independent projects.

Task 8.2: **Legal and Institutional Framework Recommendation** - Based on the analysis of the existing legal and institutional framework affecting solid waste management in the Project service area, the U.S. Firm shall recommend any modifications that are required for the effective implementation and management of the proposed Project elements to provide an effective means for monitoring the performance of the landfill gas recovery system and proposed WTE facility after implementation.

Task 9: Economic and Financial Analysis

Task 9.1: Economic Analysis - Having recommended the most suitable WTE technology and defined the required landfill gas recovery system, the U.S. Firm shall prepare independent cost estimates for each element. The U.S. Firm's estimates shall include a detailed breakdown of equipment and materials for all major WTE components, including, but not limited to:

- waste handling system;
- air pollution control;
- water treatment system;
- boilers;
- large bore and high pressure steam piping;
- steam turbine;
- condenser;
- mechanical and electrical systems;
- instrumentation and controls; and
- electrical interconnection.

The cost of land acquisition and cost of financing should be determined and added to the cost estimate at this stage. The economic analysis will also include a detailed breakdown of anticipated operational and maintenance costs associated with the proposed facility. At a minimum, this will include all costs associated with staffing, consumables, maintenance, residue disposal, and any other costs that influence the operation and maintenance of the facility on an ongoing basis. All cost estimates will be based on assuring the sustainable function of the facility over its design life. A similar cost estimate and economic analysis will also be prepared for the defined landfill gas recovery and processing system which will be independently analyzed.

Task 9.2: Financial Analysis for WTE Facility - For the WTE technology recommended, the U.S. Firm shall conduct a financial analysis based on current and future (i.e. expected) parameters such as the:

- tipping fees;
- electricity tariff rates;
- interest rates; and
- financing costs.

The U.S. Firm shall calculate net present value, payback period, and internal rate of return for the alternative development and procurement scenarios. In undertaking the financial analysis, the U.S. Firm shall also review current solid waste management cost recovery practices to determine their impact on the proposed facility. The financial analysis shall seek to evaluate the economic and financial performance of the proposed facility over its full 20 year service life. Inflationary factors including, at a minimum, increasing costs/revenues and the potential variation in the quantity of solid waste to be processed shall be taken into consideration. This shall also include the potential

economic impact of additional solid waste from outside of the project service area.

Task 9.3: Financial Analysis for Landfill Gas Recovery System - For the landfill gas recovery system, the U.S. Firm shall conduct a financial analysis based on current and future (i.e. expected) parameters such as the electricity tariff rates, interest rates and financing costs. The U.S. Firm shall calculate net present value, payback period, and internal rate of return for the alternative development and procurement scenarios. The financial analysis shall seek to evaluate the economic and financial performance of the proposed landfill gas recovery system over a 20 year service life. Inflationary factors including, at a minimum, increasing costs/revenues and the potential variation in the quantity of landfill gas to be processed shall be taken into consideration. The financial analysis shall also include an assessment of the potential for achieving carbon credit benefits and their effect on the financial and economic feasibility of the proposed system.

Deliverable #3: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Tasks 6-9. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 10: Risk Management and Procurement Analysis

Task 10.1: Definition of Project Risks - the U.S. Firm shall review and define the project risks that may influence the feasibility or ongoing function of the proposed landfill gas recovery system and WTE facility. The intent of the risk identification activity is to define the processes by which project risk can be managed or mitigated for each project element. In addition to identifying risk management processes, the U.S. Firm shall assess and recommend who should be responsible for assuring the proper management of project risk. For the assessment of project risk and mitigation, the proposed landfill gas recovery system and WTE facility shall be treated as independent elements.

Task 10.2: Project Risk Mitigation Approaches - The U.S. Firm shall evaluate alternative project procurement approaches on the basis of potential risk mitigation. At a minimum, this shall include all procurement approaches commonly used for constructing municipal infrastructure that may be capital intensive. Procurement approaches to be considered shall include, among others, private ownership or the utilization of a Design/Build/ Operate (DBO) or Build/Own/Operate/Transfer (BOOT) approaches.

Task 10.3: Alternative Project Procurement Processes - The U.S. Firm shall evaluate alternative project procurement approaches and recommend the approach that will provide an optimum and sustainable landfill gas recovery system and waste-to-energy facility at the least risk to SEMASA and the government that it represents. This will include a possible development relationship between the municipality of Santo Andre and Empresa Metropolitana de Aguas e Energia S.A (EMAE). The U.S. Firm shall recommend alternative approaches by which SEMASA and EMAE can form the

necessary relationship to develop, finance and operate the proposed project elements.

Task 10.4: Risk Assessment and Procurement Report - The U.S. Firm shall prepare and present to SEMASA a Risk Assessment and Procurement Report. This report shall clearly present a description and quantification of the potential risks associated with each element of the Project and the means by which they can be mitigated or managed. In addition, the report shall provide a description of alternative project procurement approaches that may provide a means for effectively managing Project risk. This report shall be used by SEMASA to select the procurement approach that will serve as the basis for other work associated with this Study including, but not limited to, the financial analysis and the preparation of draft tender documents for implementation of the Project. For the purpose of the risk assessment and procurement report, the landfill gas recovery system and the WTE facility shall be treated as independent elements.

Deliverable #4: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Task 10. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 11: Financing Options Review

Task 11.1: Financing Alternatives - The U.S. Firm shall review all available means for financing the proposed Project elements based on the evaluated alternative procurement approaches. (For the purpose of this review, the landfill gas recovery system and the proposed WTE facility shall be treated as independent elements). It shall be the U.S. Firm's responsibility to obtain Letters of Interest (LOI) from potential lender(s). The current terms and conditions for each of the potential sources of funding need to be clearly stated in the LOIs. At a minimum, financing alternatives associated with the World Bank, Inter-American Development Bank, the Brazilian Development Bank and other multinational or national institutions shall be considered. Financing alternatives shall also be evaluated within the context of a potential development relationship between SEMASA and EMAE.

Deliverable #5: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Task 11. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 12: Procurement Plan Development

Task 12.1: Recommended Procurement Approach - For the landfill gas recovery system and WTE facility, the U.S. Firm shall recommend the best procurement approaches for developing each project element. The U.S. Firm shall provide a detailed description of all aspects of the recommended procurement approach including, but not limited to, the responsibilities and requirements of the implementing agency. This description shall also include an assessment of the existing technical and institutional capacity within the implementing agency to manage the recommended procurement

process. For the purpose of developing a procurement plan, the proposed landfill gas recovery system and WTE facility shall be treated as independent elements.

Deliverable #6: The U.S. Firm shall provide SEMASA with a report detailing the findings and recommendations of Task 12. Two copies of the report shall be provided to SEMASA in English and two in Portuguese. The U.S. Firm shall also provide SEMASA with a CD of the report in English and in Portuguese.

Task 13: Final Report

The U.S. Firm shall prepare and provide a comprehensive Final Report to SEMASA, which shall contain an Executive Summary, key findings, recommendations and conclusions of the Study, and shall incorporate all other documents and/or reports provided pursuant to Tasks 1 through 12 above. Each task of these Terms of Reference shall form a separate chapter of the Final Report.

The U.S. Firm shall also identify the availability of potential U.S. sources of supply and prepare a U.S. supplier list which shall outline potential U.S. sources for procurement of goods and services necessary to develop the solid waste derived energy recovery facilities. The list shall include business name, point of contact, address, telephone and fax numbers for each commercial source, as well as a general description of products and services that may be procured

The U.S. Firm shall ensure that the Final Report is submitted in accordance with Clause I of Annex II of the Grant Agreement. The U.S. Firm shall provide four (4) hard copies and one (1) electronic version of both the confidential and public versions of the Final Report to SEMASA in Portuguese and one (1) hard copy of both the confidential and public versions of the Final Report in English. The U.S. Firm shall provide a copy to USTDA and the U.S. Consulate in Sao Paulo in English in accordance with Clause I of Annex II of the Grant Agreement.

Notes:

(1) The U.S. Firm is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of these Terms of Reference.

(2) The U.S. Firm and SEMASA shall be careful to ensure that the public version of the Final Report contains no security or confidential information.

(3) SEMASA and USTDA shall have an irrevocable, worldwide, royalty-free, non-exclusive right to use and distribute the Final Report and all work product that is developed under these Terms of Reference.

Annex 6

ANNEX 6

COMPANY INFORMATION

A. Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), the information requested in sections E and F below must be provided for each subcontractor.

1. Name of firm and business address (street address only), including telephone and fax numbers:

2. Year established (include predecessor companies and year(s) established, if appropriate).

3. Type of ownership (e.g. public, private or closely held).

4. If private or closely held company, provide list of shareholders and the percentage of their ownership.

5. List of directors and principal officers (President, Chief Executive Officer, Vice-President(s), Secretary and Treasurer; provide full names including first, middle and last). Please place an asterisk (*) next to the names of those principal officers who will be involved in the Feasibility Study.

6. If Offeror is a subsidiary, indicate if Offeror is a wholly-owned or partially-owned subsidiary. Provide the information requested in items 1 through 5 above for the Offeror's parent(s).

7. Project Manager's name, address, telephone number, e-mail address and fax number .

B. Offeror's Authorized Negotiator

Provide name, title, address, telephone number, e-mail address and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

C. Negotiation Prerequisites

1. Discuss any current or anticipated commitments which may impact the ability of the Offeror or its subcontractors to complete the Feasibility Study as proposed and reflect such impact within the project schedule.

2. Identify any specific information which is needed from the Grantee before commencing contract negotiations.

D. Offeror's Representations

Please provide exceptions and/or explanations in the event that any of the following representations cannot be made:

1. Offeror is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The Offeror has all the requisite corporate power and authority to conduct its business as presently conducted, to submit this proposal, and if selected, to execute and deliver a contract to the Grantee for the performance of the Feasibility Study. The Offeror is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment, or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. The Offeror has included, with this proposal, a certified copy of its Articles of Incorporation, and a certificate of good standing issued within one month of the date of its proposal by the State of _____. The Offeror commits to notify USTDA and the Grantee if they become aware of any change in their status in the state in which they are incorporated. USTDA retains the right to request an updated certificate of good standing.

3. Neither the Offeror nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

4. Neither the Offeror, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 3 above.

5. There are no federal or state tax liens pending against the assets, property or business of the Offeror. The Offeror, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

6. The Offeror has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The Offeror has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected Offeror shall notify the Grantee and USTDA if any of the representations included in its proposal are no longer true and correct at the time of its entry into a contract with the Grantee.

Signed: _____
(Authorized Representative)

Print Name: _____

Title: _____

Date: _____

E. Subcontractor Profile

1. Name of firm and business address (street address only), including telephone and fax numbers.

2. Year established (include predecessor companies and year(s) established, if appropriate).

F. Subcontractor's Representations

If any of the following representations cannot be made, or if there are exceptions, the subcontractor must provide an explanation.

1. Subcontractor is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The subcontractor has all the requisite corporate power and authority to conduct its business as presently conducted, to participate in this proposal, and if the Offeror is selected, to execute and deliver a subcontract to the Offeror for the performance of the Feasibility Study and to perform the Feasibility Study. The subcontractor is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. Neither the subcontractor nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

3. Neither the subcontractor, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 2 above.

4. There are no federal or state tax liens pending against the assets, property or business of the subcontractor. The subcontractor, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

5. The subcontractor has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The subcontractor has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected subcontractor shall notify the Offeror, Grantee and USTDA if any of the representations included in this proposal are no longer true and correct at the time of the Offeror's entry into a contract with the Grantee.

Signed: _____
(Authorized Representative)

Print Name: _____

Title: _____

Date: _____