Assessing New Technologies for Managing Solid Waste

Local governments considering how best to manage their communities' waste are often bombarded with proposals and promotional information from system vendors.

Aggressive sales representatives may present officials with unduly biased information on the merits of their particular system. Without technical backgrounds or up-to-date, state-of-the-art information, most officials do not know whom to believe.

This dilemma can be particularly problematic when a vendor presents a non-solicited proposal to officials outside the context of a structured competitive procurement process. In such a situation the local officials are likely to lack accurate, current information on alternative technologies, cost of competing systems, and key contract issues. Without such information, premature commitments to project development may be made that fall short of the community's best interests.

Hiring an experienced consultant to work with the community to analyze waste processing systems and competing claims can be cost effective. The consultant can be the advocate for the community, ensuring that the community is protected in its dealings with vendors. When choosing a consultant, it is important to find one that does not have a business relationship with a vendor or a bias in favor of a certain technology. This type of consultant might not be able to fairly represent the community and may be inclined to steer the community toward a technology that is not the best available for meeting community needs.

The information in this paper is provided to help address this problem, by helping local officials and their staffs to identify key project development issues as early as possible in the consideration of a particular technology or vendor. The following list of questions will help local officials find out the facts concerning any particular system by putting them on a better footing when vendors or consultants make presentations or provide information. The question list is not exhaustive but will provide some direction for officials who are trying to weigh the pros and cons of various alternatives. Specific questions are provided for analyzing a waste to energy or composting project proposal.

**Basic Approach to Evaluation**

When considering any waste processing technology, the community must answer four key questions:

- Is the proposed technology (i.e., waste handling method) the best one for meeting your community's specific needs? (The key here is to make sure that local needs drive the technology selection, rather than allowing a particular vendor's offering to do so.)
- What are operating and maintenance requirements and costs for the system (over the lifetime of the project)?
- Is your community getting the best business deal for the selected technology (considering both price and risk)?
- Does the proposed vendor have the proven experience to demonstrate its ability to construct or operate a reliable facility while also meeting project business commitments?
For each of those key questions, you will find specific questions in two categories. Under each key question heading is a series of general questions for those who are investigating waste processing technologies for the first time. The general questions do not require detailed technical knowledge but still solicit crucial information that the community can use to evaluate and compare proposals.

A second set of questions appears under two of the headings: Appropriateness of Technology and Evaluation of the Business Deal. These questions anticipate a higher level of technical knowledge of waste processing systems. Using these questions a local official or an engineering consultant can obtain more in-depth information about a specific type of system under consideration. Ensuring that both series of questions are ultimately answered to the satisfaction of the local government and its professional representatives will improve the decision-making capability of the community, improve its ability to establish contract conditions, and help it receive the best competitive price for providing equipment or services.

**Evaluate Appropriateness of Technology**

**Appropriateness of Technology General Questions**

- **Processible wastes** – What wastes or materials can the proposed facility process? What does it produce? What options are available in defining these inputs or outputs?
- **Existing facilities** – How well does the proposed facility relate to other existing or proposed solid waste facilities? Consider the materials processed by these other facilities, at their locations, their expected remaining lifetimes, and their tipping fees and funding mechanisms.
- **Existing collection** – How does the proposed facility relate to the existing solid waste collection system? Does the facility match with existing or proposed methods for collection of recyclables, mixed wastes, yard wastes, etc.?
- **Markets** – Are local markets available for products produced by facility? What experience does vendor have in marketing these products? What assurances are there of local markets?
- **Reliability** – How reliable have similar facilities proven elsewhere? (Should have independent evaluation of this by qualified in-house staff or independent technical advisor.) Provide names and phone numbers of facility contacts.
- **Residues** – What residues (e.g., unprocessed wastes, rejected materials, ash, and solids or sludge collected by pollution control equipment) would be produced by the proposed facility? Are any of these residues treated as hazardous or special wastes by existing or proposed state or federal regulations? How do these regulations address the testing, storage, transport, and disposal of these residues? Who is responsible for disposal of these residues? What are the expected costs?
- **Environmental impacts** – What are the types of environmental impacts associated with the proposed type of facility? Have similar facilities been able to meet state and federal environmental regulations? What has been the experience of facilities owned or operated by the proposed vendor in meeting environmental regulations similar to those applicable to the proposed facility?
- **Facility sit** – How appropriate is the proposed site for the facility? Who presently owns the land, and if it must be acquired, what is the proposed plan for purchase? Are all required utilities available at the site? If not, who is responsible for paying to provide utility extensions to site?
- **Permits** – What permits are necessary for building the proposed facility at the proposed site? Which of these present the most significant hurdles? Who is responsible for obtaining the permits to construct and operate the proposed facility?
- **Breakdown** – What will happen to wastes if part or all of facility is unable to operate? Who bears financial consequences?
• **Facility design** – What buildings and site improvements (e.g., parking, landscaping, storm water detention, etc.) are being provided as part of the facility? These should be evaluated for compliance with local regulations and architectural standards. Architectural renderings should be incorporated into contract documents to express vendor commitments.

• **Future growth** – How would the proposed facility accommodate future growth in amount of waste to be processed. For example, has space been included in the building for the future addition of equipment, or has the building been designed to easily accommodate expansion?

**Appropriateness of Technology Specific Questions--Waste to Energy**

**System Inputs**

• **Preprocessing** -- Is preprocessing (e.g., source separating or shredding) of waste necessary or desirable? How can preprocessing be added to the system? Is preprocessing performed manually or by machine?

• **Storage and handling** -- Will waste be stored and loaded using the pit and crane method or the tipping floor and front-end loader method? How will the waste be stored and loaded? How many days of storage space are contemplated in the proposed design?

• **Loading design** -- Is this system a constant flow or intermittent (batch) loading system? Is there a minimum waste volume necessary for proper operation of the facility? Will problems develop if the availability of wastes to process is not constant?

• **State and local regulations** -- What effect will laws such as mandatory source separation or yard waste disposal bans have on system performance and facility capacity?

**System Design**

• **Refractory** -- What type of refractory or other wall material is used in the system? Has the proposed design experienced problems with wall degradation, deterioration, or cracking? How is refractory erosion controlled? How often is cleaning necessary?

• **Tube corrosion** -- How does the proposed design minimize boiler tube corrosion? Discuss tube corrosion problems encountered at vendor's other facilities. How were these problems addressed? What guarantees does vendor make on boiler tube longevity?

• **System problems** -- What slagging and fouling problems has this system experienced? How often do the system tubes and other components need cleaning? Are soot blowers, mechanical rappers, or other tube cleaning devices included?

• **Tube warping** -- Has the system experienced warping of tubes or other components? What is the reason?

• **Feed and grate systems** -- How is waste transported through the system? Why was this method chosen over other available methods? How does this method support maximum processing? Has this system experienced problems with bridging?

• **Input and output** -- Describe the system for feed and discharge of solids (conveyors, chain drag, rams, grates, rotary primary chambers, or screwfeed). Why was this system chosen over other alternatives? Is there a minimum cool down period before cleanout?

• **Water needs** -- How much water is required for system operation? What will be the source of the water? What is the water used for? (Example: for scrubbers, water quench, or moisture). Where will water be discharged? Will waste water be pretreated prior to discharge? What standards will wastewater meet?

• **Nuisance and safety** -- How are noise, vibration, dust, odor, fire, and explosion potential controlled and mitigated in your system? Is the system designed for maximum safety and
repairability in the event explosive materials entered the waste stream? Please explain these aspects of the design.

- **Expansion** -- Can your system be expanded or modified to increase its size? How would auxiliary energy recovery, such as electricity generation, be added?
- **Waste handling** -- How will different types of wastes be handled? For example, how will bulky wastes, explosive materials, and recyclables be received and processed?
- **Ash management** -- Present your plan for ash management. Address the following issues: How will bottom ash, fly ash, scrubber residue, and any other residues be collected and handled. Are these different residue streams combined at some point within the facility? If yes, can plant be operated with segregation of residues? Will bottom ash be processed for recovery of metal or other materials? What precautions will be used in on-site handling, transporting, and off-site handling of residues to minimize dust and in-transport leakage of water? Where will residue be disposed of and what are the design standards of the proposed disposal site? What firm commitments have been made by facility proposed to receive ash and what is permit status of the same facility?
- **Burnout** -- What is the percentage of burn out achievable by the system? How is stated burn out calculated?

**Pollution Control System**

- **Pollution control** -- What type of pollution control system is included in the proposed facility? (Electrostatic precipitator, wet or dry scrubber, baghouse, combustion control, other)
- **Emission standards** -- What emission standards will the facility meet? What standards are being met at your other facilities? Do you guarantee that this system meets existing and any proposed state and federal standards?
- **Pollutant removal efficiency** -- What percentage of pollutants are removed by your pollution control system? Do you guarantee the percentage removal of pollutants?
- **Recommended supplementary measures** -- What other steps should be taken to control and suppress process emissions?
- **Stack dimensions** -- What is the height and width of the chimney or stack needed to meet pollution control regulations for your system? What measures are proposed to reduce negative visual impact of stack?
- **Emissions monitoring** -- What emissions will be monitored and how frequently? How often will emissions data be reported to state and local authorities? Will state have access via modem or dedicated line to real-time and recorded emissions data? What access will local authorities have to the same data?

**Appropriateness of Technology Specific Questions--Composting**

**System Inputs**

- **Preprocessing** -- Is preprocessing necessary? How are noncompostables removed from the system? Is screening performed before or after composting?
- **Hazardous screening** -- What controls will be in place to keep hazardous materials out of the compost system?
System Design

- **Wall construction** -- How are composter walls constructed? Has your system experienced any problems with cracking, jamming, or deterioration?
- **Material movement** -- How is material moved through the system? How is the material aerated? How are temperature and moisture monitored and maintained?
- **Temperature** -- What is the maximum temperature in the composter? How long is this temperature maintained? Will you guarantee that the process will destroy pathogens, weed seeds, and pesticide residues?
- **Capacity** -- How have you calculated system capacity. State all assumptions.

Pollution Control System

- **Odor control** -- How does your system manage odor? How will odors be monitored? Have vendor's other facilities received odor complaints, and how were they addressed?
- **Leachate** -- How does your system collect and manage leachate? Who is responsible for costs of leachate treatment? Where is leachate or treatment effluent discharged?
- **Site runoff** -- Describe measures to control quality of runoff from site. How is quality of runoff controlled?

Operation and Maintenance

**Operation and Maintenance General Questions**

- **Training** -- What degree of training is needed to properly operate this system?
- **Personnel** -- How many people are needed to properly operate this system? Describe variations according to proposed operating days and shifts.
- **Start-up** -- What is the expected period of start-up and shakedown for this system?
- **Spare parts** -- What is the availability of spare parts for this system? To what extent must spare parts be ordered from sole-source (e.g., original equipment mfg./supplier)?
- **Expected life** -- What is the expected life of each major system component?
- **Existing facilities** -- How many other facilities of this type and design are now operating? Are these other facilities pilot projects or full-size facilities? What has been the reliability and system availability for these systems? What problems have developed?
- **Backup system** -- Are backup systems necessary for this facility? How much backup is suggested? Which components in the system should be redundant for standby purposes?
- **Guarantees** -- What types of performance guarantees does your company provide to ensure the system works in an optimal manner.
- **Training** -- Does your company provide training of operators for this system? If not, who does? What is the cost of training?
- **Operation** -- Has climate (temperature, humidity, precipitation, wind, etc.) presented any special problems to the operation of any of your facilities? Which of your facilities are located in climates similar to our community?
- **Storage** -- How is waste stored during periods in which the system is down for maintenance? How much storage space is anticipated in the facility design?
- **Health risk** -- Does the process present a health risk to workers? Must special handling or protective equipment be used? Do you recommend or propose to provide a program for monitoring health impacts to workers?
Evaluate Business Deal

Evaluate Business Deal General Questions

- **Ownership** -- Who will own facility? If local government does not own facility, what is proposed basis of negotiation at end of service contract period?
- **Contract length** -- What is proposed duration of contract? What price guarantees are made over that period?
- **Delivery** -- What commitments must community make regarding delivery of wastes or recyclables? What penalties apply if quantities are not achieved?
- **Risk allocation** -- What risks are being borne by the vendor and what risk is the unit of local government being asked to bear? Categories of risk to address include:
  - Inability of facility to process design quantity of wastes
  - Inability of facility to meet environmental regulations
  - Overruns in cost to design, permit, and build facility
  - Increases in costs to operate facility
  - Market revenues falling short of projections
  - Amount of material delivered for processing exceeding or falling short of projections
  - Composition of delivered materials differing from expectations
  - Changes in laws or regulations
  - Liabilities associated with products or residues
  - Labor strikes
  - Fire or explosion at facility
  - Acts of God (e.g., earthquake, tornado, etc.)
- **Financing** -- Is the community being asked to participate in the financing of the facility? If yes, what is the requested role? Is the vendor asking that the project be backed by the taxing power of the unit of local government? (If yes, the project could affect the local government's bond rating, its availability of funds for other projects, and may require a referendum.) Is vendor contributing equity to project?
- **Environmental permits** -- Who will be responsible for conducting environmental studies required by state, federal, or local agencies? Who will be responsible for obtaining construction and operating permits?
- **Operating data** -- Who will be responsible for tracking such data as market revenues, amount and composition of materials received and shipped, reimbursable costs, and compliance with environmental regulations? What documentation will be maintained and how often will information be reported?
- **Other generators** -- Will the vendor be processing wastes from other municipalities or firms at the same facility? How will they participate in project costs and revenues? How will the priorities in meeting the needs of these various clients be established?

Evaluate Business Deal Specific Questions--Waste to Energy

- **Auxiliary fuel** -- Does your system need auxiliary fuel to operate the system? What is the expected amount and cost of the auxiliary fuel necessary? Describe the associated preference guarantee.
- **Electricity needs** -- What are electricity needs for operating the system? What is the expected amount and cost of electricity? Describe the associated performance guarantee.
• **Energy production** -- Is your system compatible with steam and/or electricity production? What markets exist in the local area for sale of steam or electricity? What is the quality (temperature and pressure) of steam that your system will generate? Can quality and quantity of steam be varied based on the needs of local buyers? Describe effects of steam condition on system cost. Describe proposed performance guarantees regarding energy production.

• **Recycling** -- What recyclable material sales are anticipated in the economic analysis for this system. What price per ton is predicted? What market information is this estimate based on? What performance guarantees do you propose regarding material recovery?

• **Redundancy** -- How is the need for component redundancy factored into total system cost?

• **Cost/benefit of energy recovery** -- What is the comparative capital cost of a process only system versus a system with energy or product recovery? What are comparable operating costs and revenue?

**Evaluate Business Deal Specific Questions—Composting**

• **Compost value** -- In your estimate of system economics, what value are you assuming the compost will have? How is this estimate determined? What are the proposed performance guarantees regarding compost revenue, and value reduction?

• **Recyclable value** -- What recyclable material sales are anticipated in cost calculations? How are these estimates calculated? What assumptions are used? What are the proposed performance guarantees regarding material recovery? What are the proposed performance guarantees regarding material recovery?
Vendor Evaluation

Vendor Evaluation General Questions

• Existing facilities -- What other plants has vendor built, designed, or operated? Get complete list, not just vendor-screened list. Get clear description of vendor's specific role in each project. Get description of each facility in sufficient detail to determine relative comparability to the facility proposed for your community. Get names of references and contact those associated with facilities most like yours. Follow up with calls to secondary references not supplied by vendor. Visit facilities if possible.

• Annual report -- Get copy of vendor's latest corporate annual report. Review and follow with requests for information sufficient to ascertain financial history and health vendor.

• Financial relationships -- Determine vendor's ownership and financial relationships with other companies. Is there a parent company or subsidiaries? How would each of these entities be involved in the proposed project? Was company or license for proposed technology previously owned by another firm? If yes, how did present arrangement evolve and what has been the experience of clients of the previous owner?

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