



Minnesota Pollution Control Agency

PROGRAM MANAGEMENT DECISION MEMO

Issue: Waste-to-Energy (WTE) in an Integrated Solid Waste Management System

Effective Date: June 14, 2010

DECISION

After a recent review of published information about the performance of WTE plants and landfills, the MPCA reaffirms that the state's waste hierarchy properly places WTE plants as one step up from landfills for dealing with waste that Minnesotans have failed to separate at the source for reuse, recycling, or composting. Notwithstanding the important role WTE can play in an integrated Solid Waste Management System, each facility must satisfy all the requirements of environmental review and the permitting process.

BACKGROUND

In 2006, the MPCA published a position paper ("MPCA Position on Waste-to-Energy," November 14, 2006) stating that waste-to-energy has an important role in the solid waste system, based in part on the following points:

- Any waste-to-energy facility operating today must meet rigorous federal air pollution standards. Today's waste-to-energy facilities have proved these can be achieved with high reliability;
- A waste-to-energy facility is part of an integrated waste management system that maximizes the recovery of materials and energy from the waste;
- Greater self-sufficiency in energy production for Minnesota and for the nation is a desirable outcome; and
- Today's citizens and businesses should manage today's waste rather than storing it in dry landfills for future generations to grapple with.

This Program Management Decision supersedes that position paper. At the request of MPCA senior managers, technical staff reviewed literature to compare WTE plants and landfills on five criteria:

- Energy recovery per ton
- Effect on recycling rates
- Costs at existing facilities
- Greenhouse-gas emissions
- Air pollution other than GHG emissions

RATIONALE

As a general matter the MPCA has endorsed and will continue to endorse the concept that some portion of mixed municipal solid waste ("MMSW") now going to landfills should be going into a WTE system instead, because it is in line with the Waste Management hierarchy (see quoted statute, below). The Waste Management hierarchy in Minnesota calls for moving waste "up" a statutorily-defined hierarchy whenever practical, in light of regional circumstances. In general, the greatest benefits are achieved at the top of the hierarchy. County governments decide the combination of waste management practices that best meets their community's needs, and the particular waste management practice they want to implement at a particular point in time, as incorporated in their MPCA-approved solid waste plans. Despite guidance from the hierarchy, however, Minnesotans' dependence on landfills has grown significantly over the last 15 years. There is so much garbage going into landfills each year (2 million tons a year) that Minnesota's existing WTE plants could employ all their unused capacity without threatening goals that call for more reduction, reuse, recycling, and organics processing.

Summarizing the results of the literature review concerning WTE plants and landfills on the five criteria (For a link to more information on these topics, click [here](#)):

- Energy recovery per ton: On a per-ton of mixed municipal solid waste (MMSW) basis, waste-to-energy (WTE) is clearly superior to landfill-gas-to-energy (LFGTE) in terms of the amount of usable energy produced. This edge is even greater for high-performance WTE plants where a high proportion of metals are pulled out ahead of the combustion process, and "combined heat and power" plants of the type now being built to handle garbage in Northern Europe. Olmsted County recently added such a high-performance plant when expanding its waste-processing system. On its own, however, there is not enough municipal solid waste in Minnesota to match wind turbines as a renewable energy source: Even if 1.5 million tons of MMSW that is currently landfilled yearly were directed to an expanded WTE network, the renewable energy produced would amount to no more than a few percent of the state's total electrical consumption. (When expressed as a percentage of additional baseload electrical generation that is needed before 2025, however, the share from such a WTE expansion could be closer to ten percent.)
- Effect on recycling rates: MPCA finds no evidence that the state's WTE system and its recycling system are working at cross purposes. The most important single factor in boosting reduction and recycling appears to be a well-enforced, highly visible surcharge on the cost of mixed-waste disposal, because this sends a clear economic signal to all the handlers and generators of waste. Perhaps in part because the financing of WTE plants has been based on a fee added to tipping costs, there has been a positive correlation in the US and Europe between WTE usage and recycling rates. (With this caveat: unusually high WTE usage -- over 35 percent WTE of mixed solid waste in a region -- can place a cap on what could be achievable through additional reduction, recycling, and separated organics. But few regions in the world have attained such a high WTE usage level and the capital cost of WTE makes over-

Waste-to-Energy Program Management Decision

sizing less likely than in the first wave of construction, when public financing was easier to obtain.)

- Costs at existing facilities: Setting aside uncertainty about the long-term costs of landfills, the out-of-pocket tipping fee charged to haulers delivering a ton of mixed waste to a large WTE plant will be at least twice as much as the tipping fee charged at a large landfill, if public subsidies for WTE are excluded. Because most of the cost of waste management is in the transportation of the waste to the disposal facility, the higher tipping fee for WTE translates into an additional cost of less than \$5 per household per month. While WTE plants produce significantly more energy per ton of waste than landfills with energy recovery, to date, such revenue has not been enough to offset fully the costs of expensive pollution control equipment required at all WTE plants. The same situation relates to all energy sources classified as renewable under Minnesota law: it is very difficult to match the low price of fossil fuels, particularly strip-mined coal.
- Greenhouse-gas emissions: On a per-ton of waste basis, WTE and landfill gas-to-energy facilities are largely indistinguishable in terms of greenhouse-gas emissions, although the calculation has large uncertainty bars. Best professional judgment suggests that a few hundred thousands of tons of greenhouse gases might be at stake depending on whether MMSW went to WTE or landfills, and depending on certain key assumptions such as the fate of carbon stored in landfills (termed “carbon sequestration”). MPCA used a methodology that assumes landfills will succeed in isolating a portion of the vegetative material that is disposed there. But under no scenario would sending 1.5 million tons to new WTE plants cut the total statewide GHG emissions by even one percent a year.
- Air pollution other than GHG emissions: Because landfill air emissions of criteria and hazardous air pollutants are modeled rather than measured, actual measurements are needed to confirm those models. Based on very limited and uncertain data and including the offsetting of emissions from Minnesota electricity production, WTE appears to be superior to LFGTE from a life-cycle point of view. The MPCA will continue to advance the scientific knowledge of air emissions and update its position as needed.

Again, these are observations based on national averages. Fortunately, site-specific data such as electricity delivery to the grid is available from Minnesota facilities. This can give insight into how the state’s WTE plants and landfills measure up and could be a subject for the Solid Waste Policy Report.

When communities consider building new facilities, MPCA staff can offer information about how to factor in waste generation trends including source reduction and reuse; opportunities to separate recyclables and organics ahead of WTE or landfilling; efficiency factors based on actual measurements rather than computer models; the role of controlled combustion in destroying materials such as pharmaceuticals that are better excluded from landfills; the role of pilot

Waste-to-Energy Program Management Decision

projects versus proven, commercial-scale plants; the importance of engaging citizens from the earliest stages through performance monitoring; and the need to consider ambient air quality.

The MPCA's conclusions about the comparative standing of landfills will be quite limited when it comes to air emissions because there has been a persistent lack of actual data about air emissions from the surface area of landfills. While WTE plants must provide continuously or regularly monitored emission data for a specific set of air pollutants, landfills do not have to collect any continuous data from the surface of the landfill, only from the landfill-gas collection system and only if they have one. (The only exception is that rigorous air monitoring requirements do apply temporarily to landfills undergoing emergency response following odor problems or subsurface fires. Under such circumstances, air sampling covers only a limited set of compounds that need to be monitored for short-term exposures to workers and nearby residents, and thus exclude many chemicals that would ordinarily be considered in a permitting process. The MPCA is in touch with USEPA and Upper Midwest states to gather "lessons learned" on the emerging subject of how landfill upsets affect air quality.)

In conclusion, WTE plants continue to have an important role to play in the integrated solid waste management system. That said, any new facility will have to satisfy the requirements of environmental review and the permitting process. Proposals most likely to succeed will have strong community and financial support.

Minnesota Waste Management Hierarchy (Minn. Stat. 115A.02b, as amended)

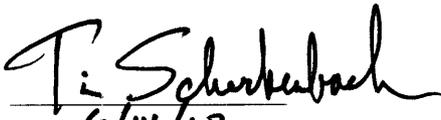
"The waste management goal of the state is to foster an integrated waste management system in a manner appropriate to the characteristics of the waste stream and thereby protect the state's land, air, water, and other natural resources and the public health. The following waste management practices are in order of preference:

- (1) waste reduction and reuse;
- (2) waste recycling;
- (3) composting of source-separated compostable materials, including but not limited to, yard waste and food waste;
- (4) resource recovery through mixed municipal solid waste composting or incineration;
- (5) land disposal which produces no measurable methane gas or which involves the retrieval of methane gas as a fuel for the production of energy to be used on-site or for sale; and
- (6) land disposal which produces measurable methane and which does not involve the retrieval of methane gas as a fuel for the production of energy to be used on-site or for sale."

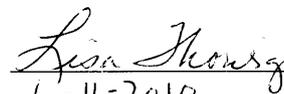
Waste-to-Energy Program Management Decision

APPROVAL

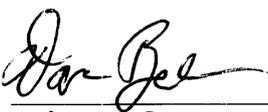
I have reviewed this program management decision and I concur:

Signed: 
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Tim Scherkenbach
Deputy Commissioner

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Assistant Commissioner

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