THE ROLE OF WASTE-TO-ENERGY IN SOLID WASTE MANAGEMENT

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Introduction

On behalf of the International Solid Waste and Public Cleansing Association (ISWA), it is a pleasure to open this First Annual North American Waste-to-Energy Conference. Solid waste management has moved to the forefront of the environmental agenda. The level of activity and concern by citizens and governments worldwide has reached unprecedented levels. Nations are considering restrictions on packaging and controls on products in order to reduce solid waste generation rates. Local and regional governments are requiring wastes to be separated for recycling, and some have even established mandatory recycling targets. Concerns about emissions from waste-to-energy plants have resulted in imposition of state-of-the-art air pollution controls. Landfills are being equipped with liners, impervious caps and leachate collection systems, and gas and groundwater is being routinely monitored. There is wide scale public opposition to siting of new solid waste treatment and disposal facilities. As a result, the costs of solid waste management are increasing rapidly.

Previously considered a local issue, it is now clear that solid waste management has international and global implications. Concerns about transboundary shipment of hazardous waste has led to the adoption of the Basel Convention by the United Nations. Recognizing the interrelationship between solid waste standards and economic development, the European Community is moving forward to harmonize waste disposal requirements in member countries. Around the globe countries are discovering thousands of sites where hazardous wastes have been spilled, dumped or otherwise discarded resulting in contamination of soils, surface waters and ground water. The economic costs of clean-up these sites will stress national economies and at the same time offer enormous international business opportunities.

Solid waste management in countries with developing economies poses a special set of problems. In these countries quite often financing is not available for the construction of waste treatment facilities, and there is a lack of trained personnel to operate waste management systems. Also, there are generally no regulations or control systems, no administrative body responsible for solid waste control and no obligation for industry to dispose of wastes properly. The United Nations Environment Programme has focused on solid waste management in developing economies as a priority concern.

More than ever before, solid waste management policy makers worldwide need sound and reliable information on the technical performance, environmental impact and costs of solid waste collection, recycling, treatment and disposal systems. ISWA, the International Solid Wastes and Public Cleansing Association is putting forward a number of programs that are trying to address that need.

The Mission of ISWA

The objective of ISWA is to promote the adoption of effective and economically sound solid waste management practices that protect the environment and conserve materials and energy resources. ISWA is a professional association open to members from all countries in the world. Its activity is solely in the public interest through professional development of its members; it does not pursue any commercial or political aims.

ISWA is truly an international organization in that its governing body, the General Assembly, is made up of National Members from 21 countries around the world. Most countries with an established solid waste management infrastructure hold National Membership in ISWA. National Members must be national organizations representing all professional activities related to solid waste management in the member country. National Members are encouraged to form national committees of solid waste professional associations within their countries to assure a broad representation in ISWA. It is this international network of National Member organizations that provides ISWA the ability to reach thousands of solid waste professionals throughout the world. ISWA also has over 700 individual and organizational members in over 60 countries. Recognizing the special solid waste management problems in developing countries, ISWA also provides a Development Membership category pending the establishment of a fully functioning National Member organization.

ISWA Programs

ISWA carries out its mission through a series of efforts to collect and disseminate information to its members. The ISWA Journal, Waste Management and Research is published six times a year by Academic Press and has a nine year history of successful issues containing high quality peer reviewed articles. Our newsletter, the ISWA Times is published quarterly and provides practical and useful information to its readers. The ISWA Yearbook, the International Directory of Solid Waste Management and Public Cleansing, provides extensive listings of companies and organizations in the solid waste field, as well as a wide range of articles summarizing activity throughout the industry.

ISWA sponsors and cosponsors a number of conferences, workshops and symposia. Important ISWA conferences and congresses for the next several years include:

ISWA Conference on the German Packaging Regulations, IFAT93, Munich, Germany, May 12, 1993.

The International Symposium on Hazardous Waste Management in Economically Developing Countries, in conjunction with the Turkish National Committee on Solid Wastes, Istanbul, Turkey, June 21-30, 1993.

The ISWA 1993 Annual Conference: Better Waste Management--A Global Challenge, in conjunction with the Swedish Solid Waste Management Association, Jonkoping, Sweden, September 28-30, 1993.

Environmental Technology and Economics- The New Competitive Strategy, Environmex Asia, Singapore, October 5-6, 1993.

Fourth International Landfill Symposium, in conjunction with CISA, Cagliari, Sardinia, Italy, October 11-15, 1993.

ISWA Conferences on Biological Waste Treatment, Waste-to-Energy and Hospital Waste, WasteCare'94, Kielce, Poland, March 21-25, 1994.

1994 ISWA Annual Conference, in conjunction with the UK Institute of Wastes Management, Torbay, UK, June 14-17, 1994.

1995 ISWA Annual Conference, in conjunction with the US/Canadian International Solid Waste Federation, Washington, DC, January 1995.

ISWA Quadrennial Congress, Vienna, Austria, May 1996.

The ISWA 25th Anniversary Congress, Yokohama, Japan, September 1996.

In order to provide the opportunity for the development of specialized ISWA activities, working groups on the following seven subjects have been established:

Hazardous Waste
Sanitary Landfill
Incineration
Recycling and Waste Minimization
Collection and Transport
Sewage and Water Works Sludge
Biological Waste Treatment.

ISWA members can belong to these working groups and engage in practical information exchanges with members from other countries. Through these working groups ISWA holds many specialized symposia and workshops and has developed an international solid waste professional book and report series.

Integrated Solid Waste Management

ISWA members and most other solid waste management professionals recognize that there is no single, simple solution to solid waste problems. Instead an integrated approach is necessary combining the elements of several techniques. In the United States, the Environmental Protection Agency published The Solid Waste Dilemma: An Agenda for Action, which outlines an integrated set of strategies for dealing with solid waste management. These strategies are very similar to those recommended by the European Commission, the United Nations Environment Programme and countries around the world. Integrated solid waste management is a comprehensive strategy involving four key elements applied in a hierarchial manner:

1. Reducing the volume and toxicity of the solid waste that is generated,

2. Recycling or reusing as much as possible of what is generated,

3. Recovering energy from the remaining waste through combustion systems equipped with the best available pollution control technology, and

4. Utilizing landfills with adequate environmental controls.

Turning now to the subject of today's conference let me make a few remarks about the role of waste-to-energy in solid waste management.

The Benefits of Waste-to-Energy to a Waste Management System

Waste-to-energy facilities employ the controlled combustion of solid waste for the purposes of reducing its volume. Municipal waste-to-energy facilities produce a number of benefits to a waste management system. Combustion can destroy bacteria and viruses in wastes as well as harmful organic compounds. Combustion can reduce the volume of solid waste by up to 90 percent thereby conserving landfill space. It also offers the possibility of recovery of energy in the form of steam or electricity, hence the term waste-to-energy facility is often used to describe this technology in the U.S. Modern solid waste-to-energy facilities burn wastes at high temperatures with

residence times necessary for efficient combustion. There are several decades of experience with this technology and research and technological developments have significantly advanced the state-of-the-art and practice. There are hundreds of examples of well designed and operated municipal waste combustors around the world.

In some countries, waste combustion is used to treat a very high percentage of the solid waste stream. In Denmark, Switzerland and Luxembourg over 75 percent of the municipal solid waste stream is treated by combustion with energy recovery. In Sweden the percentage is 60 percent, in France 43 percent and in Germany 38 percent. While Japan has a very high recycling rate (reported by some to be approaching 50 percent), it is often forgotten that Japan uses waste combustion to treat over 70 percent of the waste remaining after recycling. This attests to the compatibility of waste-to-energy and recycling.

Municipal waste combustion in the U.S. has grown significantly. Today in the U.S. 137 waste-to-energy facilities are in operation, and when combined with 39 other combustors operating without energy recovery, process 31 million tons of solid waste annually. This accounts for 17 percent of the municipal waste stream. Planned facilities could bring this total to 53 million tons of solid waste per year, accounting for 24 percent of the waste stream by the year 2000. Current waste-to-energy plants produce an amount of energy equivalent to the needs of 1.2 million homes or equivalent to 30 million barrels of oil.

Environmental Concerns

The environmental concerns of municipal waste combustion derive from two issues; the control of air emissions and the management of ash residues. On February 1, 1991, after several years of data collection and analysis, the U.S. Environmental Protection Agency (EPA) published standards for both new and existing municipal waste combustors. Different standards apply to new and existing units processing more than 250 tons per day of solid waste. Since the standards are quite complex I will not discuss the specific limits here. However, in general, they incorporate good combustion practices, emissions monitoring and highly efficient air pollution control systems to control organic emissions (dioxins and furans), metals, acid gases and other pollutants. The standards are similar to those used in other countries to regulate waste combustors. EPA estimated that in 1994 the national costs of these rules will be $170 million a year for new facilities and $302 million a year for existing facilities. Therefore in the U.S. there will be a substantial financial investment to upgrade the environmental performance of municipal waste combustors.

In another legislative development in the U.S. that will affect municipal waste combustors, on November 15, 1990 the Clean Air Act Amendments were enacted which require revision of the emission standards for these units to incorporate what is termed Maximum Achievable Control Technology or MACT. MACT is defined as

emission levels not less stringent than the average emission limitations achieved by the best performing 12 percent of the existing sources. Also limits must be set for lead, cadmium and mercury. These new rules are expected to be proposed for public comment this year and issued in final form in 1993. All of these standards will ensure that municipal waste combustors will be equipped with state-of-the-art air pollution control devices to reduce air emissions to levels necessary to protect human health and the environment.

Another environmental concern that has developed over the past several years involves the disposal of ash residues from municipal waste combustors. Usually significant amounts of lead, cadmium, zinc, mercury, arsenic, and other metals are found in incinerator ash, especially fly ash. The environmental concern is the potential for these metals to leach out of the residue when disposed of with other wastes in a sanitary landfill. This has led to the utilization of "monofills" or landfills used solely for ash disposal. In September 1992, the U.S. EPA issued an opinion that ash generated by solid waste-to-energy facilities is not considered a hazardous waste under Federal law and that the new requirements for solid waste landfills will ensure that ash is disposed of in a manner that protects human health and the environment.

Also technologies have been developed to chemically extract the metals or to solidify and stabilize them by adding cement or kiln dust to create a concrete like substance. While these technologies are effective in removing or stabilizing metals, they do result in added disposal costs. Some of these costs can be offset if the ash is treated to the extent that it can be used safely and sold as an aggregate or building material. In the U.S. over 8 million tons of incinerator ash are produced annually.

The Future of Municipal Waste Combustion

Let me close with some perspective on the future of municipal solid waste combustion. Solid waste generation rates are not expected to decline in the foreseeable future. Source reduction efforts may slow the rate of growth as compared to the past, but population increases alone will likely increase the amounts of solid waste generated. As existing landfills fill up, and as older landfills and combustors close, the demand for solid waste treatment and disposal capacity will increase.

Part of this demand will be satisfied by increased recycling. In the U.S., the EPA has established a national goal of 25 percent recycling of municipal solid waste. Some States are seeking higher recycling goals. However, even with the most optimistic expectations for recycling levels there will still be a demand for new waste combustion and landfill capacity.

The economics of solid waste disposal are narrowing the gap between the costs of landfills and waste combustion facilities. In the past, landfills were generally

always lower in cost than waste combustors but in some areas this is no longer the case.

There have been significant advancements in the development technologies to control the air emissions from municipal waste combustors. This research has led to more stringent standards for these facilities which will improve their environmental performance. Research also holds promise for more advances in performance and environmental control. Studies of leachates from ash disposal and new technologies for ash treatment will lead to improved ash management techniques.

From a technological point of view, municipal waste combustors can be designed and operated in a manner that is consistent with protection of human health and the environment.

However, as many studies have pointed out solid waste management decisions are social, economic and political in nature more than technological. Technical information in itself is not enough, it must be accepted and believed by the public. The key uncertainty in the future of municipal waste combustion is whether citizen opposition to these facilities will prevent them from being constructed.

In order for municipal waste combustion to have a significant future role, it must be accepted by the public as an element of integrated solid waste management. Municipal waste combustion must not be viewed as an alternative to source reduction and recycling but as a complimentary technology dealing with those wastes that for technological or economic reasons cannot be reduced or recycled. Similarly, landfilling of ash or non-combustible, non-recyclable waste materials must also be part of this integrated strategy.

Development of public support for integrated solid waste management programs will require rebuilding public confidence through unprecedented levels of public information and education and full public access and involvement in the decision making process. ISWA must join with solid waste professionals worldwide to help inform and guide this effort.