

# Chapter 9

## Energy Recovery and Incineration

This chapter describes how incineration of municipal solid waste (MSW) for energy recovery will be considered in the Plan. Energy recovery from the incineration of special wastes is described in Chapter 14 *Special Wastes*.

### Introduction

Making extensive use of renewable energy sources must be a key element of the County's future. But using renewable energy sources, the County can lower its costs, generate revenues for other programs, reduce the volume of waste being landfilled, and lower its carbon footprint. All of which will contribute to the County achieving its sustainability objectives.

### Definitions

**Anaerobic digestion** involves the breaking down of organic matter using bacteria in the absence of air to produce a biogas and a high nutrient residue that can be used as a soil amendment.

**Energy recovery** is defined as “the recovery of energy in a useable form from mass burning or refuse-derived fuel incineration, pyrolysis or any other means of using the heat of combustion of solid waste that involves high temperature (above twelve hundred degrees Fahrenheit) processing.”

**Gasification** involves the breaking down of hydrocarbons using the controlled application of heat and finely tuned amounts of oxygen.

**Incineration** is defined as “reducing the volume of solid wastes by use of an enclosed device, using controlled-flame combustion.”

**Pyrolysis** is defined as “the process in which solid wastes are heated in an enclosed device in the absence of oxygen to vaporization, producing a hydrocarbon-rich gas capable of being burned for recovery of energy.”

### Types of Energy Recovery

#### Municipal Waste Incineration

The need for exploring renewable energy sources and technologies for replacing limited fossil fuels which have been a primary driver of our economy is gaining renewed attention. Waste to energy is one approach being considered and it is

possible that options for using wastes in this way may be identified that have not been previously practical or economical. Energy recoveries from separated wastes remain a waste management priority to be considered as viable approaches and as markets are identified and developed.

Energy recovery incineration (ER/I) facilities may use either mass burning systems or prepared fuel systems. Mass burning systems involve feeding mixed municipal solid waste (MMSW) into a furnace or boiler without mechanically separating or preparing the waste in any way. These facilities can be either large field-erected furnace-boiler systems or smaller modular furnace-boiler systems.

In prepared fuel systems, MMSW is mechanically separated and processed to make refuse-derived fuel (RDF), either as a supplemental fuel for an existing furnace-boiler or to be used alone in a dedicated furnace-boiler.

Energy recovery is rarely associated with small incinerators; incinerators burning less than 250 tons per day do not produce cost effective steam. Medium and large MSW incinerators, however, can install larger boilers, which will generate cost-effective steam. This steam can then be used to generate electricity, power industrial processes, or provide heat.

### **Biomass Incineration**

Biomass incineration involves the incineration of organic matter such as animal litter (for example, horse stall material and chicken litter), yard waste, discarded wood products (such as pallets), and forest debris collected during forest thinning. The organic matter is reduced in size to burn more quickly and efficiently. The heat generated is used to create steam which is then used to generate electricity. The County has an abundant supply of organic materials that could easily serve as fuel for a biomass incineration plant.

### **Biogas Production**

The organic matter used in biomass incineration can also be used to create biogas. Once produced, the gas can be burned to create steam and generate electricity. There are a number of ways to generate biogas: anaerobic digestion, pyrolysis, and gasification.

## **Existing Conditions**

### **Energy Recovery in Clark County**

Currently, the County and cities do not have any operating ER/I facilities. The 1985 Plan update included a detailed evaluation of the development and operations of an ER/I facility in Clark County. After significant public opposition, the 1985 plan recommended that ER/I not be considered as a viable disposal option. The 1994 plan recommended that regional ER/I activities be monitored and then reconsidered during the next plan update.

Some source-separated post-consumer materials, such as pallets, have traditionally been processed for use as “hog fuel.” Hog fuel (so called because it has typically been processed through a type of grinder called a hammer hog) is a broad term that includes residue material from log sorting yards, lumber mills and stump grinding operations. It can also include post-consumer wood waste from source-separated collection services or recovered from solid waste processing. Hog fuel is burned to heat industrial boilers for process-steam generation. Markets for hog fuel have not distinguished between pre-consumer, post-consumer or industrial wastes.

Source-separated wood waste recovery has increased significantly since the 1994 Plan was developed. Much of this recovered material is currently sold as hog fuel while lesser quantities are periodically marketed to particleboard and liner board manufacturers. No source-separated wood waste is currently being landfilled. The wood-waste recovery market in Clark County is very competitive; in-county and regional operators from the Portland area actively compete for material. Despite this competition, hog-fuel market prices are still very volatile, ranging from \$6 to \$22 per bone dry ton. In Clark County, Columbia Resource Company (CRC) sorts wood waste from incoming MSW in addition to collecting source-separated materials from larger generators. Other private wood-waste recycling operators, such as H&H Wood Recyclers, Inc., also accepts and process source-separated wood waste, land clearing debris and similar materials.

Wood waste burned as hog fuel and motor oil burned as bunker fuel (use of motor oil as an alternative fuel source is addressed in Chapter 11 *Moderate Risk Waste* are not included in Clark County’s recycling rate computations but is included in the calculated recovery rate.

During the mid-1980s, state grants were available for counties and cities to study the use of ER/I facilities as an alternative to landfilling solid waste. In many cases these local governments were concerned about the risks and uncertainties of siting and permitting replacement landfills in their jurisdictions. Later in the decade, interest in ER/I was replaced by interest in exporting solid waste to large regional landfills in eastern Washington and Oregon. Waste exporting eliminates local concerns about landfill siting and often costs less than ER/I. With the current economic conditions, interest in ER/I technology has been renewed. The County is currently researching the feasibility of a biomass plant for forest byproducts. The County should conduct further research on the technology and feasibility of using the municipal waste stream for energy generation.

## **Throughout Washington State — Past And Present**

In the 1990’s, the City of Tacoma operated the only refuse-derived fuel (RDF) facility in Washington. RFD is burnable MSW that has been shredded or pelletized into a uniform size and shape before it is burned. Separation of burnable and non-burnable MSW is done at the facility where RDF is made. At the Tacoma facility, processed RDF from the facility is then burned at the City’s power station and the residual ash landfilled. In 2000, the Washington Department of Ecology reclassified the plant as an “incinerator”, requiring higher burning temperatures. In 2001, Tacoma Public Works shut down the plant until permitting issues could be resolved.

In 2004, State rules changed with regard to an emission standard. Those rule changes allowed plants to focus on resulting emissions rather than internal burning temperatures. With this change, the City of Tacoma proposed to take a phased approach to determine whether the steam plant could be refurbished into a state-of-the-art waste-to-energy plant. After assessing and evaluating each phase of the project the Tacoma City Council, in December 2005, voted to not proceed with the project. The City owns its own landfill (City of Tacoma Landfill) which it uses for its waste disposal. The facility will be returned to Tacoma Public Utilities who plan to dismantle the plant or sell it to a private energy company.

There is currently one operating MMSW energy recovery incinerator in Washington State: an 800 ton-per-day facility in Spokane. The Spokane facility is owned by the City of Spokane, managed by the Spokane Regional Solid Waste System and operated by Wheelabrator Spokane, Inc. This facility opened in 1991 with partial funding through a State-matching grant. A much smaller, 100 ton-per-day facility in Ferndale (Whatcom County) which was owned and operated by Recomp of Washington under a disposal agreement with the City of Bellingham was closed in December 1998. The Spokane facility uses energy recovery equipment to generate electricity, which is then used for in-plant operations or sold to utility companies.

Several other small MSW incinerators within Washington State have closed in the last decade. Incinerators in both Skagit and San Juan Counties have been permanently retired. The Skagit incinerator built in 1988 was also partially funded through a State-matching grant. The 178-tpd facility was closed in 1996 due to equipment failures and high operating costs. A smaller incinerator in Friday Harbor (San Juan County) was closed in 1995 because its environmental compliance costs exceeded its budget. Olivine Corporation's 100-tpd incinerator in Whatcom County was forced to suspend operations due to its inability to compete economically against other county waste export operations. The Spokane facility is an example of a field-erected mass burn system; the Recomp facility in Bellingham and the closed facilities in Skagit and San Juan Counties are examples of modular systems.

All incinerators in Washington State are subject to the "Special Incinerator Ash Standards" adopted by the Washington Department of Ecology in 1991. These standards require ash be tested to determine whether it must be handled as a solid waste or as a "special waste." Currently, the only MMSW incineration facility operating in Washington (Spokane) transport their ash to a dedicated ash cell at Rabanco's Regional Disposal Company landfill in Roosevelt, Washington. This type of facility typically produces ash equivalent to 30% by weight and 10% by volume of the incoming waste.

## **Biofuels**

Oregon and Washington have nearly 30 ethanol and biodiesel projects being planned. If all of those refineries are built, they would create enough capacity to produce 1.3 billion gallons a year of fuel made from plants, kitchen grease and animal fat instead of crude oil. Oregon, Washington and California have passed laws designed to boost biofuel usage. Ethanol, blended with gasoline, and biodiesel can decrease oil imports and cut the greenhouse gases and pollution from cars and trucks. "Cellulosic" ethanol uses perennial switchgrass, poplar trees and crop byproducts such as corn stalks and

wheat chaff. It generates an estimated 90 percent reduction in greenhouse gases versus gasoline. It also avoids using food crops for fuel.

## **Energy Recovery Nationwide, Local Experience**

During the 1980s and early 1990s, many communities turned to ER/I facilities (both mass burning and RDF plants) as a way to extend the life of local landfills or minimize the size of replacement-ash landfills. Typically, communities used revenue bonds to finance capital costs; capital and operating costs were then funded through tipping fees. Because tipping fees at ER/I facilities were usually higher than neighboring landfills, communities adopted flow-control ordinances to ensure that the facilities received enough waste to remain economically viable. In addition to the Spokane incineration, similar mass burn facilities continue to operate in Salem, Oregon and Burnaby, British Columbia.

The 1994 U.S. Supreme Court *Carbone* decision on flow control jeopardizes the ability of local governments to direct waste to ER/I facilities. The inability to control the flow of MSW, concerns over the disposal of hazardous ash and the emergence of lower-cost regional landfills have essentially stopped the construction of new ER/I facilities and severely hindered existing operations.

On April 30, 2007, the U.S. Supreme Court ruled in *United Haulers Association Inc. v. Oneida-Herkimer Solid Waste Management Authority* that local governments are permitted to engage in flow control to government-owned disposal facilities in specific circumstances. The Court concluded that flow control laws that favor government-owned disposal facilities do not discriminate against interstate commerce, and are reviewed under a more lenient balancing test. The Court's decision narrows the impact of the Court's *Carbone* decision in 1994.

In the Portland area, Browning-Ferris Industries (BFI) and Rabanco, joint-venture partners operating the Metro Central Transfer Facility, installed processing equipment to convert mixed waste paper and some plastics into a fiber-based fuel (FBF) which was then sold primarily to hog fuel consumers. Strong recycling markets for the feedstocks in 1995 made it difficult to obtain enough materials to make enough FBF to support the process. In 1997, wood chip and natural gas prices fell, forcing FBF out of the market and eventually causing the project to be discontinued and the equipment sold.

## **Recommendations**

1. To meet the state priorities for the management of solid waste (RCW 70.95.010), the County will continue the established energy recovery program for wood waste, monitoring the volume being diverted from landfill disposal.
2. The county should investigate whether to establish a biomass incineration plant to meet its special waste management needs. The county should also conduct further research on the technology and feasibility of using the municipal waste stream for energy recovery.

3. The county should consider building either a demonstration or production biogas plant, possibly using the 78<sup>th</sup> Street WSU Extension property, once the county resumes ownership. This would enable the county to generate power for the site, mitigate a waste stream, and produce nutrient rich soil amendment. This would be consistent with the county sustainability policy and would add to the sustainable nature of the 78<sup>th</sup> Street site.