



**CITY OF BEVERLY HILLS**  
**PUBLIC WORKS DEPARTMENT**  
**MEMORANDUM**

**TO:** Public Works Commission

**FROM:** Robert Welch, P.E., Utilities General Manager  
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**DATE:** March 10, 2022

**SUBJECT:** Best Practices Around the World – Waste to Energy in Sweden

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**RECOMMENDATION**

This item is for information and discussion purposes.

**DISCUSSION**

This report provides an overview of Sweden's waste-to-energy (WTE) program and the ways in which it furthers the country's sustainability goals.

Since enacting its *Environmental Protection Act* in 1969, Sweden's legislative initiatives have placed WTE on the forefront of waste management technology. In fact, Sweden identifies itself as the global leader in dealing with and recycling waste and has extensive programs, including household recycling (required by law) and biogas production from municipal wastewater and landfill plants. Waste-to-energy (WTE) incineration plants are one part of Sweden's comprehensive sustainability policies.

Sweden's first WTE incineration plant was built in 1904 in Stockholm. Then after the second World War, Sweden significantly expanded its district heating network which now comprises several thousand miles of underground pipes, transporting hot water from a common heating plant to heat over half of all commercial and residential buildings in Sweden.

In the wake of the 1973 oil crisis, Sweden launched a major expansion of WTE incineration plants as part of a policy to reduce dependence on foreign oil with the goal of using available fuel or heat that would otherwise go to waste in order to satisfy local needs. The district heating network guarantees a market for the heat produced by WTE plants.

In the mid 1980's when faced with mounting environmental concerns over emissions from burning waste, the government enacted new regulations and retrofitted existing plants to improve atmospheric emissions. In the years since, Sweden has reduced heavy metal emissions by 99% despite generating 300% more waste.

To further discourage waste disposal at landfills, Sweden enacted a landfill tax in January 2000 to encourage additional recycling and incinerating waste. In the years since, several landfill tax

increases have gone into effect as well as a total ban on combustible waste (like paper) from landfills.

Sweden's system relies upon legislation, consumer buy-in, infrastructure spending, and also on clearly defined responsibilities for all parties: municipalities enact a waste management plan, including collecting and disposing of most household waste; households sort waste and deliver it to local municipal facilities; and producers cover the cost or collection of certain materials like packaging, batteries and tires through the policy of Extended Producer Responsibility. The holistic approach spreads responsibility across stakeholders.

Extended Producer Responsibility ("EPR") is a law adopted by Sweden's Parliament in 1993, which shifts the waste management costs or actual waste collection for certain products from local government to producers. The fundamental principle behind EPR is that the party responsible for creating the product is responsible for paying for the pollution. Not only does EPR shift the financial burden away from the municipality, it also encourages producers to consider the environment and design for the life cycle of the product. The EPR system is funded for different types of products either through fees paid by the consumer at the point of sale or income generated through sales of the recycled materials.

EPR's success significantly relies upon trust in the system as well as acceptance of responsibility on the part of producers, trade organizations, municipalities and individual consumers. In addition, the industrial market demands high quality recycled products which are supplied through sorting the stream of waste.

### **How the System Works**

The majority of households view recycling as a high priority, and the government recognizes the attitudes of the consumers as a key factor in the success of its recycling program.

Consumers are completely accustomed to sorting their trash into categories – food, metals, plastics, paper, glass, newspaper, electronics, tires and batteries – and individual consumers make regular trips to local recycling centers.

Consumers deposit their organic waste into green bins or bag it in green plastic bags, which are diverted to WTE plants. The organic waste is then dropped into a boiler and incinerated with the heat transformed into steam than spins turbines and generates electricity.

Sweden's trash-powered plants use 90% of the total energy produced whereas conventional power plants with large cooling towers fully use only 40% of the energy.

Waste incineration is generally accepted by Sweden's population with several plants and facilities near city centers in highly visible locations. However, Swedes still view recycling and reusing as more favorable solutions to incineration. They realize that incineration is a reasonable but imperfect solution to waste disposal due to the resulting air pollution, but the technology continues to advance.

Sweden's power supply is primarily provided by hydro and nuclear energy at 83%. Wind power supplies 7%, and garbage provides even less. The importance of garbage incineration, though, is the diversion away from landfills.

## **Statistics**

As a result of its waste management policies, Sweden generates more energy from waste than any other country in Europe. 34 waste-to-energy power plants currently operate in Sweden which together treat over 2MM tons of household waste each year.

The energy generated by the incineration of 4 tons of garbage is equivalent to 1 ton of oil, 1.6 tons of coal, or 5 tons of wood waste.

As the global leader in waste management, Sweden sent less than 1% of municipal waste to landfills in 2020, according to the Swedish Waste Management and Recycling Association. 37% of municipal waste was recycled or composted, 16% underwent biological treatment, and 46% went to energy recovery, including incineration. The Association reports recent upticks in a few categories, including an increase in construction material waste, which is attributed to COVID-19 or the “corona effect”.

The energy supplied to the district heating network from WTE plants provides enough heat in the winter to warm 1,250,000 apartments and 680,000 houses each year.

Sweden’s WTE power plant capacity has now outpaced its supply of garbage, so Sweden currently accepts household waste from several European countries where landfill taxes are more costly than Sweden’s fees to incinerate the garbage. As a revenue source, the fees generate approximately \$100,000,000 for Sweden annually.

Detractors of WTE power plants focus on emissions and air pollution produced during incineration. However organic waste diverted from landfills reduces methane released into the atmosphere, and methane is approximately 72 times more potent than carbon dioxide as a greenhouse gas.

After the Paris Agreement in 2015, the Swedish Parliament enacted a framework policy for climate action in 2017 which included a Climate Act, requiring Sweden to reach zero net emissions of greenhouse gases by 2045 at the latest. The stated goal is to be the world’s first fossil-free nation.

As of 2018, only 2% of Sweden’s total greenhouse gas emissions resulted from waste treatment, a number which has been falling since 1990. The emissions from waste incineration are low as of 2021 and are expected to remain stable through 2045 yet. In order to reach zero net emissions, Sweden’s Ministry of the Environment has identified waste incineration as an area for further improvement not through lower emissions regulations but through planned expansion of the Extended Producer Responsibility program to include textiles as well as focusing on extending product lifespan within a circular economy. Therefore, Sweden has not enacted new regulations to lower the GHG emissions from WTEs.

Critics also equate increased diversion of garbage to WTE power plants with a reduction in recycling, but Swedish consumers actually increased recycling from 2011 to 2015.

## **California**

Unlike Sweden, the U.S. has plenty of open space for landfills and historically cheap energy. As a result, the U.S. has not significantly invested in waste-to-energy power plants. Current state law requires cities to reduce, recycle or compost at least 50% of their trash and provides a 10% credit for waste sent to an incinerator.

As of 2020, there were 20 operating biomass incinerators in California, burning different fuels: biomass, digester gas, landfill gas and municipal solid waste.

Of those, only two burn municipal solid waste: Covanta Stanislaus incinerator and the Southeast Resource Recovery Facility (SERRF) in Long Beach.

The Stanislaus plant has operated since 1989 as a public-private partnership, processing more than 265,000 tons of waste annually. It is responsible for greenhouse gas reduction equivalent to taking 48,000 passenger vehicles off the road each year. It also produces enough electricity to power 14,000 homes annually. It relies on cap-and-trade laws and renewable-energy credits to sell the electricity generated at a premium price, allowing buyers to claim renewable-energy credits.

The Long Beach plant, on the other hand, is publicly owned and does not participate in the cap-and-trade system. Built in 1988, the plant relies upon combustion technology to incinerate garbage, reducing the total volume of solid waste by approximately 80%. The energy produced powers the plant itself, and Southern California Edison buys the remainder to sell to its customers. The facility generates enough power each year to supply 35,000 homes.

In 2011, the California Governor requested a study, which was conducted by the California Council on Science and Technology to discuss the viability of waste-to-energy conversion and address criticisms. The Commission concluded that waste-to-energy technologies could offer positive environmental impacts in California.

The opportunities for improvement are great – as of 2012, 40% of California's municipal solid waste was biomass; the abundance of which is available to potentially generate biofuels through waste-to-energy conversion processes.

The Commission's study cited three main barriers for waste-to-energy systems in California: (1) State laws restricting technology; (2) permitting requirements; and (3) project financing. Efforts to protect the environment have resulted in restrictions on site locations and emissions and cap-and-trade economic incentives. These factors are interrelated and result in extreme challenges to the permitting process, resulting in delayed project approval and extremely high costs. All of which result in lost WTE opportunities and loss of investment money.

The Commission also found that WTE programs do not necessarily impact other waste management strategies, contrary to popular criticism.

The Commission noted that public acceptance of waste incineration in California is low even though emissions have been reduced over 90% since 2000. In stark contrast, Swedes appreciate the environmental costs associated with waste incineration, and they view it as a developing technology providing a temporary solution.

On February 8, 2022, Assembly Bill 1857 was introduced by Assemblywoman Cristina Garcia who represents residents near the Long Beach plant. AB1857 will remove the 10% diversion credit for municipal waste sent to incinerators and instead prioritize zero-waste policies. Assemblywoman Garcia's stated goal is to remove incineration as a practical option for waste management. If enacted, the proposed legislation would also support an integrated waste management plan, including building infrastructure to support recycling and organic waste reduction goals.

Assembly Bill 1857 was referred to the Committee on Natural Resources on February 18, 2022 and may be heard in committee as early as March 11, 2022. While environmental activist groups have made their support clear, formal opposition to the bill is currently uncertain. However, the director of the Long Beach Department of Energy Resources disputes claims that the facility creates significant pollution, and the City Manager's office has indicated that the plant's "future is under study".

The City of Beverly Hills 2021 Legislative Platform policies include (among others) combatting climate change, improving air quality, recycling in U.S. facilities, and fostering sustainability practices. Therefore, staff will be monitoring the analysis for this bill and respond when additional information becomes available.