



Colorado  
Legislative  
Council  
Staff

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MEMORANDUM

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August 12, 2008

**TO:** Senator Mike Kopp

**FROM:** Geoffrey Johnson, Research Associate, 303-866-4788

**SUBJECT:** Plasma Gasification of Municipal Solid Waste

This memorandum responds to your request for information concerning use of the plasma gasification process for the treatment of municipal solid waste (MSW). Specifically, you inquired about:

- any potential changes in permitting requirements that would be needed to locate such a plant in Colorado;
- proposed and operational plasma gasification plants for the processing of MSW;
- whether proposals for such plants have been challenged in U.S. federal or state courts on environmental grounds; and
- the position of the U.S. Environmental Protection Agency in regard to the use of this technology for treatment of MSW.

The memorandum provides background on the plasma gasification process and responds to your specific questions. A list of proposed and operational plasma gasification plants processing municipal solid waste is included as Table 1.

**Background**

*Plasma gasification process.* Plasma gasification is a waste treatment technology that uses high temperatures generated by an electrical arc "gasifier" to break down a feedstock (including MSW) into elemental gas and solid waste (slag).

In plasma gasification, high voltage electricity is passed between two electrodes in a "plasma torch" creating an electrical arc. Pressurized gas is passed through the arc of electricity creating an ionized gas called "plasma" which can reach temperatures as high as 25,000 degrees Fahrenheit. Since oxygen is not present, the waste is not burned. Instead, the waste is "gasified" (converted into mostly hydrogen gas and carbon monoxide) and "vitrified" (made into a glassy substance).<sup>1</sup>

The plasma torch separates the molecular bonds of waste producing "syngas." Inorganic compounds in the waste are converted to a hard, glassy substance called slag. The syngas is cleansed of harmful trace elements, and then burned to produce electricity. The electricity is used to operate the plant, and excess electricity is sold back to the grid. The slag produced can be used in asphalt or concrete, or converted to a type of rock wool and used for insulation.

Plasma gasification is intended to be a net generator of energy, and can reduce the volume of MSW sent to landfills. The processing of a ton of trash is estimated to yield 55.2 kilowatts of power.<sup>2</sup>

Proponents of plasma gasification of MSW argue that the process has the potential to reduce the MSW disposal problem in the United States while providing a new energy source. Plasma gasification is most likely to be financially viable in communities with high "tipping fees" (i.e. fees to dispose of waste in landfills). The process is expected to become increasingly financially viable as tipping fees increase, land costs for landfills become more expensive, and energy prices increase.

### **State Permitting Requirements**

A representative of the Colorado Department of Public Health and Environment said that the department is unable to state precisely which permits would be required for a plasma gasification plant to process MSW in the state. The representative noted that permitting requirements for such plants could vary depending on the specific proposal received by the department. The representative added that it is likely that any such proposals would require a solid waste disposal permit, a hazardous waste disposal permit, and an air quality permit, at a minimum. The representative also noted that the department has not permitted such a facility to date, and that the department will conduct research into any proposed plasma gasification technology submitted to determine permitting requirements.

The departmental representative said that the department does not anticipate that any statutory changes regarding the state's permitting processes would be necessary to accommodate construction of a plasma gasification plant for MSW treatment in Colorado.

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<sup>1</sup> Popular Science, *The Prophet of Garbage*, March, 2007

<sup>2</sup> Sun Energy Group, Inc.

***Legal challenges to plasma gasification plants on environmental grounds.*** You also asked if legal challenges have been filed against plasma gasification plants treating MSW on environmental grounds. A search of federal and state case law revealed no examples of environmentally driven lawsuits challenging the siting of plasma gasification plants treating MSW in the United States.

***Position of the United States Environmental Protection Agency on the use of plasma gasification for processing municipal solid waste.*** Staff was unable to obtain an official position of the Environmental Protection Agency regarding the potential for the use of plasma gasification technology to treat MSW; however, the following statement on this subject from the agency's Environmental Technologies Council was obtained:

*One of the technologies which potentially can use various types of waste, produce electricity and hydrogen without emitting dioxin, furan and mercury, is plasma arc technology. Municipalities can install a plasma arc facility which will eliminate land filling, and will safely dispose of animal waste; at the same time municipalities will potentially generate revenue from energy and hydrogen production. Types of challenges are: figuring out the technical and economic feasibility of using various types of waste for energy recovery and disposal; identifying types of various waste mixtures at appropriate proportions to have cost effectiveness; and identifying the commercial use (i.e., fuel cell) of hydrogen generated from the plasma arc.<sup>3</sup>*

### **Status of Plasma Gasification Plants**

Staff has identified proposals for plasma gasification plants for the treatment of MSW and operational plasma gasification plants in five states and five foreign countries. A list of these plants is included as Table 1.

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<sup>3</sup> Source: [http://www.epa.gov/etopetop/forum/problem/plasma\\_arc.html](http://www.epa.gov/etopetop/forum/problem/plasma_arc.html)

**Table 1  
Proposed and Operational Plasma Gasification Plants Processing Municipal Solid Waste**

Plant Location	Contractor	Total Megawatts Generated (projected)	Tons of Waste Processed Per Day (projected)	Status
St. Lucie County, Florida	Geoplasma	120 MW	1,000 to begin, increasing to 3,000	Startup expected winter, 2010
Tallahassee, Florida	Green Power Systems	30 MW	1,000	Startup expected October, 2010
New Orleans, Louisiana	Sun Energy Group LLC	138 MW	2,500	(Proposed)
Sacramento, California (proposed)	U.S. Science and Technology Corporation	Not Available	Not Available	The Sacramento City Council has voted to negotiate a contract.
Los Angeles County, California (proposed)	PlascoEnergy Group	Not Available	Not Available	Plasco is pursuing a City of Los Angeles bid for a new waste treatment facility.
Hawaii	Geoplasma LLC	Not Available	250	Startup expected prior to June, 2013 (\$100 million in tax-exempt revenue bonds have been approved by the state.
International Falls, Minnesota	Coronal, LLC	Not Available	100	Permitting expected mid-2008.
Utashinai, Japan	Hitachi Metals	8 MW	300	Startup in 2003
Mihama-Mikata, Japan	Hitachi Metals	Not Available	28	Startup in 2003
Ottawa, Ontario, Canada	PlascoEnergy Group demonstration project	4 MW	85	Began operations in July, 2007
Ottawa, Ontario, Canada (proposed)	PlascoEnergy Group	21 MW	400	The project is in the permitting process, to be followed by an 18-month construction period.

**Table 1  
Proposed and Operational Plasma Gasification Plants Processing Municipal Solid Waste (Cont.)**

<b>Plant Location</b>	<b>Contractor</b>	<b>Total Megawatts Generated (projected)</b>	<b>Tons of Waste Processed Per Day (projected)</b>	<b>Status</b>
Port Moody, British Columbia, Canada (proposed)	PlascoEnergy Group	Not Available	approx. 400	The city has signed a letter of intent with Plasco.
Faringdon Oxfordshire, United Kingdom (Test facility)	Advanced Plasma Power	Not Available	Not Available	The test facility operational.
Swindon, Wiltshire, United Kingdom (Test facility)	Advanced Plasma Power	Not Available	Not Available	The test facility operational.
Orastie, Romania	Environmental Energy Resources, Ltd. (EER)	Not Available	approx. 84	A memorandum of understanding between EER and the city was signed in December, 2007.
Yblin, Israel (demonstration facility)	Environmental Energy Resources, Ltd.	Not Available	approx. 13	A demonstration facility is operational.

Sources: <http://www.westinghouse-plasma.com>, <http://www.plascoenergygroup.com>, <http://www.advancedplasmagroup.com>, and <http://www.eer-pgm.com>.

