

# CARIBEX, INC.

## WASTE TO ENERGY

*The dream machine for municipalities everywhere*



*One technology 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 ..." – EPA*

By

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Caribex Inc is offering to cities and municipalities worldwide the Westinghouse Plasma gasification technology, which can be installed in a plant wherein a wide variety of waste materials can be converted to useful and inexpensive electricity.

Caribex Inc is prepared to offer a simple and workable solution that can solve two problems. By building a Plasma torch gasification plant, any city can begin eliminating the mountains of waste materials that are presently being trucked daily into an unsightly and polluting landfills. The plant can instead turn this costly, dangerous and unproductive waste into affordable electric power.

How does this work? We typically establish a PPC, ( Public Private Corporation) that will finance and construct the plant. The size of the plant, meaning its capacity and output are designed proportionately to the needs of the city. We have available 100% financing plans that have survived the world's present credit problems. We will cooperate with any local corporation or company to present the waste to energy concept to ant municipal or federal government. We are an inclusive company interested in advancing this amazing technology we are open to working in any way that accommodates the interests of all parties.

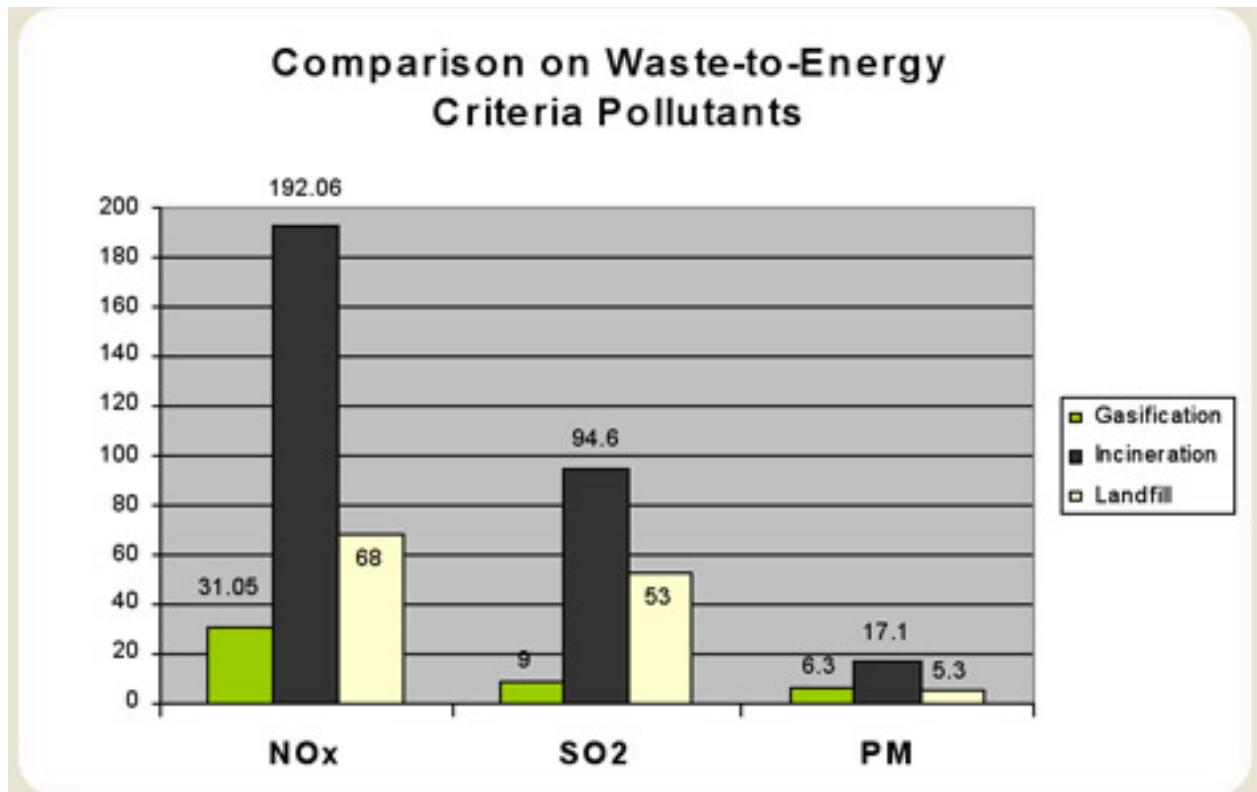
Generally, the municipality, as the public entity, provides the land, approximately 10 to 15 acres, and Caribex in cooperation with their local partner will construct the plant **entirely with private funding** without using or requiring local funding/

**What's the catch**, what would the plant require in return? There are only two requirements. The local electric company(s), either individually or collectively, must agree to purchase the generated electricity fed into the local grid by the plant at a price approximately of .8 ½ cents per KW. The plant, which will be 100% financed by private lenders, will assume a 20-year mortgage of approximately \$100 million USD. The servicing of this debt, in addition to the cost of maintenance and labor, etc., is entirely paid for by the sale of the electricity along with a "tipping fee" for each truck delivering waste materials to the pant. These two sources' of revenue are set so as to provide for 100% of the overheads and an operating profit.

The advantages to the city and municipal government are immediately apparent. The plant will provide full time employment for approximately 140 workers including the technical and managerial staff. During the 12 to 16 months of construction, contracts will be provided to as many local vendors and service companies as possible. For example, all those materials that are available will be purchased from local vendors. The PPC (Private Public Corporation) will employ civil works contractors, mechanical engineers, electrical installation companies, etc., so as to put as much of the construction costs back into the community as possible.

Once the plant is in full operation the materials from the existing land fill can be delivered to the plant on a 24/ 7 basis to be converted to useful power- this is in addition to servicing the daily supply of waste generated by the city. Over time, the land fill can be reduced and the land restored to its original state and possibly sold to a developer.

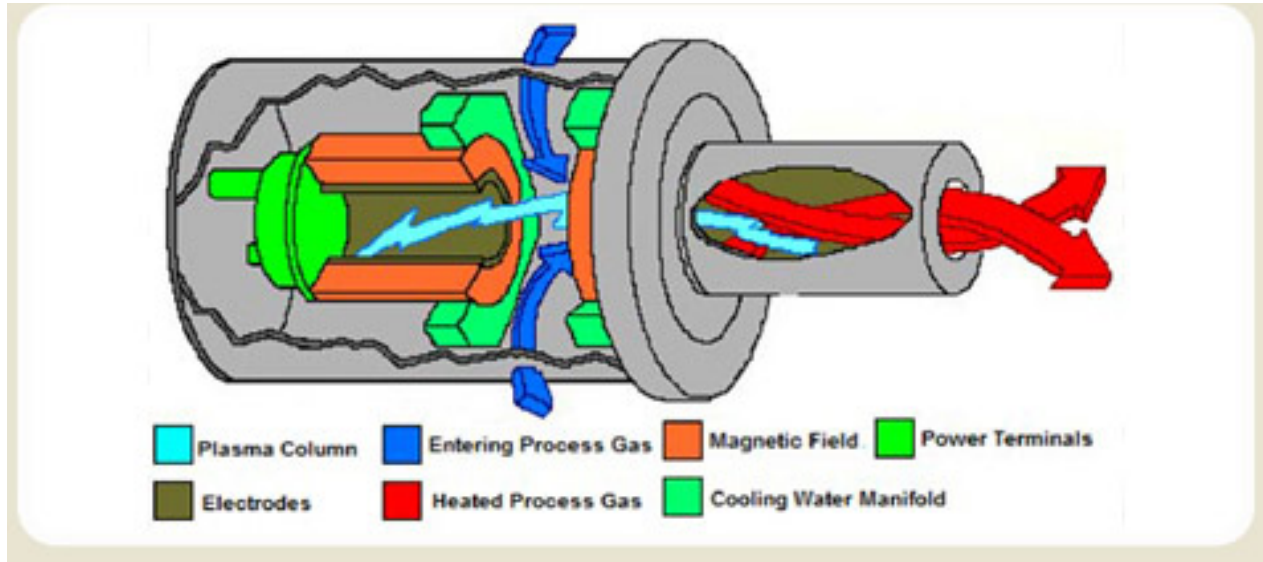
Is the technology environmentally friendly? The Westinghouse waste to energy plant produces almost no harmful by-products at all. It is the cleanest possible technology.



## What is Plasma Gasification?

Plasma, often referred to as the “fourth state of matter”, is the term given to a gas that has become ionized. An ionized gas is one where the atoms of the gas have lost one or more electrons and have become electrically charged. The sun and lightning are examples of plasma in nature. Man made Plasma is formed by passing an electrical discharge through a gas such as air or oxygen. The interaction of the electric discharge and the process gas causes the temperature of the gas to increase significantly often exceeding 5,500°C (10,000°F), nearly as hot as the sun’s surface.

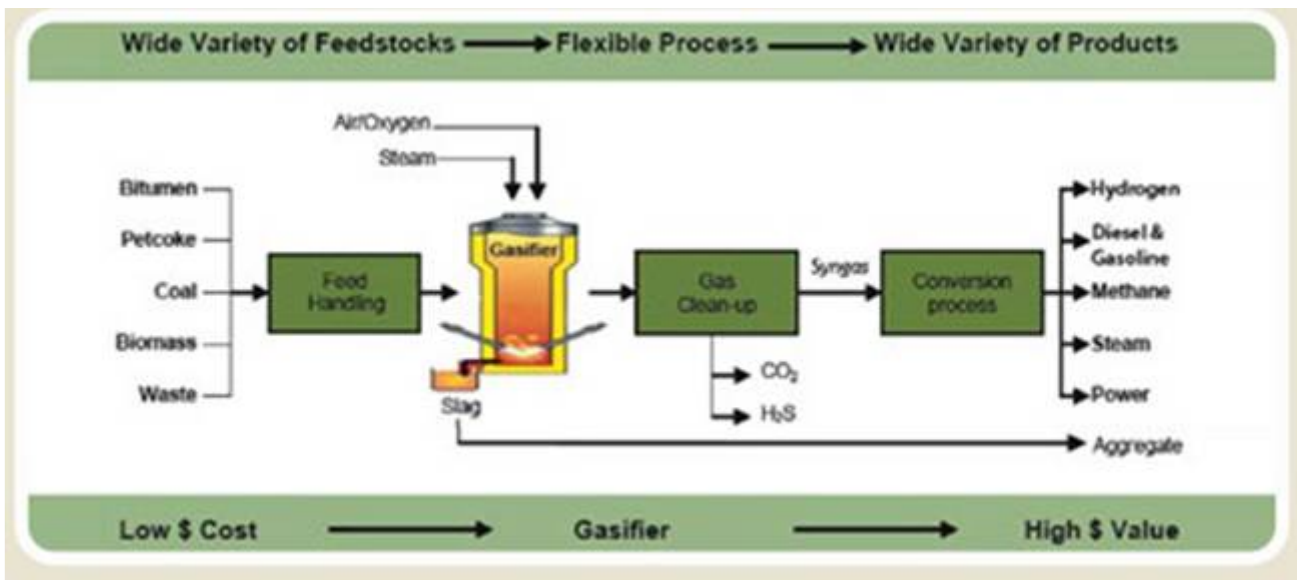
WPC’s plasma torches can be fed with process gases of widely varying chemical composition including air, oxygen, nitrogen, argon and others. This flexibility allows WPC to tailor the plasma torch system to best fit our customers’ needs. WPC’s plasma technology can increase the energy of the process gas to between two to ten times higher than conventional combustion.

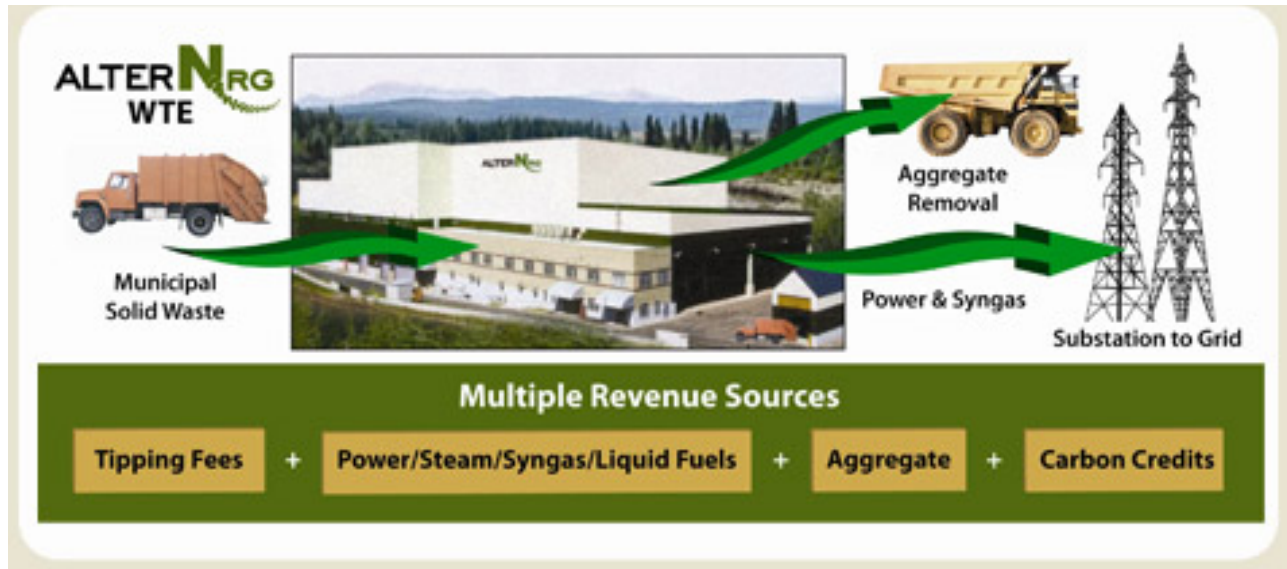


## Plasma Gasification

Gasification is a process that converts carbon-containing materials, such as coal, petroleum coke, municipal solid waste, or biomass, into a synthesis gas, (syngas), composed primarily of carbon monoxide and hydrogen.

Gasification occurs when a carbon-containing feedstock is exposed to elevated temperatures and/or pressures in the presence of controlled amounts of oxygen. Syngas can be used as a fuel to generate electricity or steam or it can be used as a basic chemical building block in the production of high value energy products such as diesel or electricity.





*Imagine if your city could eliminate the mountains of wasted land used for landfills. Imagine if the cost of collecting the waste ( of all kinds) could be converted to electricity?*

**Waste-to-Energy: converting waste material such as municipal solid waste, wood waste, tires, electronic waste and industrial waste into clean energy products like power and liquid fuels.**

## Energy Production

WPC Plasma Technology provides a uniquely flexible process for the conversion of opportunity fuels, such as, Municipal Waste, coal, petroleum coke and biomass, into synthesis gas 'syngas' that can be transformed into a variety of energy products including electricity, transportation fuels and many others using readily available technologies.

*"Power generation with Plasma Gasification reduces emissions far below conventional coal plants."*

WPC Plasma Gasification technology and its plasma torch systems when compared to incineration or traditional gasification offer the following benefits:

Feedstock Flexible	Ease of Operation	Environmental Benefits	Flexible Product Delivery
A wide range of opportunity fuels can be accepted with limited preprocessing requirements	The Gasification Reactor Operates at ambient pressures allowing for simple feed system and online maintenance of the plasma torches	Operation is environmentally responsible creating a syngas with very low quantities of NO <sub>x</sub> , SO <sub>x</sub> , Dioxins and Furans	Syngas composition (H <sub>2</sub> to CO ratio, N <sub>2</sub> ) can be matched to downstream Process equipment by selection of oxidant and torch power consumption
Multiple Feedstocks can be combined	Plasma Torches have no moving parts resulting in high reliability. Torch consumables are quickly replaced off line by plant maintenance personnel	Inorganic components get converted to glassy slag safe for use as a construction aggregate	Multiple gasification reactors are used for larger projects increasing availability of the gasification system
<b>Difficult fuels such as Tires and Municipal Solid Waste can be easily treated</b>	Plasma power can be easily adjusted to match the gasification process requirements	<b>Air can be used as an oxidant eliminating the need for added capital and operational costs required for air separation plants</b>	

## **WPC Plasma Advantages**

WPC's plasma torch technology, which has been in development for over 30 years, is a high efficiency process heating device designed to operate with minimal maintenance in an industrial environment. The WPC plasma torch provides an inherent level of flexibility over combustion burners as it allows control over temperature, independent of fuel or oxygen throughput in the process. In general, the greater the temperature difference between the heat source and the material to be heated, the faster it can be processed

### **The benefits of WPC plasma torches include:**

- High reliability – over 500,000 hours in commercial operation
- Proven commercially in the world's largest plasma gasification facility
- Availability in a wide range of power inputs from 80 to 2,400 kW
- Power input can be quickly adjusted to match process requirements.

Did you know?

The largest plasma gasification facility in the world was developed by Hitachi Metals Ltd. in Utashinai, Japan using the WPC technology. This facility has been treating 200-280 tpd of MSW and auto shredder residue since early 2003.

Plasma gasification represents a clean and efficient option to manage waste in an environmentally responsible manner. The WPC plasma gasification technology is ideally suited to process waste such as Municipal Solid Waste, common hazardous waste, industrial waste, chemical waste, sediment sludge and biomass. As well as, it can also vitrify fly ash from incinerators and any other types of ash. Converting waste into various energy outputs or power reduces our reliance on the use of conventional fossil based fuels by using readily available waste.

- WPC has experience in treating difficult waste materials including:
- Common Hazardous Waste
- River and Harbor Sediment
- Chemicals Destruction
- Spent Catalyst Recovery

### **Incineration Plasma Gasification**

Oxidation completed using excess air to form CO<sub>2</sub> Gasification completed using partial oxidation and water shift reaction to form mainly H<sub>2</sub> & CO

Yields bottom ash requiring disposal in special landfills. Yields an inert vitreous slag suitable for aggregate use.

Yields hazardous fly ash that requires alternate disposal or treatment. Fly ash combined with molten slag and rendered inert.

Limited to steam cycle power generation with a typical thermal efficiency of 15% from input. Ability to run steam cycle, combined cycle or produce transportation fuels depending on configuration allowing for higher thermal efficiencies. In addition, WPC gasification offers the ability to sequester CO, H<sub>2</sub> or CO<sub>2</sub> for chemical industry use.

**Plasma gasification also offers a means of achieving the high temperatures required for the safe destruction of many hazardous and toxic wastes. Materials, such as PCBs, dioxins, DDT, furans, halogenated hydrocarbons, as well as military chemical agents, pose serious problems to the environment and to the public.**

Facilities employing a plasma process for the destruction of such materials have resulted in safe disposals with emissions below regulatory requirements. **Plasma gasification of typical hazardous waste generates almost eight to ten times as much energy per unit of waste than the energy required to destroy the waste.** As well, compared to conventional waste management strategies, plasma gasification is able to recover more energy from residual waste and also recycle all the solid by-products of the remaining residue.

### **Commercially Proven**

Commercial applications have been in operation in Japan since 2002. The Eco-Valley plant in Utashinai, Japan, which Hitachi Metals, Ltd. partially owns and fully operates, uses WPC technology. **Eco-Valley transforms up to 280 tons per day (tpd) of MSW and auto shredder residue into steam and electricity.** The Eco-Valley facility currently provides 1.5 MW of net electricity output to the grid. Maximizing power output isn't the primary objective of the Eco-Valley facility, and **if the plant was designed to optimize power output using a combined cycle mode, it could produce up to 12.0 MW.** Hitachi Metals also commissioned a facility between the towns of Mihama and Mikata in Japan that processes 20 tpd of MSW and four tons per day of sewage sludge. Both Japanese facilities meet all environmental regulatory requirements including extremely low levels of dioxins and furans.

Mihama-Mikata, Japan — MSW to Energy Facility Plasma gasification is commercially proven and viable, while also meeting all current regulatory requirements. Plasma gasification is positioned to take hold as a practical, economical and environmentally responsible alternative to conventional forms of waste disposal and power generation.

### **Frequently Asked Questions**

How does Plasma Gasification's energy output compare to conventional conversion processes?

**A further advantage of the plasma gasification process is its ability to unlock the greatest amount of energy from waste.** As compared to landfill gas capture, (where facilities capture landfill methane emissions and combust the gas for energy), the power output from plasma gasification is close to four times greater.

### **What is the conversion output rate of Municipal Solid Waste?**

The conversion of 1,000 tons of MSW is equivalent to producing one barrel of oil.

### **What are environmental operational benefits of a WTE facility?**

Operation of a plasma gasification WTE facility avoids:

the release of methane that otherwise would be emitted when trash decomposes in landfills, as well as

the displacement of CO<sub>2</sub> that would have been emitted had the electricity been generated from fossil fuels such as coal.

### **What are the advantages of a plasma gasification WTE facility over incineration?**

Provide a new cost effective means of producing synthesis gas (syngas) and steam to generate electricity and other forms of energy, while reducing greenhouse gas emissions.

Incineration creates bottom ash and fly ash, which is considered a hazardous waste which requires additional treatment or disposal in special landfills. The high temperature of the plasma gasification converts all inorganic material to a molten slag which, after cooling, can be used as construction aggregate roadbed material.

### **What are the advantages of a WTE facility over landfills?**

Can reclaim land by eliminating or minimizing landfills.

Compared to landfills a plasma gasification WTE facility has a smaller greenhouse gas footprint and harmful air emissions are virtually eliminated.

Will eliminate the release of methane that would otherwise be emitted when trash decomposes in landfills. According to Environmental Canada, methane is estimated to have a global warming effect 23 times greater than carbon dioxide.

## Overview

### Did you know?

Westinghouse Plasma Corporation's plasma torches have more than 500,000 hours of operation in tough industrial settings.

Westinghouse Plasma Corporation's plasma torch systems are proven in metallurgical and waste-to-energy commercial applications. In Japan, WPC Plasma gasification system has been used to process MSW for more than five years. Plasma torches have also been used in cast iron foundry melting at a General Motors plant in Defiance, Ohio since 1989.

Date	Customer	Location	Process
1989	General Motors	Defiance, Ohio, USA	Metallurgical
1992	ALCAN	Jonquire, Quebec Canada	Metallurgical
1995	Ishikawajima-Harima Heavy Industries	Kinuura, Japan	Ash Vitrification
1999	Hitachi Metals, Ltd.	Yoshii, Japan	Waste Treatment & Energy Processing Demo Facility
2002	Hitachi Metals, Ltd.	Mihama-Mikata, Japan	Waste Processing & Energy Production
2002	Hitachi Metals, Ltd.	Utashinai, Japan	Waste Processing & Energy Production
2008* Expected Startup	SMS Infrastructure, Ltd.	Nagpur, India	Waste Processing
2008* Expected Startup	SMS Infrastructure, Ltd.	Pune, India	Waste Processing

## **WESTINGHOUSE TECHNOLOGY**

Relying on over 30 years of experience in the application of plasma technology, Westinghouse Plasma Corporation (WPC) is focused on applying innovative applications using plasma for:

- **environmentally responsible energy production,**
- **waste processing and**
- **metallurgical and chemical processing solutions.**

Our experience, including over 24 patents relating to the plasma torch, plasma torch systems and process design, allows us to meet the needs of both research and development for industrial applications in various markets. This Technology is:

- Commercially Proven
- Robust and Reliable
- Versatile and Flexible
- Environmentally Responsible

## **SUMMARY**

### **What do we do now, how to proceed?**

Let us know if you wish to advance this project. We can arrange a tour of an existing plant and will prepare a detailed business plan indicating all facets of the project including five year financial projections covering reflecting the overheads and expected revenues. Once the project has been decided upon, Caribex Inc., together with its local partner, will initiate the process on the site submitted by the municipality. Plans will be submitted and the property surveyed. At this time meetings will be initiated with the electric power companies and the waste delivery management to create the working agreements between the parties.

Once the project has been planned and the revenue sources have agreed to the terms, contracts will be let to the most capable construction firms and the actual plant will take shape. Expert guidance will be on hand from Westinghouse for each step of the development. Before the plant becomes operational temporary highly experienced and skilled management and operational teams will be on site to initiate the educational process for local workers and management. These will be formal classes requiring several months and will include hands- on experience once the plant becomes fully functional. After typically 5 months, the local staff will fully take over the plant operations.

The generation of revenues will commence immediately the first truck of waste is delivered and the first KW of power is transmitted to the local grid. The operation of the plant is 100% governed by highly functional computer software programs that generate automatically invoicing for every truck entering the plant and tracking the output of each KW of power. The operational control room is entirely modern in every respect.

**For more information please contact:**

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