Westinghouse Plasma Gasifier
Tees Valley 1 (TV1) Site in Tees Valley, UK

» AP: Tees Valley Projects
» GE: Gas Turbines Refueling

» GTS: Grand Opening
» GES: Environmental Approval
Westinghouse Plasma Corp (WPC), provides alternative energy solutions that meet the growing demand for environmentally responsible and economically viable energy in world markets. We are working to replace landfills with the most energy efficient and environmentally sustainable waste to energy solutions.
Westinghouse Plasma Technology is at the center of two facilities in Tees Valley, northern England. TV1 has completed construction and is planned to be in commercial operation in early 2015.

The ground breaking ceremony for TV2 was carried out in April 2014 by Francis Maude MP, Minister for the Cabinet Office. The TV2 facility is expected to come on-stream in 2016. These pictures illustrate the significant progress and activity on the site since it began active construction in 2012.

The operation of the Tees Valley #1 project will demonstrate:

**Commercial scale volumes of syngas from waste:**
- 950 tpd of feedstock will produce ~3 Million MMBtu/year of syngas
- 50 MW electrical, base load production of energy
- Equivalent production to 800-1000 Bbls/day of biofuels

**Syngas will be consistently produced at the required specification:**
To ensure reliability the syngas must consistently meet the fuel specification of the gas turbine
Gas turbine syngas specification is similar to liquids conversion technology syngas specification

**Ability to create low cost syngas from feedstock’s that you get paid to process:**
Tipping fee revenues cover the operating cost of making clean syngas
IMPACT for Alter NRG: The scale of these projects enhances Alter NRG’s substantial lead in the plasma gasification industry.

IMPACT for the World: One step closer to making traditional landfills obsolete; clean renewable power is a reality.

Impact for Future Clients: The Westinghouse Plasma Technology is commercial at a scale that provides meaningful energy output and associated cashflow.
Hazardous Waste Facility

GTS Energy held a grand-opening of its hazardous waste destruction facility in March 2014. This is an important facility as it is turn-key and can be replicated and sold in many areas of the world.

This turn-key solution includes the Westinghouse Plasma Technology as the core technology. Under the recent joint development and marketing agreement, Alter NRG has the opportunity to sell these turn-key units worldwide.

Since the grand opening, multiple companies from China and Europe have been to the commercial demonstration which illustrates the encouraging market potential of this joint solution.
We have created an economic and environmentally sustainable hazardous waste solution

The Westinghouse Plasma Gasification solution effectively processes hazardous waste and incinerator fly ash to produce an energy rich synthesis gas (syngas). In this configuration, the syngas generated by the plasma gasifier is immediately combusted, and used to create pressurized steam that is utilized by an existing steam turbine to create power.

Project Cost: US$ 15-20 million

- Pricing is indicative without project specific engineering and does not include any applicable taxes
- Pricing reflects the total installed cost of the system
- Pricing based on 30 tonnes per day (tpd) capacity of hazardous waste feedstock

Indicative Project Execution Schedule

- The timeline from start of engineering to start up is estimated at 12 months. This schedule is subject to change based on local construction conditions, etc.

Project Economics and Investment Return Analysis

Assumptions (table on right):

- 25 year project life
- 330 operating days per year
- Tipping fees of US$ 500/t
- Power price of US$ 0.09/kWh
- Steam sale US$ 10/GJ

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount in US$ (Millions)</th>
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<tbody>
<tr>
<td>Total installed capital cost</td>
<td>18</td>
</tr>
<tr>
<td>Total revenue</td>
<td>8</td>
</tr>
<tr>
<td>Total operating cost</td>
<td>4</td>
</tr>
<tr>
<td>EBITDA</td>
<td>4</td>
</tr>
<tr>
<td>IRR</td>
<td>20%</td>
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</table>

“In these three years, we have cooperated very successfully and constructed a 30 tonne/day medical and hazardous waste plasma gasification treatment system in Shanghai, China. This is the first time in China that advanced plasma technology has been utilized on a large commercial scale, and our system has been highly acclaimed by industry experts and the Chinese government. The medical and hazardous waste treatment industry is an immense domestic and international market with an incredibly bright future for our continued development. I would like to acknowledge and express my sincere appreciation towards Alter NRG/Westinghouse Plasma for their contribution and support of advanced plasma technology. GTS Energy will continue to use all resources, knowledge and 30 plus years of industry experience, which spans over 300 large scale energy projects all over the world, to strengthen this partnership and future ventures.”

– Naicheng Zhou, President, GTS Energy
The Plasma gasification system includes eight subsystems as follows:

- Feed system
- Plasma gasification system
- Plasma torch system
- Heat recovery system
- After burner syngas combustion system and water quench
- Exhaust treatment system
- Electronic control system
- Auxiliary systems

30 tonnes per day (tpd) Hazardous Waste-to-Steam Facility
GREENWORLD ENERGY, CHINA

Environmental Approvals in hand

The Guizhou Provincial Environmental Protection Bureau approves the Environmental Assessment for China’s first Plasma Gasification Facility.

In November 2014, US Green Energy Development Co., Ltd. (GES), received the environmental assessment approval from the Government of Guizhou and the Provincial Environmental Protection Office. The Plasma Gasification waste treatment facility will be located in Bijie City, Qixingguan under the District Garbage Utilization Demonstration Project.

After the initial start-up, expected in late 2016, GES referred to as Bijie City Green Environmental Energy Limited (BGE) intends to double the capacity of the facility with a second gasifier and also has many additional projects in Southern China under development.

“We are very excited to be kicking-off our first project in China which we believe provides the best-in-class waste management solution with better environmental performance compared to other alternatives. In addition to the Bijie project, BGE has additional projects in China which it also continues to advance. This project will also provide a testing platform for clean coal applications. We believe that the Westinghouse Plasma Gasification Technology will play a significant role in China Clean Coal Applications.”

– Jeffery Hu, Principal, BGE

IMPACT for Alter NRG: GES has additional projects under development in Guizhou Province and other areas in China.

IMPACT for the World: Westinghouse Plasma Gasification solution has multiple applications, including clean coal.

Impact for Future Clients: Westinghouse Plasma technology will improve both project returns and environmental performance.
Refueling GE Gas Turbines with Westinghouse Plasma Syngas

Our Westinghouse Plasma gasifier has the ability to transform 330,000 tonnes per year of waste into 650,000 barrels per year of equivalent energy that can be used to displace higher cost fossil fuels. To capitalize on this opportunity, we are working with GE, who has thousands of gas turbines deployed in target areas around the world. The results of a recently completed feasibility study, confirmed that Westinghouse Plasma gasification syngas is suitable for GE’s B, E, and F class turbines.

The two questions that were answered during the GE study were:

1). Can the GE turbines operate on Westinghouse Plasma gasification syngas?
2). Will the performance of the gas turbines be negatively affected by syngas?

In all cases, the study confirmed that the Westinghouse Plasma gasification syngas is suitable for GE’s B, E, and F class turbines.

Currently, there are over 5,000 6, 7, and 9 series GE gas turbines operating globally that are a potential target for fuel replacement.

“GE simulated performance of a 6B.03, 7E.03, 7F.04 and a 9F.03 operating on a fuel blend composed of natural gas and syngas generated from a Westinghouse Plasma gasification system. In all cases the Westinghouse syngas was found suitable for the GE turbines in either a blend or full load scenario.”

- Jeffrey Goldmeer,
  Gas Turbine Fuel Flexibility Manager (GE Power & Water)
The Westinghouse Plasma Gasification technology is capable of processing a variety of waste materials to generate a commodity grade syngas, that can be utilized in GE turbines to displace high cost fossil fuels.

Our marketing strategy focuses on two groups:

1). Importers/consumers of high cost fuels (natural gas, oil, LNG) for the production of power. The chart (bottom left) shows the October LNG prices and illustrates the high cost of energy in many areas of the world.

2). Countries/customers that utilize native fossil fuel for the production of subsidized power (e.g. Saudi Arabia):

These countries could refine the heavy oil and sell to the international market.

The chart (on left) shows the impact of syngas operation on the capacity of GE gas turbines. In each case, the syngas created from the Westinghouse Plasma Technology may create additional power from the same unit when compared to natural gas at ISO conditions. The Westinghouse Plasma Solution provides a significantly lower cost of energy as well as increased power output.

Walter Howard (CEO, Alter NRG) and Jeff Goldmeer (GE), jointly presented at the Power-Gen Middle East Conference, held in Abu Dhabi, UAE, from October 12-14, 2014 (photo below).
Alter NRG hosted this year’s open house event in Tees Valley, Northern England. A firsthand view of this flagship facility allowed participants to truly understand the scale and complexity of our Westinghouse Plasma Gasification Solution. The facility reflects our commercial momentum and dedication to playing a vital role in the energy advancements of the 21st century. We appreciate Air Product’s support in providing an overview and answering questions regarding the overall facility.
Guest Speakers at the Open House:

**Presenter: Lisa Jordan, Business Manager, Bioenergy Europe**
Air Products & Chemicals Inc. (Air Products), a Fortune 500 company recognized for its innovative culture, operational excellence and commitment to safety and the environment. Lisa presented the two facilities currently under construction and discussed future business developments efforts in the energy from waste market.
www.airproducts.co.uk, www.airproducts.com

**Presenter: Matt Cook, Global Technology Leader**
Foster Wheeler Ltd. (Foster Wheeler), is a leading international engineering, construction and project management contractor and power equipment supplier. Matt presented their learnings and role during the Tees Valley projects as well as other projects they are supporting using the Westinghouse Plasma Technology.
www.fwc.com

**Presenter: Jeffrey Hu, President**
GreenWorld Energy Solutions, (GES) is referred to as Bijie City Green Environmental Energy Limited, is a structured solutions provider to the waste to energy sector in Southern China. Jeffrey presented details of their first project in Bijie, China and another dozen projects they intend to build in the coming years.
www.ges.org.cn

We thank the speakers who presented at the open house for their continued support including Air Products, Foster Wheeler, Cahill Energy, GreenWorld Energy Solutions Corp, and GTS Energy Technology (Shanghai) Ltd.

**Presenters: Naicheng Zhou, General Manager and Dean Mao, Deputy General Manager**
GTS Energy, designs and manufactures a wide range of energy systems for industrial applications worldwide. Alter NRG and GTS Energy have signed a joint development and marketing agreement for its turnkey and small scale waste destruction solution. Naicheng presented details on their reference facility which has been commissioned and their future plans.
www.gtsenergy.com.cn
Open House in Photos

Delegation and guests from China including GTS and GES

Delegation and guests from Brazil

Alter NRG Team at the Open House 2014
Guests taking in a complete view of the Westinghouse Plasma Gasifier

Listening to AP’s Duncan Snelling’s overview on the bus

Networking at the reception

Alter NRG team undertaking Q&A at the Open House

Networking at breakfast

Guests enjoying the reception
## Alter NRG: Conferences 2014

<table>
<thead>
<tr>
<th>Conference</th>
<th>Date</th>
<th>Location</th>
<th>Alter NRG Attendees</th>
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</thead>
<tbody>
<tr>
<td>MSW to Biofuels and Bio-products Event</td>
<td>October 6-7</td>
<td>Orlando, FL, U.S.A.</td>
<td>Alex Gorodetsky</td>
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<tr>
<td>Power Gen Middle East</td>
<td>October 12-14</td>
<td>Abu Dhabi, U.A.E.</td>
<td>Walt Howard and Jeffery Goldmeer (GE) to co-present; Mark Wright, Bruce Leonard</td>
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<tr>
<td>All Energy Australia</td>
<td>October 15-16</td>
<td>Melbourne, Australia</td>
<td>Richard Fish</td>
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<tr>
<td>SGC International Gasification Seminar</td>
<td>October 15-16</td>
<td>Malmö, Sweden</td>
<td>Kevin Willerton</td>
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<td>Export Development Canada (EDC) and IFC, a member of</td>
<td>October 24-28</td>
<td>Hong Kong</td>
<td>Richard Fish, Danny Hay</td>
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<td>the World Bank Group</td>
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<tr>
<td>GTC Gasification Technologies</td>
<td>October 26-29</td>
<td>Washington, DC, U.S.A.</td>
<td>Walter Howard, Richard Fish, Alex Gorodetsky, Bruce Leonard</td>
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<tr>
<td>Alter NRG and GTS Open House</td>
<td>November 18-19</td>
<td>Shanghai, China</td>
<td>Mark Wright, Ken Willis, Bruce Leonard, Alex Gorodetsky</td>
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<td>LD Micro</td>
<td>December 2-4</td>
<td>LA, San Francisco, U.S.A</td>
<td>Walter Howard</td>
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<tr>
<td>ROTH New Industrials Corporate Access Day</td>
<td>December 16</td>
<td>New York, NY, U.S.A.</td>
<td>Danny Hay</td>
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Walter Howard (CEO of Alter NRG) and Richard Fish (President of Alter NRG) attended the Nanjing Mayor’s International Consultative Conference, held in Nanjing, China on September 23, 2014.

Walter Howard making a presentation to government officials.

Richard Fish at the banquet.

The Mayor of Nanjing, Ruilin Miao (front row, center), Walter Howard (second row, second from left side) and Richard Fish (top row, second from right).
Westinghouse Plasma President, Richard Fish, joins the panel discussion on Waste-to-energy at the International Finance Corporation Forum, held in Hong Kong, from October 28-29, 2014.

Richard Fish (President of Alter NRG - second from right), at the EDC / IFC discussion forum presenting the company’s projects and technology overview.
Alter NRG and GTS Energy jointly hosted their Open House in Shanghai China from November 18-19, 2014, showcasing their Turnkey Hazardous Waste Solution utilizing the world class Westinghouse Plasma Gasification technology. Over 60 participants were invited to learn from industry experts and meet our key executives and some current customers.
Alter NRG: Awards

Alter NRG was honored with the IAIR Corporate award for Best Company for Leadership in Clean Technology. The IAIR awards recognize excellence in global economy and sustainability. Winners were chosen based on IAIR readers’ votes, including business and financial journalists in 120 countries, and selection by the editorial staff.

In addition Alter NRG’s CEO, Walter Howard, won the Roy F. Weston Award from the Journal of Solid Waste Technology and Management. The Roy F. Weston award was established in 1985 to acknowledge significant individual contributions to the field of industrial waste management. The Journal of Solid Waste Technology and Management is an international peer-reviewed journal covering landfill, recycling, waste-to-energy, waste reduction, policy and economics, composting, waste collection and transfer, municipal waste, industrial waste, residual waste and other waste management and technology subjects.

About:
- IAIR AWARDS® (www.iairawards.com)
- Roy Weston Award (www.pwea.org/awards)

Walter Howard (CEO, Alter NRG), receiving the Roy F. Weston award
Alter NRG provides clean energy solutions that are economically viable and environmentally sustainable.

Westinghouse Plasma is the industry leading plasma gasification technology that provides clean and renewable energy solutions by converting all types of waste and biomass into high value energy - like electricity, ethanol or syngas. With plasma systems in operation for 20 years and converting waste into energy since 2002, the technology is commercially proven and produces lower emissions than other conventional energy technologies.