SPOTLIGHT ON:
Delivering the World’s Largest Plasma Gasifier

- Alter NRG has reached the Tipping Point
- Air Products: Tees Valley Project 2, UK
- Waste2Tricity: Concept Design Study & Expansion Plans
- Commissioning of Waste to Liquids Facility, China
- Westinghouse Plasma Gasification Market and Torches Applications
For our 7th edition of NRG Focus we will continue to bring clarity to the experiences and activities that help optimize our Westinghouse Plasma gasification technology. In this issue, we will provide updates on the world’s largest gasifier, Tees Valley project 2, waste to energy concept design, market and torch applications among others.

Please read on and we hope you enjoy this latest edition of NRG Focus.

From the team at Alter NRG
Alter NRG has reached the Tipping Point

Tipping Point – “The critical point in a situation, process, or system beyond which a significant and often unstoppable effect or change takes place”. - Merriam Webster Dictionary

Tipping Point – “the point at which a dominant technology or player defines the standard for an industry resulting in ‘winner-take-all’ economies of scale and scope”. - Wikipedia

Alter NRG has the dominant plasma conversion technology. Through a more than 20 year evolution of technology development, numerous reference facilities, and expanded product design the tipping point has been reached. During the year 2012 Alter NRG achieved some very significant commercial milestones positioning the company for exceptional growth in 2013.

- Validation of the Westinghouse Plasma Gasification Solution by a well-respected Fortune 500 Company, Air Products and Chemicals, Inc. (“Air Products”), which has a facility under construction and their second facility at the planning permission stage in the United Kingdom.
- Scale-up of the existing reference facilities to a 950 tonne per day project which will produce 50MW of electricity. This is enough electricity to power 50,000 homes.
- Utilization of a combined cycle configuration which provides greater energy efficiency compared to incineration or other advanced energy technologies.
- Commissioning of the Westinghouse Plasma Gasification unit at a demonstration facility taking biomass waste to liquid fuels. This is a major step to unlocking further value from the syngas, converting into a higher price commodity.

Through decades of innovation by the engineers and scientist of the Westinghouse Plasma Corporation, Alter NRG has evolved to a tipping point that allows plasma conversion technology to be commercially viable on a much larger scale. Our commercial history is a testament to the utility of the Westinghouse Plasma solution. It marks the result of a next generation technology that converts waste into numerous forms of energy in a more efficient and environmentally friendly manner.
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Air Products for the Tees Valley Project 1, UK

Air Products will operate the world’s largest renewable energy plant in the UK using the Westinghouse Plasma gasification energy-from-waste (EfW) technology owned by Alter NRG Corp.

The scale-up of our existing gasification solution to 1000 tonnes per day of municipal solid waste, and converting it to 50MW of power, is significantly larger than any plasma competitor in the market. Alter NRG has completed approximately 79% of the $20 million purchase order from the US based Fortune 500 Company. This includes delivery of the fabricated gasifier in full progress and current construction activities since the summer of 2012.

- Commissioning 2014
- Utilizing combined cycle power configuration
- 65,000 NM3 per hour of syngas, enough to produce 50MW electricity, or 1,000 barrels per day of liquid fuel

The gasifier is the heart of the operation where waste is gasified under extreme temperatures to create syngas then undergoes a clean-up process to make it suitable for the conversion of energy. For the purpose of the Tees Valley Project, where municipal solid waste is the feedstock, the conversion process is tailored to generate power.

This project is a clear indication of Alter NRG Corp’s ability to provide energy solutions offering an environmentally friendly turnaround in power production on a global scale.
Westinghouse Plasma gasifier fabrication is complete for the world’s largest plasma gasification project, taking 950 tonnes per day of waste to create 50 MW of electricity. The gasifier is currently en-route to the Air Products project site in Tees Valley, UK.
Air Products and the UK Government have entered a Power Purchase Agreement for energy generated from their second Tees Valley project which will utilize Westinghouse Plasma Gasification Technology. It is similar to the first project, and fits well with UK’s intentions to encourage renewable sources of energy in the country’s effort to expand its power infrastructure.

Below are excerpts from the UK government recent announcement:

Air Products expects to invest an amount similar to that of their first plant – £300 million – to build a new energy from waste facility in Tees Valley, Teesside, bringing new jobs to the local area from the initial construction phase and beyond. The new agreement means government – via the Government Procurement Service (GPS) – will buy a portion of its energy directly from a UK-based generator at a low fixed price via an innovative Power Purchase Agreement rather than buying entirely through short-term wholesale markets which are subject to unpredictable price fluctuations.

Air Products has long-standing expertise in building and operating large, complex industrial gas and energy plants ensuring its projects are delivered safely, reliably and cost-effectively.

Advanced gasification is a more efficient energy-from-waste process than incineration and has a lower overall environmental impact. Raw waste is collected from local businesses and then converted into a clean fuel gas which is then used to generate valuable electricity.

Lisa Jordan, Air Products’ Business Manager for Bio-Energy Europe states that “We are delighted that the Cabinet Office has agreed to purchase the power which we expect to produce at a new Tees Valley Renewable Energy facility, subject to planning and approval later this year. By buying the electricity we produce, the Cabinet Office will help Air Products divert up to 350,000 tonnes of non-recyclable waste from landfill every year, which we will turn into reliable, controllable, renewable energy.”

Hon. Francis Maude, Minister for the Cabinet Office, UK states that “This is the beginning of a pioneering approach to how government uses its collective buying power and long term demand to buy energy. Not only have we secured £84 million of savings for taxpayers by signing a new, low cost energy deal with Air Products, but we’re also helping the UK compete in the global race by investing in growth and creating hundreds of new jobs through the construction of a new ‘energy from waste’ plant. Our aspiration is to develop world-leading, exportable technology, and the new state-of-the-art site in Teesside will help the UK become a centre of renewable technology. This is about changing the way we work to not only get the best out of our suppliers, but the best out of the UK.”

ABOUT AIR PRODUCTS:
Air Products is a Fortune 500 Company and a world leader in industrial gases and gas clean-up systems. Air Products has 5 project licenses negotiated in Europe and North America under a joint development agreement with Alter NRG. www.airproducts.com
Tees Valley Project 1, UK: Under Construction

- Convert 1000 tpd MSW producing 50MW combined cycle power.
- Enough to power 50,000 homes.
- Currently under construction.
- 2014 commissioning date.
- Will utilize Westinghouse Plasma gasifier design and plasma torch systems.
Developing Waste Management Solutions in the UK and Thailand

Alter NRG is pleased to provide details from recent announcements made by one of our customers, Waste2Tricity (W2T) partially owned by Roman Abramovich (similar to Alter NRG). They have been developing energy-from-waste projects for several years and is hitting commercial milestones. As well as being the licensee they are at the forefront of the AFC Fuel Cell Technology implementation. The announcement below states Alter NRG’s involvement in their project developments and opportunities for the Westinghouse Plasma technology deployment.

CONCEPT DESIGN STUDY FOR ADVANCED WASTE-TO-ENERGY PLANT IN UK (FROM AN APRIL 9, 2013 PRESS RELEASE)

Waste2Tricity (W2T) announced the start of a Concept Design Study for the development of an advanced waste-to-energy plant. Peel Environmental will provide the property solution for the facility, which will convert approximately 100,000 tonnes a year of feedstock – residual household or commercial and industrial waste - to low carbon electricity.

Similar to the Air Products plant on Teesside, which recently started construction, the Project will use Westinghouse plasma assisted gasification from Alter NRG, to convert waste sourced from several suppliers including Energy Gap Ltd. Alter NRG is providing a discounted technology license for the Project in exchange for an option to take a minority investment.

W2T, in conjunction with its engineer AMEC and consultant Foster Wheeler, is also working with partners to draw up plans for the 13.6MW plant, which will produce nearly 109,000 MW hours of low carbon electricity a year - enough to power around 24,000 homes. The Project will utilise internal combustion engines, but W2T expects it to also demonstrate AFC Energy’s alkaline fuel cells, as they become commercially available. The equivalent fuel cell plant will export an additional 43% of electricity from the same amount of feedstock.

INTERNATIONAL EXPANSION IN THAILAND (FROM AN APRIL 12, 2013 PRESS RELEASE)

Waste2Tricity (W2T) announced international expansion with the launch of its wholly owned subsidiary Waste2Tricity International (Thailand) Ltd; and the opening of its offices in the Rajchathewi district of Bangkok.

W2T hopes to take advantage of the subsidies that exist in the Thai region and the natural opportunities that exist in its expanding economy that has inherent issues with waste management and a shortage of power.

Waste2Tricity International (Thailand) Ltd will be seeking a number of opportunities to deploy the Alter NRG Westinghouse plasma technology in multiple locations; and is in advanced discussions with several potential partners. There has also been substantial interest in the future deployment of the AFC Energy fuel cell which will significantly enhance return on capital employed.

Peter Jones, Chairman of W2T states that “Thailand presents an excellent opportunity for the immediate deployment of the Alter NRG technology. This will be in conjunction with conventional power island technologies similar to the Air Products Tees Valley programme, which is currently being built in the UK. We liken the opportunities for development of this technology in the Thai market, as being at least on a par with the UK market. With the future prospects of the AFC Energy fuel cell technology achieving commercial roll out by 2016, the prospects for investors in Waste2Tricity are very exciting”.

ABOUT WASTE2TRICITY:
Waste2tricity is a structured solutions provider for the waste to energy sector. Its shareholders include Ervington Investments (UBO Roman Abramovich), Age of Reason Foundation and Eturab, all of whom are substantial shareholders in AFC Energy and/or Alter NRG Westinghouse and represent approximately 30% of each company.

www.waste2tricity.com
Waste2Tricity advances waste to energy deployment projects that use the proven Westinghouse Plasma gasification process to generate syngas to power efficient and proven internal combustion engines (ICE) or gas turbines (GT) to generate electrical power.
KEY FACTS: GLOBAL WASTE GENERATION

- Current global MSW generation levels are approximately 1.3 billion tonnes per year
- Expected to increase to approximately 2.2 billion tonnes per year by 2025
- Waste generation per capita rates to increase from 1.2 to 1.42 kg per person per day over the next fifteen years

"Waste generation levels are expected to grow by 69% by 2025."

2025 MARKET SIZE

WESTINGHOUSE PLASMA GASIFICATION: WASTE TO ENERGY EQUIVALENTS

G-G5 GASIFIERS
6,000+

ELECTRICAL
3 Million/MW OF CAPACITY

LIQUID FUELS
4.7 Million BARRELS PER DAY

FOSSIL FUEL REPLACEMENT
11 Million BARRELS PER DAY

6 Million TONNES PER DAY

Source: World Bank
Market Applications: Waste to Syngas to higher value energy products

The Westinghouse Plasma Technology owned by Alter NRG Corp. is considered the industry leader for the treatment of all types of waste.

- Industrial
- Household
- Commercial
- Hazardous etc.

This allows for the diversion of waste from landfills and creates an important environmental benefit. Additionally, the world has a demand for economically viable energy. The Westinghouse Plasma technology has the ability to address these concerns in one single solution. It is designed to convert a wide variety of waste streams to produce an energy-rich gas, called Syngas through plasma gasification.

Multiple energy outputs can be produced from Syngas, such as:

- Electricity
- Ethanol
- Gasoline
- Diesel Fuel
- Fuel Oil Replacement

The Westinghouse Plasma technology is commercially proven, with over 10 years of operating experience, providing applications in:

- Waste to Electricity Production
- Fuel Oil Replacement
- Production of Liquid Fuels

Our current customers are successfully developing projects involving the conversion of the Syngas to create power and heat or to convert into ethanol or other liquid fuels.

The Westinghouse Plasma technology is superior to other forms of waste management, and offers several advantages.

- Environmental performance - reducing overall greenhouse gas emissions
- Feedstock input flexibility - variety of low value materials
- Product output flexibility - high value energy products, power, replacement fuel oil, ethanol, diesel etc.
- Energy self-sufficient – generating enough energy to sustain itself
- Strong economic returns – multiple revenue streams

Utilizing waste for a renewable fuel enhances recycling, cleans the environment & produces valuable renewable energy.

Air Products:
Two municipal waste to electricity facilities under development - United Kingdom

SMS Infrastructure:
Constructed two facilities for treatment and disposal of hazardous waste – Indian.

Wuhan Kaidi:
Constructed a biomass to power & ethanol facility - China.
Westinghouse Plasma Torches have been developed over 40 years, they are designed to operate with high efficiency and minimal maintenance in difficult commercial environments. It provides a clean source of heat improving environmental performance in many different industrial applications.

Typical Plasma Applications include:

- Energy recovery from waste through plasma gasification
- Hazardous and medical waste destruction
- Combustion replacement
- Boiler ignition
- Foundry melters
- Ironmaking
- Steel

- Plasma fired blast furnace
- Non ferrous metals processing
- Processing of metallurgical waste
- Plasma reformers
- Acetylene production
- Chemical processing
- R & D applications
- High temperature testing of ceramic and metallic materials.

Plasma torches have the unique capability of increasing the energy of the process gas when compared to combustion equipment. The Plasma Torch offers distinct advantages that include, process gas flexibility, allows control over temperature, proven in tough commercial environments such steel mills, foundries and waste to energy facilities - among others. These applications will provide significant economic and environmental improvement from current processes.

There is a wide range of opportunities for specific uses of the Westinghouse Plasma torches, spanning industries in steel automotive, specialty metals and other industrial needs.

Mr. Huang Geng, Chief Technology Officer of Guanchuan states that "WFC is a proven leader in its field in plasma gasification and the plasma torch system. Their systems have been proven commercially and represent significant market potential for the industrial furnace retrofits in China. China is the world's largest steel producer and this application of Westinghouse Plasma torches will be used to reduce the overall emissions profile and operating costs in the steel facilities."

On June 26, 2012, Mr.Zhida Sima, chairman of Guanchuan and Mr. Richard Fish, president of Alter NRG signed the torch sale agreement in Beijing. Mr.Luo, chairman of Association of China Iron&Steel Industry, Mr. Kang, chairman of Association China non-iron metal industry and other industry leaders attended the ceremony.

BEIJING HUANYU GUANCHUAN PLASMA TECHNOLOGY
Beijing Huanyu Guanchuan Plasma Technology is focused on applications utilizing advanced plasma technology for industrial applications. Guanchuan develops new plasma technologies and equipment, aiming to become the leader in the field of energy saving and environmental protection.

www.gchb.cn
Project Updates

Commissioning of Westinghouse Plasma Gasifier at the Biomass Waste to Liquids Facility in Wuhan, China

In December 2012, Wuhan Kaidi (Kaidi) successfully completed commissioning of the Westinghouse Plasma gasifier at a biomass to liquid fuels facility in Wuhan, China. The Westinghouse Plasma gasification unit is designed to process approximately 100 tonnes per day of biomass waste and convert it into clean syngas.

The clean syngas will then be processed via a Fischer Tropsch process to be converted into liquid transportation fuels. This facility is a significant reference plant that has expanded the global reach of Westinghouse Plasma Corp. and further commercializes the technology in Asia. The Wuhan Kaidi facility is the first commercial demonstration facility for plasma gasification in China and showcases the flexibility of Westinghouse Plasma technology and its ability to facilitate the generation of liquid fuels. This facility is the initial strategic investment by Wuhan Kaidi to implement a clean fuels solution in China and is part of their broader business to convert waste into clean renewable energy.

Kaidi is a leader in green technology solutions in China and globally. Kaidi has supplied services to millions of individual clients and to thousands of companies. The facility is located in a new clean energy and technology park in Wuhan China and will show case solutions involving green energy, environmental protection, and energy-saving technologies – like Westinghouse Plasma technology. Kaidi also operates over 100 biomass to power facilities throughout China and Southeast Asia.

Walter Howard states that “This is a significant reference plant that shows how our Westinghouse Plasma conversion technology has the ability to take a societal problem of waste products and convert it into useful renewable energy. China is a large market with aggressive mandates for renewable energy and we are excited by the interest in the region for waste-to-energy technology and the foothold we now have in the China market with Kaidi.”

WUHAN KAIDI

Wuhan Kaidi Holding Investment Co., Ltd. (hereinafter referred to as Kaidi Holding) is the first Chinese hi-tech investment company in the field of green energy, specifically dedicated to environment protection, energy saving, cleaning combustion, technical system integration, new product R&D, EPC construction, commercial operation, asset management, and diversified investment, etc. Kaidi, founded in 1992, is located in Wuhan Eastlake New-Tech Development Zone.

www.kaidihi.com
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.