

# An Introduction to DTE Green Waste to Fuel™

The DTE Green Waste to Fuel™ Series of Reports

A Report by Delta Thermo Energy Labs, a Division of Delta Thermo Energy™

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# Notice

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# Disclaimer

Many of the competitive technologies identified within this report are many years old and some have been in use for many decades. Delta Thermo Energy may not be aware of the latest advances put in place by individual plant operators or by their suppliers and subcontractors. Comparisons with Delta Thermo Energy Green Waste to Fuel technology and the underlying core technology, DTE Hydrothermal Decomposition<sup>™</sup> is based upon publicly available information available to us. Our core technology, DTE Hydrothermal Decomposition<sup>™</sup>, is supported by proprietary and unique intellectual property protected by existing and pending patents. Trade secrets are also part of our operating procedures and implementation and are necessary to achieve stated performance levels.

The reduction in pollutants released into the environment during and as a byproduct of DTE Hydrothermal Decomposition is significantly lower, in some cases by more than an order of magnitude, than most legacy waste processing practices. In any comparison with legacy Waste to Fuel and other widely used waste processing techniques our comparisons use generalized numbers based upon authoritative third party sources and the results of testing within our existing facilities. Individual plant key performance metrics will vary based upon many factors and which will vary amongst plants.

# About The DTE Green Waste to Fuel Series of Reports

These reports highlight the results of our research into current or potential critical waste processing and Waste to Fuel issues. The DTE Green Waste to Fuel (GWF) report series are publications of Delta Thermo Energy Labs, a division of Delta Thermo Energy. The mission of Delta Thermo Energy Labs is to conduct important waste processing and Waste to Fuel analysis and investigation, and to report the findings back to the community at large through our publications. The Delta Thermo Energy Labs knowledge base benefits from information on waste processing shared with us during the operation of our facilities within the United States and those of partners which are in operation around the world.

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# Executive Summary

In this white paper we overview the challenges to our environment in the processing of Municipal Solid Waste (MSW) and sewage sludge. We will introduce our remarkable new process, DTE Green Waste to Fuel™ and share information about the underlying core technology, DTE Hydrothermal Decomposition™. We will overview the environmental benefits, Near Zero Emissions, and value proposition that make Delta Thermo Energy facilities compelling for your community or for your company.

Our planet is still losing the battle to protect and preserve our environment. Our land, the air we breathe, and the food we eat is increasingly threatened by pollution by products from manufacturing, energy production and waste processing on a global basis. Sustainable solutions, those that enable us to continue to live in an environment without harming it, are in sight, but have not emerged into the mainstream yet.

Legacy solutions in areas like waste processing recycling, have made a positive impact but it is not enough. Recycling aside, the basic processes for incineration and Waste to Fuel processing add a burden to the environment that is not acceptable. Landfills and legacy waste dumps continue to threaten us with toxic leachate and gas emissions. Does anyone really want to live on a landfill? To make matters worse, the availability of landfills is diminishing within local communities and force municipalities to pay for the long distance trucking and rail shipment of waste to far away areas. The price for landfill use, known as the “tipping fee” will be very unpredictable over the next few decades. It seems obvious that most communities will not want a landfill within their township nor will they want your waste in the years to come.

DTE Green Waste to Fuel is not incineration. Incinerators burn trash - we do not. We process it into a clean fuel first. DTE Green Waste to Fuel implements new clean processes based upon DTE Hydrothermal Decomposition core technology. DTE Hydrothermal Decomposition includes a combination of innovative waste processing technologies licensed exclusively and assembled in conjunction with new intellectual property. DTE Hydrothermal Decomposition is a remarkable technology, one that promises to change our view of what is attainable in our fight to keep our environment clean.

DTE Green Waste to Fuel brings a highly disruptive and positive change to the legacy incineration of municipal waste. The Near Zero Emissions of a DTE Green Waste to Fuel facility challenge the entire industry in a positive way. Communities and industry can integrate our DTE Green Waste to Fuel systems with existing incineration processes, or, acquire new facilities from DTE directly. DTE Green Waste to Fuel and DTE Hydrothermal Decomposition technology will rapidly emerge as the solution of choice for communities and industry around the world.

As with Uber®, AirBNB®, Amazon® and many new applications of new technology which can clearly solve existing problems far better, we see corresponding challenges across a broad front from a variety of stakeholders supporting legacy waste processing practices. They have no way to easily adapt, and see an uncertain future in the face of these technological advances. That said, we see no other path forward. We fight this battle to help ensure that our future generations will have the same opportunity to enjoy this planet as we do. Clean air, clean water and healthy food are essential to our well-being. We're committed to the fight for our environment and we will continue to stand up to forces that seek to do otherwise for short term gain and profit.

DTE Green Waste to Fuel continues to find new allies. Delta Thermo Energy continues to start new dialogues with environmental organizations that usually spend much of their time fighting the business stakeholders within the waste processing industry. The sustainability of our solution based upon our Near Zero Emissions has created new energy and discussion within this community. We expect to announce innovative one-of-a-kind partnerships over the next year with many of the staunchest environmental, academic and government groups within our country. In the final analysis, DTE Green Waste to Fuel and DTE's Hydrothermal Decomposition technology will rapidly emerge as the solution of choice for communities and industry around the world.

# The Challenge to Communities Today

The environment is under assault from a variety of legacy manufacturing, energy production and waste processing activities. The physical processing required for the majority of these produce highly undesirable by products, consume far more energy than they produce and leaves the environment with a greater burden after the process is complete.

## Incineration

Incineration is the most common way communities have treated and eliminated waste. The incineration process works by combusting all of the Municipal Solid Waste (MSW) in the form it is delivered to the incinerator. Most communities in the United States spends time on pre-sorting and removing recyclable materials. It is important that these recyclables are separated out prior to trash collection.

During the process of incineration this municipal solid waste material is converted into incinerator ash, gases, particles and excess heat. In facilities where incineration is combined with Waste to Fuel applications these products are later used for generation of electricity. Ideally, the waste gases are treated for elimination or reduction of pollutants before being released into the atmosphere.

Incineration produces very significant amounts of waste. This depends on what waste is sent to the incinerator. The need for landfills remains but in lesser quantities. Combined with Waste to Energy techniques, incineration can produce a significant amount of energy. In nations like Denmark it is estimated that roughly 24% to 25% of the energy is produced by Waste to Energy techniques. Roughly 20% of the energy from incineration goes to District heating facilities. The other 4% to 5% is delivered directly as electric energy.<sup>1</sup> Waste to Energy is a step forward in that the byproduct energy and heat may be re-utilized.

Of course, many of the byproducts of the most modern incineration plants are damaging to the environment. While deriving energy from the processing of waste is desirable, incineration produces toxic compounds and gases, damaging to human health and damage to the environment.

The byproducts of the incineration process include two types of ash. Bottom ash comes from the furnace and is mixed with a stony or glass-like byproduct called slag. Fly ash is emitted by the smoke stack and contains more hazardous materials. Bottom ash is approximately 10% of the volume and perhaps 20% to 30% or more by weight of the solid waste processed. Fly ash

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<sup>1</sup> [http://wwf.panda.org/wwf\\_news/?204596/Denmark-Waste to Energy](http://wwf.panda.org/wwf_news/?204596/Denmark-Waste%20to%20Energy)

quantities are much lower, often only a few percent of the original waste by weight, but the resultant emissions are extremely toxic. Once again these percentages vary by plant as each one has slight differences.

These emissions from incineration include heavy metals, dioxins and furans. These can be found in the waste ash, the emitted gas or water used in and around the process. The combustion of synthetic man-made materials like the plastic polyvinyl chloride (PVC) is the primary source of these dangerous pollutants.

These toxic compounds are created at various stages of the incineration process. Their production cannot be avoided and they cannot often be destroyed - this is the normal byproduct of incineration. Sophisticated filters and remaining ash often contain these compounds. Even if trapped in the filters, these filters then, in turn, become toxic. Because they are so toxic, even if trapped, they require special hazardous landfills for disposal.

## Human Health Remains at Risk

It is quite clear that incineration produces pollutants which are detrimental to human health and well-being. Incinerator ash becomes dispersed throughout the environment, with potential negative impact to human health and the quality of the food we eat, the water we drink and the air we breathe. The ecological chain is complex. We all breathe the same air - this affects both the plant personnel and the nearby community. Locally processed food and water may be contaminated by airborne pollutants from the incinerator. Local flora or fauna may also be contaminated.

Even the newest and most modern designs for incinerators release toxic metals, dioxins, furans and acid gases. Waste incinerator systems produce toxic ash and other residues that still required substantial landfill capacity.

Legacy Waste to Energy technologies designed to maximize energy recovery operate in a manner which works against the chemistry for the reduction of dioxins emissions. Dioxins are clearly the most hazardous persistent organic pollutants and have irreparable environmental health consequences. Dioxin is persistent and very difficult to eliminate. It is a highly toxic compound known to be responsible for neurological damage, cancer, and can impact the thyroid, respiratory system and the reproductive system.

Communities located near the incinerator as well as those living farther away may be impacted by these dangerous compounds. The implications are obvious to us all.

## Financial Impacts and Other Consideration

Control systems are required to limit and reduce toxic emissions from the incineration process. This includes systems to address toxics such as mercury, cadmium, lead, furans, dioxins,

arsenic, and other dangerous organic compounds. Just about half of the cost of a typical incinerator is on the pollution and air quality control systems and the careful ongoing operation of these systems on an ongoing basis.

Scale is another problem. In emerging and developing countries the heat energy value of waste is lower than in developed countries so that to implement incineration they must add auxiliary fuel, creating even more pollution and making the process less economically viable. Small to midsized communities are also negatively impacted by scale. Incineration generally requires about 1000+ tons per day to be efficient. The cost of a facility like this is often in excess of \$350 million and includes high overall operating costs including costs for the pollution controls.

Fly ash, being so toxic, cannot go into standard municipal landfills. A special hazardous waste landfill is required which is many times costlier (often ten times costlier) than a municipal landfill. The cost of municipal waste incineration continues to rise given the requirement for special landfills associated with fly ash. DTE Green Waste to Fuel systems help provide a better alternative.

## Introducing DTE Green Waste to Fuel

In the final analysis, incinerators are like the gasoline combustion engines in use throughout the automotive industry. We depend on them for transportation today. They are more reliable than ever. A fixture in our lives. Years of additional expensive technology development has positively impacted and reduced the pollution produced by these engines, yet it remains clear that the burning of fossil fuels in these engines is not a sustainable practice.

Electric cars such as the Tesla® and the Chevy Volt® bring sharp disruption and contrast. Electric cars show a disruption in terms of power, efficiency, and dramatically reduce pollution. The pollution required to produce the energy charge the electric vehicle requires is a small percentage of the “one tankful of gasoline” that would otherwise be required. If this energy is produced by hydrothermal generators or solar power, the pollution is reduced much closer to zero. All of the automotive manufacturers are scrambling to bring electric vehicles to market. The future trend is obvious to us all. Respectfully submitted, the gasoline engine is definitely on the way out.

The DTE Green Waste to Fuel process using the DTE Hydrothermal Decomposition is equally disruptive to the waste processing industry. This remarkable process now enables communities and industry to deploy sustainable DTE Green Waste to Fuel solutions for the clean processing of MSW and sewage sludge within their communities. DTE Hydrothermal Decomposition substantially reduces the emissions and byproduct production of pollutants to a very small percentage of existing legacy waste processing techniques.

We don't burn trash - we convert it to a fuel that burns cleaner and hotter than coal to produce electricity. We don't produce furans or dioxins. On just about every measurement we produce

significantly less of any pollutant than any Waste to Energy incinerator. You can see the detail in our white paper “Near Zero Emissions – The Facts” which overviews and compares the output from a DTE facility with legacy incineration facility that does not use our technology.

## DTE Green Waste to Fuel Solutions

### Solutions for Municipalities

In 1960, the average American threw away 2.7 pounds of trash per day. According to the United States Environmental Protection Agency’s document, Municipal Solid Waste in the United States 2013 Facts and Figures (published June 2015) the average American throws away about 4.4 pounds of trash per day. Of those 4.4 pounds, about 34% is recycled or composted, and about 13% is burned and converted to energy. The rest, about 53%, is discarded, mostly into landfills. About 85% of household trash is material that will burn, and about 61% of that is biogenic—material that is made from biomass (plant or animal products).<sup>2</sup>

#### **Municipal Solid Waste Facts and Figures**

**34% – MSW is Recycled or Composted**

**13% – MSW Burned**

**53% – MSW Discarded Mostly into Landfills**

All of this will be coming to an end over the next few decades.

Landfills near major cities are closing down or being filled. Research has also shown that landfills create a toxic environment within proximity to their location. Most community members do not want to be located anywhere near landfills. Communities may legislate against them and place restrictions on their operations. Over the next hundred years or so we believe that older landfills will need to be reclaimed and their waste reprocessed using technologies from manufacturers such as Delta Thermo Energy. All in all, the challenges brought by municipal waste processing are significant.

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<sup>2</sup> Note 1: [http://www.eia.gov/energyexplained/?page=biomass\\_waste\\_to\\_energy](http://www.eia.gov/energyexplained/?page=biomass_waste_to_energy)

Delta Thermo DTE Green Waste to Fuel systems can change all of that for your community. DTE can supply Green Waste to Fuel systems that can integrate with your existing waste processing and management solutions. DTE can also supply a complete Green Waste to Fuel to Energy facility. Under most anticipated municipality solution agreements, land is leased to Delta Thermo Energy for the plant location. Alternately, DTE can buy a local parcel of land. Site locations can range from approximately 4 to 5 acres to more depending, in part, on the volume of waste to be processed. The plant needs good access to electrical, natural gas, water supply and transportation infrastructure for both initial construction and ongoing Green operation. Delta Thermo Energy will design, engineer, build, operate and maintain the municipality project facilities for the long term contract. We will employ qualified and properly trained personnel and will maintain adequate numbers of personnel to properly operate the Project over the projected life. It is always the case that we will bring good green jobs into the community in support of plant operations.

A typical municipality will need to process approximately 150 tons per day, seven days per week of Municipal Solid Waste (MSW) and perhaps 50 tons per week of municipal bio solids. Our partnerships with municipalities typically provide for the processing MSW and sewage sludge for a period as long as 35 years. Each municipality has a complete plant in place. We utilize DTE Hydrothermal Decomposition technology to convert the MSW and bio solids into a special fuel called Engineered Pulverized Fuel (EPF). The Engineered Pulverized Fuel will then be combusted to produce steam for the thermal treating process and produce approximately four (4) megawatts (MW) of electrical energy to be sold to the power producing grid.

## Solutions for Industry

One of industry's biggest challenges is finding a way to meet national and global energy needs while minimizing impact on the environment. Many manufacturers are facing the need for expanded waste processing, both to handle capacity and to deal with rising costs. The opportunities to benefit from Delta Thermo Energy Green Waste to Fuel systems or complete Green Waste to Fuel to Energy facilities are considerable.

We have strong return on investment models that a variety of manufacturing processes. Our facilities are compact and can usually fit into your existing plant environment easily. We typically propose capacities to process from between 200 tons to as much as several thousand tons per day of Manufacturer Output Solid Waste (MOSW). Our long-term arrangements fit manufacturers well with a strong return on investment and reduced cash flow.

Local communities often resist expansion and changes to local manufacturing facilities. Residents typically view these corporate industrial facilities as potential sources of health risk and hazard to the community. Industrial partners that deploy a complete Delta Thermo Energy facility will provide a community showcase for safe, Near Zero Emissions DTE Green Waste to Fuel to Energy technology. You will lead the way in your local community as an environmental

leader. You will process your industrial waste more efficiently, more cleanly and in a more sustainable way than the local community waste processing facility!

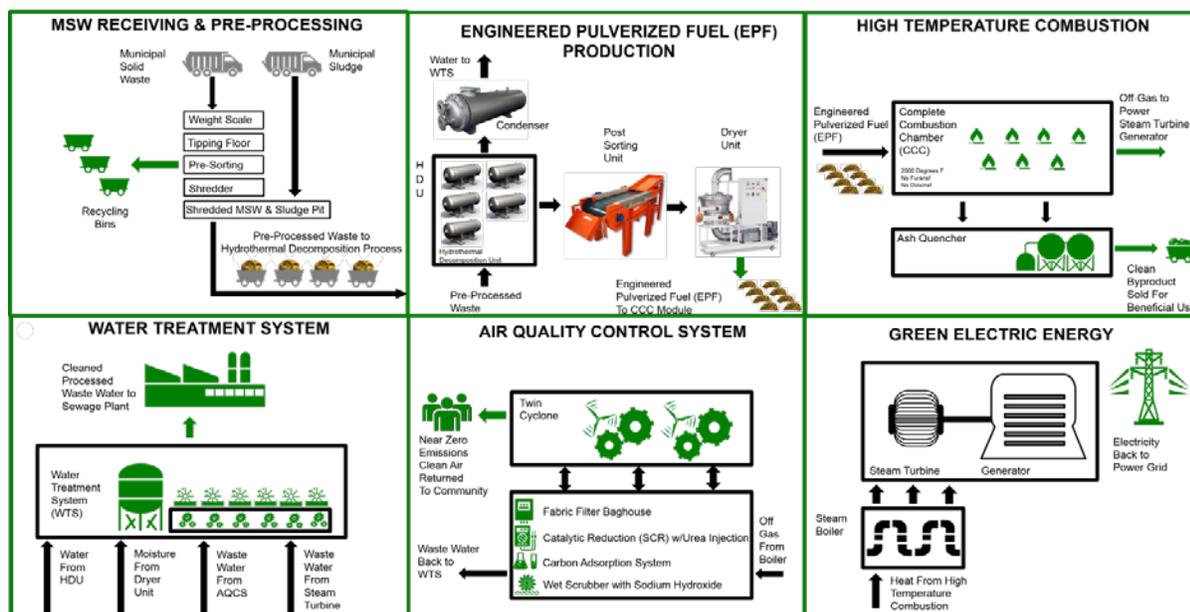
Delta Thermo Energy can get a plant into operations for our industry partners in as little as 18 months. We'll work together to obtain necessary permits and licenses and move rapidly to bring the waste processing capacity you need online as fast as possible. Alternately, you can acquire and integrate our Green Waste to Fuel systems in as little as six to nine months. Hundreds of manufacturers can benefit from our technology.

# Technology

## Process Overview – An Introduction to DTE Green Waste to Fuel

### DTE GREEN WASTE TO FUEL™ TO ENERGY

- PROTECT OUR ENVIRONMENT
- SUSTAINABLE GREEN ENERGY



The First DTE Green Waste to Fuel Process™ in the United States

### 6 Key Steps – DTE Green Waste to Fuel Process

DTE Green Waste to Fuel systems absolutely do not burn municipal solid waste (MSW). We convert it to a clean burning fuel. Delta Thermo Energy facilities include all necessary equipment and systems to receive municipal solid waste (MSW) and bio solids and then convert it through our proprietary processes into prepared fuel (DTE Engineered Pulverized Fuel or EPF). EPF burns cleaner and hotter than coal. This EPF is then combusted at temperatures close to 2000 degrees Fahrenheit to produce steam for the Resource Recycling System (RRS) process and for electrical power generation. Because pure combustion is done near 2000 degrees Fahrenheit, and because we use MSW which has been converted EPF, we do not

produce dangerous pollutants such as Dioxins and Furans. In fact, they cannot be created at these temperatures.

The DTE Green Waste to Fuel process consists of the following major process areas:

- MSW Receiving and Pre-Processing;
- Thermal processing of MSW and bio solids into Engineered Pulverized Fuel (EPF); and,
- Dewatering and drying of the pulverized fuel.

Additional processes for complete DTE Green Waste to Fuel to Energy facilities:

- Combustion of the pulverized fuel;
- Steam production and electric generation; and,
- Wastewater treatment and air pollution control.

All of our facilities utilize a sophisticated air quality control system (AQCS). The AQCS includes the following major components:

- Twin Cyclone for initial particulate removal;
- Selective Catalytic Reduction (SCR) with urea injection to reduce NO<sub>x</sub> and VOC;
- Fabric filter baghouse to control particulate matter (PM) and metals;
- Wet Scrubber with sodium hydroxide to control SO<sub>2</sub>, HCl, HF; and,
- Carbon Adsorption system to control mercury (Hg) and VOC.

Delta Thermo Energy is the first company enabled to prototype and design a full commercial-scale Green Waste to Fuel to Energy facility within the United States. Delta Thermo Energy DTE Green Waste to Fuel technology utilizes a number of previously proven technologies from partners in Japan, South Korea, and Germany. These technologies have been used for MSW and sludge processing and together constitute the DTE Green Waste to Fuel process architecture. This technology has been used successfully for the past 11+ years in commercial applications.

The thermal processing system, known as the Resource Recycling System (“RRS”), was originally developed by the Hokuto Kougyo Co. (Hokuto) of Japan, one of our key partners, for the disposal of hazardous hospital (red bag) wastes. The Complete Combustion Chamber system (“CCC”) a technology developed by Jasper, GMBH in Germany, another key partner, is used for the combustion of processed waste such as MSW, biomass and industrial wastes.

The RRS system generates wastewater which must be treated before discharge to a municipality’s wastewater treatment plant. The Waste Treatment System (“WTS”) is a technology developed by ETC, Inc. of South Korea for the treatment of industrial wastewater.

Delta Thermo also incorporates conventional equipment for receiving, sorting, shredding and storing MSW and sludge prior to treatment and combustion as well as conventional heat recovery and steam turbine equipment for recovering useful energy from the combustion process. A highly advanced state-of-the-art air quality control system manufactured in the United States is also incorporated.

## The First Sustainable Zero Emissions Waste Processing Solution

Delta Thermo Energy's Green Waste to Energy process brings the first truly sustainable solution for waste processing to the United States. DTE Green Waste to Energy technology processes both municipal solid waste and sewage sludge with our Near Zero Emissions patented technology. This brings a sustainable bridge to a healthy environment from the clean processing of waste through to the delivery of electrical energy. Other than initial startup, this integrated process requires no fossil fuels to operate the facility.

## Differentiation – How We Are Unique

### Near Zero Emissions Help Protect the Environment

Our sustainable DTE Green Waste to Fuel process is environmentally safe for any county or municipality in the world. We produce minimal byproducts for beneficial use, and Near Zero Emissions throughout the entire Green Waste to Fuel process. We can partner and integrate with your existing ecosystem of vendors and technologies, or, optionally, deliver and operate a full Waste to Fuel to Energy facility.

### Our Process Doesn't Produce Solid Waste

Delta Thermo Energy doesn't produce waste, pollution or generate tons of waste for landfills. We produce a clean burning fuel. An analysis of our Engineered Pulverized Fuel (EPF) analysis done by an independent engineering firm in support of an ongoing municipality's due diligence concluded in a summary written report that "EPF is properly classified as a fuel product rather than a solid waste." Both State department of environment protection agencies and the U.S. Government Environmental Protection Agency agree.

Engineered Pulverized Fuel (EPF) has a meaningful heating value for energy recovery that is similar to coal, and superior, in that it contains, in many cases, low levels of naturally occurring HAP and conventional air pollutant precursors and carbon derived from biomass rather than fossil sources. Hence it burns much hotter, more efficiently and most important, cleaner than coal. Delta Thermo Energy's Engineered Pulverized Fuel (EPF) meets the legitimacy criteria of Non-Hazardous Secondary Materials (NHSM) Rule (40 CFR 241.3 (d)(1)). Our Engineered Pulverized Fuel (EPF) is properly viewed as a fuel product and not a solid waste under the Non-Hazardous Secondary Materials Rule.

## Patents

Delta Thermo Energy has exclusively licensed existing patents and submitted for new patents which are pending. Hydrothermal Decomposition is unique. No other vendor within the United States has the license for DTE Green Waste to Fuel technology.

# Benefits

## Protect the Environment

### The Challenge Using Legacy Waste Processing Technology

Although the best examples of incineration of municipal waste coupled with electrical energy recovery seem a major step forward, it is still clear that these plants emit pollutants in fairly large quantities and their other byproducts continue to overflow landfills. The benefits from Waste to Fuel processes that produce energy are positive, but still overwhelmed by the negative fact that combustion-based waste processing pollutes both the air, water and land.

Beyond this, most communities do not even use incineration with Waste to Energy processes today. They just incinerate trash. In fact, on a global basis, a considerable number do not even use an air quality control system to post process the gas and smoke from combustion!

Landfills, of course, remain long-term liabilities for most communities. In the short term, local capacity for some communities is running out. They require the shipment and trucking of waste far longer distances and for far greater fees. Worse yet, is that landfills have not lived up to most expectations in terms of how they would contain hazardous materials. In fact, many have started to produce hazardous gases and odors that threaten local communities. Landfills, and the older “trash dumps” more common earlier in the century, are, in many ways, a total environmental disaster. Liquids in the decomposing trash go to the bottom, and if not adequately isolated, go from there, into the soil and groundwater. This pollutant is also called leachate and usually contains a variety of hazardous chemicals. The rotting garbage builds up in the dump and can also release methane in large quantities. It is apparent to many in the waste processing world that future generations will likely need to remove many landfills and older trash dumps and then reprocess the waste with a better, environmentally safe process.

### The Opportunity to Protect the Environment

Delta Thermo Energy’s DTE Green Waste to Fuel processes produce Near Zero Emissions and virtually no landfill impact. Everything we process produces primarily water vapor and gases normally found in the atmosphere prior to industrialization. Engineered Pulverized Fuel (EPF). EPF is classified as a fuel product, not a pollutant. Our facilities do not require huge smokestacks to disperse harmful airborne pollutants, nor do they produce many tons of hazardous waste for landfills.

# Sustainable Green Waste to Fuel

## Sustainable Green Energy – A Mandatory Goal for Our Planet

Sustainable green energy is the creation of usable energy such that it meets the needs of the present generation without compromising the ability of future generations. Sustainable green energy must be renewable, produced on an efficient basis, and not harm or pollute the environment.

Technologies that promote sustainable green energy include a multitude of renewable energy sources. Hydroelectric power generation, solar energy, wind energy, wave power, geothermal energy, bioenergy and even tidal power are part of the technology mix in use today.

## Combustion-Based Power Plants and Waste Processing Plants Are Neither Green Nor Sustainable

Combustion based power plants require fossil fuels, emit massive quantities of pollution, and other than the few that produce energy, do little to recapture the energy released by combustion. In any realistic period of time projected forward, these technologies are not sustainable, harm our environment and jeopardize life for our future generations.

## Conserve Operating Expense

### Trucking Fees and Transportation Costs are Reduced

Trucking your community waste long distances can now be reduced or eliminated. DTE's Green Waste to Fuel facility enables shorter trucking distances within the community. This results in less air pollution and less truck traffic. As landfills disappear or are regulated out of existence, we find that most large regional landfills are often located far from the communities using them.

We project these transportation fees will continue to increase substantially beyond the estimates most municipalities use in their long term planning cycles.

### Tipping Fees Contribute to Your Local Community

Tipping fees remain in your town where the waste was generated. Large regional landfills are most often privately owned. The revenue they produce does not remain in the community that generated the waste. Tipping fees at regional landfills are based on levels of competition from other regional landfills and may not be related to the cost of disposal. Because of long-term contracts and a fixed debt repayment structure, Green Waste to Energy plants offer stable tipping fees for municipal waste. Large regional landfills, usually privately owned, compete with other landfills for waste and the resulting tipping fees can be unpredictable.

## Tipping Fees May Escalate Due to Shrinking Limited Landfill Capacity

The problem with landfill space is much more political than geographical in nature. Legislation in most communities is moving against the development of new landfills, public or private. Emerging problems with landfill stability, pollution and related health impact make it highly undesirable for any community to consider a new landfill. On top of this, existing landfills are filling up and losing capacity.

New York state, despite shipping most of the Big Apple's trash across state lines, has only about 10+ years of capacity left. As of January 2015, there were approximately 27 active municipal solid waste landfills within New York State. By year end in 2010, the landfills had 200+ million tons of capacity remaining. Using a projected number of 7.7 million tons per year, this gives the Big Apple zero landfill capacity approximately by the year 2026. In any case most of New York City's waste is hauled or railed to other states far away.

## Substantial Revenue from DTE Green Waste to Fuel Plants Remains in Your Community

The economy of the community is enhanced. The average Waste to Energy incineration facility in the US is responsible for the creation of as many as 58 full time jobs<sup>3</sup>. Generally, these are salaried, skilled positions with relatively high pay. And, these jobs have at least a 40 year projected life. Of course, Delta Thermo Energy builds and manages Green Waste to Fuel to Energy facilities, but the numbers are relatively close depending on plant capacity.

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<sup>3</sup> Note 1: Per the Energy Recovery Council.

# Summary of Benefits

The benefits of a partnership between Delta Thermo Energy and your community are considerable. We provide benefits in multiple areas that positively impact your community today and far into the future.

Our new technology can help protect the planet we all share. Delta Thermo Energy's DTE Green Waste to Fuel processes produce Near Zero Emissions and virtually no landfill impact. Everything we process produces primarily water vapor and gases normally found in the atmosphere prior to industrialization. Our facilities do not require huge smokestacks to disperse airborne pollutants, nor do they produce many tons of hazardous waste for landfills.

Sustainable green energy for your community is now in sight. Sustainable green energy is the creation of usable energy such that it meets the needs of the present generation without compromising the ability of future generations. Sustainable green energy must be renewable, produced on an efficient basis, and not harm or pollute the environment. Nothing could be more ideal than to process waste cleanly, without pollution, and then to leave a byproduct as useful as energy for the community. DTE Hydrothermal Decomposition technology brings together innovative and unique technology from around the world to enable the world's first truly sustainable Waste to Fuel process.

# Company

Delta Thermo Energy is a leader in delivering the world's first sustainable DTE Green Waste to Fuel process for industry and community. Uniquely, our internationally patented and U.S. patent pending DTE Hydrothermal Decomposition technology enables our systems to convert municipal solid waste into a clean-burning fuel that produces Near Zero Emissions. Our modern systems reduce costs and pollution within existing waste processing plants, protect the environment and help to return clean energy to the community. Our markets include industrial manufacturers and small to mid-sized communities across the world.

Contact us to learn more about how we can help. Learn how to integrate DTE Green Waste to Fuel systems with your existing incineration processes. Find out how we can provide a complete DTE Green Waste to Fuel to Energy facility. Contact us now via 1.215.809.1130 or email us via info@deltathermo.com.

## Technology Partners

### **SKANSKA**

Skanska is one of the world's leading construction groups. In the U.S., we are a provider of comprehensive construction services and a developer of public-private partnerships. We apply our expertise to everything from small renovations to billion-dollar projects.

### **北斗興業株式会社** HOKUTO KOGYO CO.,LTD

Hokuto Kougyo Co is a leader in the construction industry. We develop industrial waste processing collection and transportation vessels and specialized placeholder process control systems.

### **Environetics** Designing Environments That Work.

Environetics® has long been a leader in interior design, architectural design, planning, project management, and sustainable practices. Our team of architects, designers, engineers and planners works closely with you to envision, develop and realize an environment that helps your organization achieve its mission.

### **j JASPER**

Jasper is an owner-managed enterprise that develops highly specialised solutions for customers in the aluminium and steel industry and local authorities. The focus of our activities is in industrial furnace engineering and firing systems, energy engineering and control systems and process control technology. The company supports customers on a global level from its three German locations.



IES is a leader in consulting services specializing in environmental compliance, multi-media audits, OSHA compliance and training, outsourced compliance and management services, industrial hygiene, process safety & risk management, potent compound evaluations, design/build of air and wastewater pollution abatement systems, and facility upgrades.



Tokyo Tech established its Integrated Research Institute on April 1, 2010, and the Frontier Research Center was incorporated into it. Tokyo Tech's research laboratories comprise the core of the Integrated Research Institute. The Frontier Research Center and Solutions Research Laboratory are strategic research organizations spanning the research laboratories and charged with integrating research efforts between laboratories.



Eco Technology Completion (ETC, Inc) is based in Seoul, South Korea. ETC designed the main waste processing system in downtown Seoul, Korea which is a showcase for their advanced technology and program management expertise. ETC has been operating three large systems in Korea for several years and has an additional four modern waste to energy facilities being installed in Ecuador.

## Technology Advisory Board



Dr. A. Gupta

Combustion research is centered in the Department of Mechanical Engineering at UMCP. The main objective of ongoing research in our laboratory is to develop a better understanding of the fundamental combustion processes through comprehensive experimental and mathematical modeling studies. The goal is to develop efficient combustion and reduce pollutants emission from a range of propulsion and power systems.



Dr. N. Themelis

The Waste to Fuel Research and Technology Council (WTERT) brings together engineers, scientists and managers from universities and industry. The mission of WTERT is to identify and advance the best available Waste to Fuel (WTE) technologies for the recovery of energy or fuels from municipal solid wastes and other industrial, agricultural, and forestry residues.



Dr. J. Sale

The mission of the Energy Research Center is to find solutions to national and global energy and energy-related problems by collaborating with federal, state and local agencies, energy businesses, technology developers and suppliers, the research community and academic institutions.



Dr. B. Gleeson

The Department of Mechanical Engineering and Materials Science (MEMS) houses ABET-accredited mechanical engineering and materials science and engineering programs that provide the solid fundamentals, critical thinking, and inventive spark that fires up our graduates as they design the future. They perform advanced research into the high temperature decomposition of materials.



Dr. M. Castaldi

The CUNY Energy Institute, headquartered at the City College of New York (CCNY), is an interdisciplinary research center that pulls the resources of the CUNY campuses together to develop advanced and sustainable technologies that have low-carbon footprints.

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