Wendy Briggs

Subject:	Alan Robinson (President & CEO, Paradigm BioAviation)
Location:	Administration Conference Room 216
Start:	Thu 7/18/2013 4:00 PM
End:	Thu 7/18/2013 5:00 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Mark Peterson
Required Attendees:	Mark Peterson (mpeterson@normal.org)

Wendy Briggs

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Meeting Status:	Not yet responded
Organizer:	Mark Peterson
Required Attendees:	Mark Peterson (mpeterson@normal.org); Sally Heffernan; Steven Mahrt

Wendy Briggs

From: David Hales <dhales@cityblm.org>
Sent: Saturday, January 05, 2013 4:43 PM
To: Mark Peterson
Subject: Allied Waste Landfill Contract Extension and Coordination of Due Diligence Activities Associated with Paradigm Aviation

Mark,

Sorry for any confusion.

Now that Alan Robinson has made his presentation to our respective Councils, it seems appropriate for us to coordinate the "due diligence" work that both cities and the EDC need to undertake in the months ahead. I want to make sure that you and I agree on what needs to be done, when and by whom. It is this topic that I wanted to meet with you and other appropriate staff members. Should we try a initial meeting with a few staff members in attendance (i.e. Managers, Attorneys and one or two others)?

I agree that Jim and Robin have been working through the Allied Waste contract extension but there seems to be resistance from Allied Waste to support a contract extension that allows us to divert our bulky waste to Tom Kirk's commercial recycling center. Our Council and staff believes we should at least have that option. The last I heard from Jim is that there is no contract extension that has been prepared that gives the Town and City that option. Is this correct and does the Town also want this right?

Thanks,

David

David A. Hales
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dhales@cityblm.org

-----Mark Peterson <mpeterson@normal.org> wrote: -----
To: "David Hales (dhales@cityblm.org)" <dhales@cityblm.org>
From: Mark Peterson <mpeterson@normal.org>
Date: 01/03/2013 09:13AM
Subject: Proposed meeting regarding Allied Waste & Paradigm

David, Sandy took a call this morning from your assistant (Bobby) seeking to schedule a meeting to discuss "Allied Waste Contract & Paradigm BioAviation." Your assistant requested that several Town staff attend that meeting including me, Pam Reece, Steve Mahrt, Andrew Huhn, and Robin Weaver to be held on either Jan. 18 or 25. Before I commit to sending all of those people to this meeting, I would like to get a little more information about the purpose.

Just so you know, we are poised to extend our contract with Allied Waste (now called Republic Services) for one year starting on March 1, 2013. They have offered a 3% rate

increase. Robin Weaver tells me that Jim Karch has also participated in the contract extension discussions with Republic since our contracts expire at the same time. It is her understanding that Jim will be recommending that the City follow suit and approve an identical extension agreement for one year. We have tentatively planned to place this item on our Council's Jan. 22nd regular meeting agenda. Thanks, mp

Mark R. Peterson

City Manager

Town of Normal

Normal, IL 61761

(309) 454-9777

mpeterson@normal.org

"Committed to Service Excellence"

Wendy Briggs

From: Mark Peterson
Sent: Wednesday, December 12, 2012 4:21 PM
To: Sandy Fedden
Subject: Attachment to Paradigm report
Attachments: Normal City Council - Paradigm plan.doc.doc

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"Committed to Service Excellence"

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ParadigmBioAviation

The **Paradigm Energies Group** has invested 3 years researching the feasibility of producing alternative aviation fuels and green electrical power using locally available feedstock, specifically Municipal Solid Waste. Paradigm is now positioned to be a leader in the production and delivery of competitively priced alternative aviation and renewable diesel fuels to commercial, corporate and military aviation users. The first such facility, an Integrated Bio-Refinery, will be constructed in Bloomington-Normal, Illinois, with production targeted for late 2015.

A key driver for Paradigm has been to mitigate the risk associated with this emerging industry. Thus Paradigm has structured the Bloomington-Normal project in two consecutive phases. Phase One includes a Materials Recovery Facility which will process recyclables, contain a gasification plant to produce Syngas for use in a Power Island, which will produce green electrical power. Phase Two will be the construction of a full scale Gas to Liquids plant, producing alternative jet and diesel fuels.

The conversion of Municipal Solid Waste, through gasification, for the production of green electrical power is a low risk and proven technology, and the gasifier selected by Paradigm is utilized in over 1,000 plants around the world. While the process for converting gases to liquid fuels was first commercialized in 1936, the process has been mainly utilized in large scale refineries. Production utilizing a scaled down Gas to Liquids plant is in the advanced research and development stage, with several pilot plants in operation in the USA and other parts of the world. Paradigm will construct a small, 15 tons per day Gas to Liquids pilot plant concurrently with the first phase, to facilitate onsite testing and refinement of Gas to Liquids technologies. In Phase Two, a full scale Gas to Liquids plant will be built, with the pilot plant then being utilized for development work on alternative feed stocks and technologies, thereby extending the range of technologies that Paradigm will possess in pursuit of future business strategies.

Upon completion of both phases, the project will generate three distinct revenue streams – 1) sale of recyclables; 2) sale of alternative fuels; and 3) sale of green electric power. By-products of water, recovered heat, and BioChar will also be produced. BioChar may be sold as a fertilizer, a soil amendment or a Solid Recovered Fuel, which is used as a green power source by power plants and cement kilns.

The Paradigm Energies Group has a long-standing aviation pedigree of commercial airport ownership & operation. Its management team also brings a wide range of demonstrated experience, achievement and capability in the fields of chemical production plants, fuels research and development, waste management, and property development. Its senior executives have extensive global business experience. Paradigm has also aligned itself with key local businessmen who possess extensive expertise in areas needed to move the project forward at the local level. It has a working relationship with Illinois State University, who has been selected to conduct economic impact and feasibility studies, perform analysis of the Municipal Solid Waste and other feed stocks, and to conduct testing and research in the Gas to Liquids portion of the project. Paradigm has entered into a teaming agreement with Hensel Phelps, a construction company with annual sales of over $3 Billion, for the design, development and construction of the facility, and with Southern Research Institute – North Carolina, to provide Municipal Solid Waste to Syngas gasification equipment for

electric power production and to provide its proprietary Gas to Liquids system, currently being tested in Durham, NC, for the conversion of Municipal Solid Waste to liquid fuels.

The Bloomington–Normal facility is the first of six identified sites where Paradigm plans to construct future plants. All of the sites have been selected based on the criteria of 1) their close proximity to regional airports which have a significant need for alternative aviation fuels; 2) the existence of a sufficient long term feed stock supply, primarily Municipal Solid Waste; and 3) the existence of solid business relationships previously established by the Paradigm management team. These locations are in the USA, Caribbean, Europe and Central America.

All domestic and commercial unsorted Municipal Solid Waste is delivered to the plant tipping floor for pre-screening. A sophisticated "Dirty" Materials Recycling Facility is then used to remove all recyclables such as glass, ferrous metals, plastics, plastic bottles, tin, aluminium, copper, and aggregates. This process combines the use of automated, manual and semi-mechanical methods to leave a residue of organic matter for consumption in the gasifier. Construction waste is hand sorted into organics and aggregate. Tires are shredded for gasification, with the steel banding removed for recycling. Yard waste, trees and brush can by processed "as-is" for fuel. It is projected that only 7% of incoming materials will not be processed or sold; requiring transport to a landfill. The organic material is processed into a Solid Recovered Fuel of 25MM by shredding/grinding/drying and then fed into a gasifier that recombines the carbon molecules into a Syngas fuel and BioChar solids. In Phase One the Syngas is mixed with methane to power multi-gas turbines connected to electrical generators for the generation of electrical power. In Phase Two the Syngas is passed directly into the Gas to Liquids plant for production of alternative liquid fuels.

The existing process technologies for a Materials Recycling Facility, gasification to Syngas and power island, are well proven and in widespread commercial operation today. However the optimum operating parameters of a small scale Gas to Liquids production plant (verses Gas to Liquids in large refineries) are still in the demonstrator stage. There is a Municipal solid Waste to alternative fuels batch pilot plant online in Chicago. Numerous demonstrator size plants are in the construction stage throughout the USA. British Airways is currently constructing a large, commercial scale Gas to Liquids plant outside of London for the production of power and 16 million gallons per year of alternative jet fuel. Paradigm believes, as does its technology partners, that technology and costs for a full scale, commercially viable Gas to Liquids system will exist by 2015.

Southern Research Institute, our technology-teaming partner, has proven experience with commercially proven gasifiers and is operating two gasifier pilot operations at their facility in Durham, NC. They also have proven experience in directly integrating the organics derived from MSW with their gasifier and Syngas clean-up system, using multifunctional Gas to Liquid catalysts. When properly integrated, these systems reduce capital expenditures and enable the design of commercially scalable integrated plants.

Commercial aviation is challenged by the rising and uncertain cost of jet fuel, which comprises about 40% of commercial carrier operating costs. Airlines are further challenged by their significant

contribution to green house gases through carbon emissions. The EU Emissions Trading Scheme, effective January 2012, imposed a carbon emission tax on all aircraft which fly in European air space. Using alternative jet fuel will mitigate this tax. Alternative aviation fuels are now seen as a critical component to reversing the emissions impact on the environment and potentially stabilizing fuel prices.

Since 2010, over 30 airlines have test flown or implemented commercial use of alternative jet fuel. Both the US Air Force and Navy have flown aircraft supersonically on alternative jet fuel and the Navy has run multiple surface ships on alternative fuels. The Air Force and the Navy have each committed to operating universally on a new single "battlefield" fuel comprising a 50/50 blend of alternative/fossil fuel by 2016 and 2020 respectively. Industry experts estimate there is need for at least 500 new Integrated Bio-Refinery in the USA and some 2,300 are projected to be needed in Europe.

Paradigm has assembled a core team of experienced executives from the aviation, chemical, petroleum and property/land development industries that have worked together for several years. Collectively they have experience in owning, developing, constructing and managing major capital assets in the US, UK and the rest of Europe, Middle East, South Africa and Australia, including owning and/or operating airports and fixed base operations at airports, and operating chemical plants. The team has significant involvement in new technology development and integration, from research through to commercialization.

Alan Robinson - President & CEO

James Brumwell LLB - Director & General Counsel

Michael Fearfield - Director

Orval Yarger - Director

Gail Farrin Robinson - Projects Director

Lester Vicary - Director of Business Services

Dr. Steven Johnson - Head of Process Research & Technology Integration

Paradigm is currently working closely with the following professional advisors:

Illinois State University (ISU) will be commissioned to perform the following tasks:

- Analysis of local supply chain – MSW, agricultural waste, food waste, tires, etc.
- Sustainability analysis and Economic Impact Study
- Review of end-to-end supply chain and resultant carbon footprint
- Quality control, testing, issues related to blending of fuels, certification, etc.

Southern Research Institute – operates a 3 and 10 ton per day pilot plant in Durham, North Carolina. Will provide the gasifier and GTL equipment. Southern has over 25,000 hours of experience in operating thermochemical conversion systems, for governmental and commercial clients. It will provide the core integrated conversion technology.

Andrews Engineering, Springfield, Illinois – Provide the schedule, costs and "fatal flaw" analysis for the entire zoning and permitting process. Served as engineer of record for all landfills located in the Bloomington/Normal and several others throughout Illinois. They have significant successful experience in the community, are specialists in obtaining permitting and zoning for landfills and Municipal Solid Waste transfer stations.

Hensel-Phelps Construction Company – provides EPC services for the federal government as well as a multitude of national and international clients. Annual sales in excess of $3 Billion. Committed to becoming a major contractor in the area of renewable energy plants.

Stern Brothers & Co. – Will structure the tax-free bond offering. Has extensive experience in USDA bond issues for the bio-fuel and renewable energy field.

Clifton Larson Allen, CPA – 8th largest accounting firm for privately held businesses. Will provide tax advice, conduct mass energy studies, review of financial models, and perform cost segregation analysis for construction of the Integrated Bio-Refinery. Coordinate international tax issues and corporate structure with UK tax advisors.

UK Professional Advisors

Shipleys, LLP, London – Auditors

IFS - International Fiscal Services Ltd. – International Tax Advisors

Charles Russell – London – Legal Advisors

Berwin Leighton Paisner – Legal Advisors

Wendy Briggs

From: Mark Peterson
Sent: Friday, December 14, 2012 3:56 PM
To: Sandy Fedden
Subject: BioAviation info. for Friday Memo
Attachments: Stern Brothers Biomass Nov2012 article.pdf; Normal City Council -- articles on waste to fuel.pdf; SRI WTE System Summary v2 12-7-2012-1.pptx; 121012 Dave Loomis PPT.ppt; BNL Pres-PBA HP SRIV5Final-10 Dec12.pptx

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Back to Business Intelligence

Meet the Biobanker

How bond-based financing are commercializing bioenergy

By [illegible] | October 30, 2012

The unemployment rate in the rural region surrounding Lake Providence, La., hovers around 18 percent. Thanks to Massachusetts-based Myriant Corp., the term biobased succinic acid will soon be synonymous in the struggling region, however, with the term employed. By the time Myriant begins operations at its 30 MMgy biobased chemical plant, 250 people in the area will have been employed to build the plant, and for everyday operations, another 50 will call the Lake Providence facility their full-time employer.

Although the creation of 50 jobs may not impress someone outside the region, for the biobased chemical industry, the story of Myriant's Lake Providence facility is significant. The story reveals what the future of biobased project finance looks like, why a town with a population under 4,000 is the new capital (unofficially) of the biobased chemical industry, and, why every new or future hire at Myriant's facility, or any other biobased facility that may soon begin operations, should thank a particular investment banker from St. Louis.

THE CAPITAL: Myriant's Lake Providence facility is a prime example that overnight [illegible] project [illegible] paid for. [illegible]

The Right Idea, the Right Time

John May calls St. Louis home, but his job requires a grueling travel schedule that takes him to places in South America, southern Florida and in the case of Myriant, Lake Providence. As the managing director at investment banking firm Stern Brothers & Co., May knows well what it takes for a company to secure funding to build a bioenergy plant. His client list includes nearly all of the advanced biofuel production companies who've applied for and secured commitments for guaranteed loans from USDA for commercial plant build out in the last two years, including: ZeaChem Inc., Chemtex International, Fulcrum Bioenergy, Enerkem Inc., Fiberight LLC and others. According to May, his success at Stern Brothers wouldn't have happened if his team hadn't decided to test a new financing strategy in 2002.

"Stern Brothers took a risk of its own in trying to create a demand in the bond market for bioenergy project finance among different types of funds," he says, including mutual, insurance and hedge funds. The result of May's attempts to create a demand for project debt in the bond market has proven, he says, that Stern Brothers was at the right place at the right time with the right idea.

May's idea on bond-based financing created in 2002 is also the same financial model used today by nearly all of his clients in bioenergy, including Myriant, and as May explains, there's one huge reason why: risk. The five major banks in the U.S. currently hold nearly 60 percent of all total bank assets in the country, meaning that if large scale projects over $25 million, receive traditional debt financing, one of the big five will be the source, May says. But, banks haven't been willing or able to lend significant sums of debt for the past 10 years, especially for projects that come with inherent risks like commercially unproven technology, feedstock input uncertainty or a lack of end user contracted agreements.

"The bank market of the U.S., and really around the world," May says, "is such that commercial banks aren't capable of handling a large, sophisticated transaction (like the Myriant project) because they simply do not have the risk appetite."

In the past, if U.S. banks were unwilling to provide project debt to bioenergy companies, developers could turn to European banks such as WestLB of New York. But, that office has closed and sold its renewable energy practice due to the exposure it faced in the European financial crisis. And, when May says U.S. banks don't have the risk appetite, it's because those banks simply can't take on projects with the risk profiles that many bioenergy project finance transactions represent. Upcoming Basel III new capital and liquidity standards, from the globally recognized banking standards committee that most globally recognized banks adhere too, could soon force large banks to adopt a strategy that some are already using: holding more cash or liquidity on hand, while avoiding (due to regulations that limit the ability of banks to invest in risk intensive deals) loans that are too risky and could result in a significant loss to a bank if a loan recipient defaulted.

And unless a company is willing to give up a significant portion of its collateral to strategic partners, venture capitalists or private equity providers through financing rounds, equity financing in exchange for company control is not an option.

Because May and his team knew that the bond market was not, and would not be under the same regulations of major banks or require a company to option off portions of its company, he went to the bond market.

Bioenergy firms however, haven't succeeded solely on bonds issued to mutual or hedge funds, in part, because May and his team realized something else: that investors looking at projects with higher risk profiles would need some element of certainty that their investment would pay off. To appease investors, May developed a project finance strategy that involves credit enhancing tools similar to a USDA loan guarantee which pushes a poorly rated bond up by assuring through the guarantee that a bond will be paid out if the loan recipient defaults, with a complex bond-placement structure that brings bond investors looking for small returns in the 4.5 to 6 percent range together with investors that are actually looking for riskier investments that could potentially return 14 to 17 percent.

Myriant, like nearly all of May's previous clients, is a prime example of what the bond based, credit-enhanced, structurally complex project finance model of today, and tomorrow, looks like. The Lake Providence facility is the first-ever biobased chemical plant to receive a USDA Business and Industry Rural Development loan guarantee, a program that has been around since the 1970s, and more importantly, offers a loan-backing provision that will guarantee up to 60 percent of the loan amount issued.

In Myriant's case, that meant $15 million of the bonds the company placed in the market were guaranteed by the USDA. Here is where the structure gets complex. In order to appease the investor who also wants higher yields (willing to underwrite the riskier investment), while also offering a bond package to the investor looking for a less-risky investment, May used the $15 million in guaranteed bonds, in combination with another $10 million worth of unguaranteed bonds to achieve a placement for $25 million with a very competitive blended rate. In short, May achieved a sweet spot rate that can attract risk-averse investors, who like the guaranteed portion, and risk seeking investors, who are all about the unguaranteed, 16 percent yielding portion.

Typical projects of this type have installed bond tenures in the 15- to 20-year range, allowing the bioenergy companies enough time to build the equity and produce fuels or chemicals and also comfortably manage amortization of outstanding principal and accrued interest. In the end, May has found a way to offer hope to project developers strapped with technology, feedstock or any other risk, by pairing an investment market (bonds) that has and will always have an appetite for the potential earnings created by a unguaranteed investment, with those in need of investments that hold a perceived risk. Although several of the transactions that May is working on in the bioproduct space will use USDA loan guarantees, he believes the bond market is viable even without credit enhancement.

Myriant's success at using the bond based financing approach wasn't just about the ability of May to explain the story of Myriant or the circumstances surrounding the bioenergy industry to investors, a message he says most bond investors understand. Feedstock requirements, off-take agreements, terms of debt and technology risk, he says, are all issues in other markets, but May says the bond market understands those factors may not all be answered in the world of bioenergy and be neatly wrapped and accounted for.

The Project Finance Regimen

Stephen Gatto, chairman and CEO of Myriant, is no stranger to bioenergy or project finance. He's already built and sold a biofuel production company and for the last 25 years, he's been working on project finance for office buildings, labs or fuel production plants. "My experience over the last 25 years is that project finance regimens, if utilized by themselves," Gatto says, "lower the cost of debt because they effectively lower the risk profile." That is exactly why Gatto says, in addition to performing independent engineering and technology analysis on Myriant's biochemical production process prior to seeking out funding, he decided to follow the bond based financing approach for his Lake Providence project.

May and Gatto share the same understanding of the bioenergy market, as evidenced through their history together. Gatto was the first person to let May deploy his bond-based financing method in the early 2000s. "Going into a project today, where you can mitigate the risk through contractual elements... is probably the only way you get these deals done," he says.

Gatto believes that if Myriant had attempted to use a traditional debt style financing, the weighted cost of capital received for the project, if any capital were received at all, would have been around 18 percent (almost 10 percent higher than that achieved by Stern Brothers for the Lake Providence project). "That is a very high cost of capital, certainly for a first of its kind plant," he says. If the success of Myriant's Lake Providence facility, or others who've worked under the guidance of May on bioenergy installations isn't enough to prove why bond based financing is the new normal for project finance, then Gatto's future expansion plans should. "We will not change our financial structure regimen," Gatto says, on plans for new plants. The company's future regimen will include a third-party process evaluation that allows investors to see that the company can deliver what it says it will, and the regimen will also go to the $1 trillion bond market for financing, a place where typical regulations don't exist and risk is welcomed.

Although the complex nature of issuing a renewable energy linked bond placement might sound as if an aspiring company would need a previous relationship to work with May and his team, it's not the case. May says he takes all calls from project developers, and is willing to pursue any type of bond-based project. The team is currently working on roughly 30 projects for 30 separate clients, the lion's share of which, he says, are in the biomass industry. Over the next 18 months, he believes at least six deals will go through, ranging in size from $25 million to $250 million. Typically, at any given time, his team has at least two bond placements on the market.

The life of a bond placement for a biobased company can be broken down into two parts. The first part involves a financial advisory relationship between a company such as Stern Brothers and the bioenergy firm. The first stage can last two to three months. The second part is the execution, when May sets up an online data room offering investors a chance to view a company's profile, technology and overall risk. That step can take roughly one year.

May and his team earn their compensation through monthly retainer fees and a placement fee that is paid when the bonds are sold to investors. The compensation can vary he says, but typically is based on 3 to 4 percent of the total amount of the bonds sold.

For companies interested in pursuing a bond-based financing package but are worried about expiring loan guarantee programs, May says his firm is already developing, or has developed other credit enhancing tools like insurance guarantees for certain technology. May believes that over the next few years his travel schedule will not decrease, and his bond-backed strategy will continue to offer the best alternative to traditional debt financing and in most cases, a better alternative. Comments from Gatto also show just how important the first-ever biobased project in the U.S., and its ability to deploy a bond based financing regimen, truly is for the entire industry. "The good news," Gatto says of his Louisiana plant, "is that the construction will be completed shortly. Not only do you prove to investors that the plant and the operations are viable, but you have effectively de-risked your second plant."

Author: Luke Geivet
Features Editor, Biomass Magazine
[redacted]

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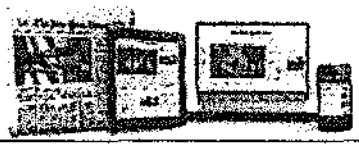


Wednesday, May 27, 2009

Converting Garbage into Fuel

Waste Management, a large waste company, gives technology for gasifying trash a boost.
By Kevin Bullis

Waste gasification: a process for converting garbage into fuel and electricity without incinerating it, may be a step closer to large-scale commercialization. Last week, Houston's Waste Management, a major garbage-collection and -disposal company, announced a joint venture with InEnTec, a startup based in Richland, WA, to commercialize InEnTec's plasma-gasification technology.

Waste Management will fund the new venture, which will be called S4 Energy Solutions, as well as provide infrastructure and expertise from its waste-collecting and -processing businesses to make the technology economical. The company, which will operate and market plasma-gasification technologies, will be announcing specific projects to build facilities later this year. The involvement of Waste Management could signal that the technology, which has been more expensive than other waste-disposal options, is finally reaching a stage at which it can be practical. "Up until late last year, it was under the radar," says James Childress, the executive director of the Gasification Technologies Council. "Now the big players are finally getting involved in this."

InEnTec's technology, originally developed at MIT and the Pacific Northwest National Laboratory, in Richland, WA, uses a multiple high-temperature processes--including subjecting garbage to plasma arcs--to break down organic materials into syngas, a mixture of hydrogen and carbon monoxide. Syngas can either be directly burned in gas turbines to produce electricity, or it can be converted into other fuels, including gasoline and ethanol. Metals and other inorganic materials in garbage can be isolated and recycled. The combination of high temperatures and an oxygen-poor environment that prevents the garbage from catching fire eliminates the production of dioxins and furans, two toxic chemicals produced during incineration.

That core technology has been proved, says Joseph Vaillancourt, managing director at Waste Management and the senior vice president of the new joint venture. What's kept it from being commercialized, he says, is the need to develop the processes for economically collecting and feeding waste into the system, and on the "back end," pairing the syngas produced with gas turbines for generating electricity, or other chemical processes for converting it into fuels. Vaillancourt says that Waste Management has already developed infrastructure for collecting and processing waste and for using heat from incinerators for generating electricity, and it will employ its "knowledge and wherewithal" to develop an "integrated system" using InEnTec's technology.

S4 Energy Solutions plans to market the first gasification units in specialized markets such as those concerned with the disposal of automobile shredder residue or medical waste, for which landfills often aren't an option, hence companies are willing to pay more to dispose of waste. Eventually, they could be used more generally for municipal solid waste, especially in rural towns and small cities that do not produce enough waste for cheaper incinerator technologies to be practical. The technology has the benefit of allowing customers to generate some of their own electricity, which could make it more affordable.

There may still be hurdles to commercial success. Childress notes that waste gasification may still face problems with local regulations. And companies using similar technologies have failed in the past. Nevertheless, some waste-gasification companies are reporting initial success. For

example. Enerkem, based in Edmonton, Alberta, has opened a commercial facility to convert used utility poles into methanol and ethanol. It has signed an agreement with the city of Edmonton to process 100,000 tons of municipal solid waste a year for 25 years, although that's still a relatively small amount compared with other options for disposing of waste.

technology review
Published by MIT

Friday, December 21, 2007

Fuel from Waste

A portable system converts biowaste into jet fuel and diesel for the military
By Prachi Patel

Last year, the U.S. military used more than five billion gallons of petroleum-based fuels. Transporting the fuel to battle zones and remote military bases is costly and time consuming, and the fuel is a prime target of terrorists. So the U.S. Department of Defense is looking for cheaper, more secure, and easier options.

Two companies, Diversified Energy and Velocys, are working together on a portable system that converts coal, natural gas, and biomass into diesel and jet fuel. The military could use the system to convert waste created at military bases--food scraps, paper, wood--into a fuel for military jets and vehicles.

The system has two main parts: a gasifier and a fuel reactor. Diversified Energy, an energy company based in Gilbert, AZ, will make the gasifier that converts any carbon-containing material into a mix of carbon monoxide and hydrogen, known as synthesis gas, or syngas. The fuel synthesizer made by Velocys, based in Plain City, OH, will convert the syngas into a hydrocarbon liquid fuel.

Converting waste into fuel at defense bases is the answer to two problems that the military faces, says Eric Sattler, project engineer at the army's Tank-Automotive Research, Development and Engineering Center, which is funding the new project. The transportation of fuel to bases accounts for 70 percent of military trucks and convoys that are on the road in Iraq and Afghanistan. At the same time, the military has to truck out waste from bases to dispose of it.

Portability is the key aspect of the waste-to-fuel system. Erik Kalkio, power and energy technology team leader at the army's research and engineering center, says that the system will have to be scalable to different sizes, making daily anywhere from about 2,100 to 21,000 gallons of fuel while weighing between 150 and 1,500 tons, respectively. The system should also be able to make fuel from various feedstocks, including coal and natural gas.

Jeff Hassannia, vice president of business development at Diversified Energy, says that the new gasifier and reactor technologies should meet these requirements. The military should be able to move the system on a semitruck or an aircraft carrier, he says.

In conventional gasifiers, hot steam or air is mixed directly with the biomass. But in Diversified Energy's gasifier, coal or biomass is introduced into a bath of molten iron and tin at a temperature of 1,300 °C to which steam has been added. Any carbon source immediately gasifies and produces carbon monoxide and hydrogen, says Hassannia. Using molten metal keeps the gasifier compact and produces syngas with significantly fewer impurities, which eliminates the cost of cleaning it.

Velocys's reactor, which converts the syngas into liquid fuel, is also compact and efficient. It is made of tiny crisscrossing channels, each between 0.01 and 0.2 inches wide. The syngas flows through some of these channels, where it comes in contact with a cobalt-based catalyst and gets converted into long chains of hydrocarbons. Other channels in the reactor carry a coolant--typically water--to absorb the heat from the catalytic reaction.

British Airways partner with Solena to convert trash into jet fuel

By Andrew Nusca | February 16, 2010, 7:58 AM PST

British Airways and Washington, D.C.-based bioenergy firm the **Solena Group** announced on Monday a partnership to establish Europe's first sustainable jet-fuel plant and convert trash into jet fuel.

The new fuel will be derived from waste biomass and manufactured in a new facility that can convert several types of waste materials destined for landfill into aviation fuel.

The airline said it plans to use the low-carbon fuel to power part of its fleet beginning in 2014.

The self-contained plant will likely be built in east London. It's expected to convert 551,000 tons of waste into 16 million gallons of green jet fuel each year.

Quick hits about the savings:

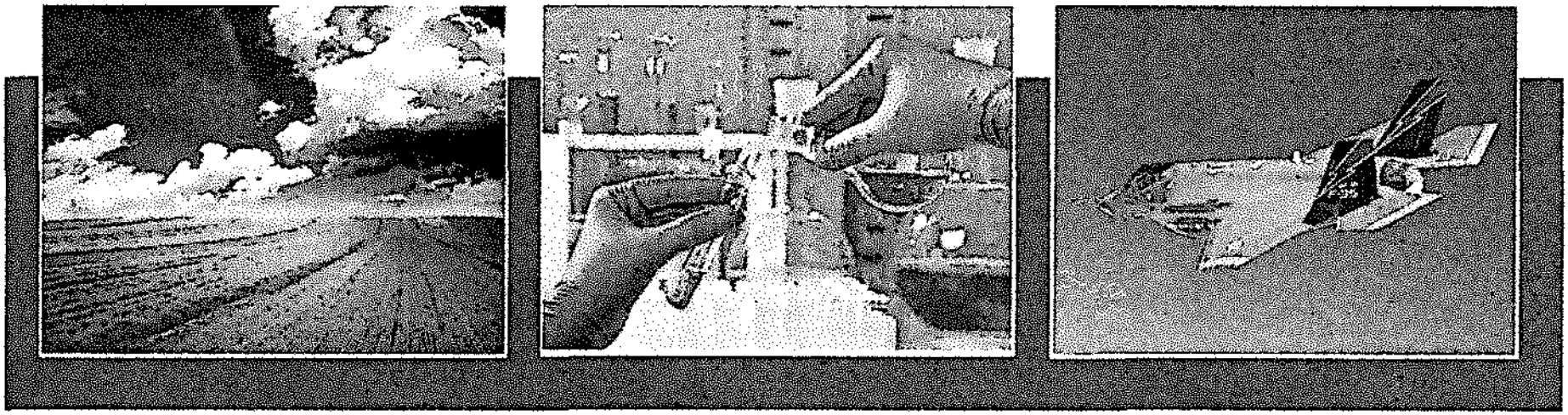
- The plant offers lifecycle greenhouse gas savings of up to 95 percent compared to fossil-fuel derived jet kerosene.
- The project will reduce the volume of waste sent to landfill.
- The plant itself will be CO_2 neutral, and will emit oxygen, plus small quantities of nitrogen, argon, steam and carbon dioxide.
- The only solid waste product is an inert vitrified slag material, which can be used as an alternative to aggregates used in construction.
- Tail gas can be used to produce 20MW of excess electricity for export to the national grid or converted into steam to be used in a district heating system.

The green fuel will be produced by feeding waste into a patented high temperature gasifier that produces BioSynGas, or biomass-derived synthetic gas. Using a process known as Fischer Tropsch, the gas is converted into biofuels to produce biojet fuel and bionaphtha.

Bionaphtha is used as a blending component in gasoline, as well as a feedstock for the petrochemicals industry.

The resulting fuel would make all of British Airways' flights at nearby London City Airport carbon-neutral, and is the equivalent of taking 48,000 cars off the road per year, BA says.

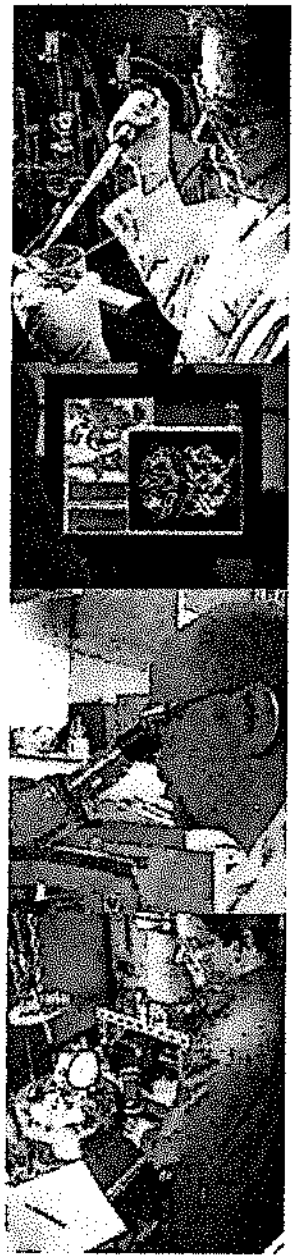
SOUTHERN RESEARCH
INSTITUTE



Southern Research Micro-Thermochemical Platform for Waste to Energy Applications

Southern Research Institute

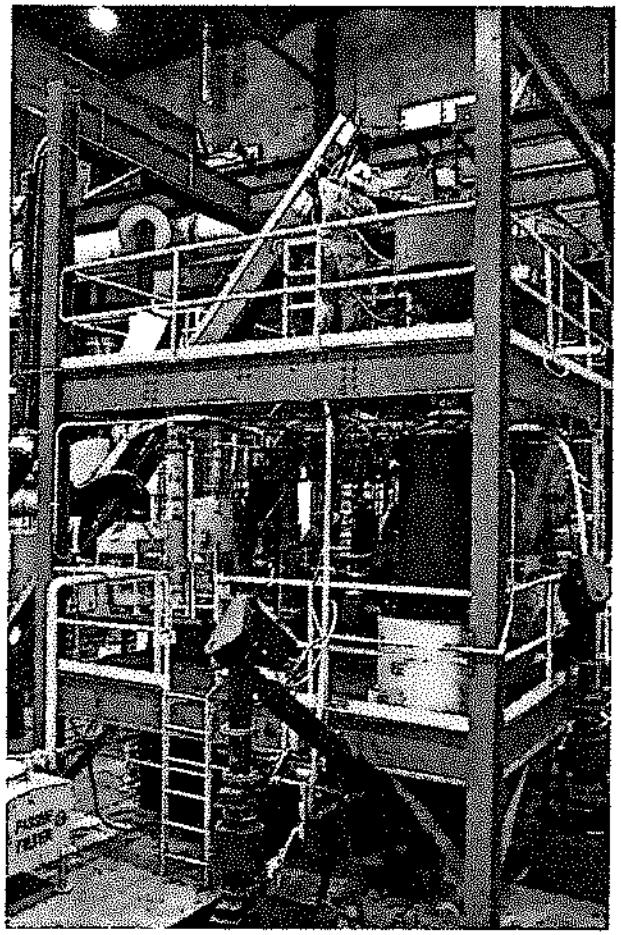
- Established in 1941 as an independent, not-for-profit (501-c-3) center for scientific research and development
- Headquartered in Birmingham, Alabama
- Revenues of $82.5 million in 2011
- Staff of over 500 employees
- Organized into three divisions:
  - Engineering, Environment, and Energy
  - Drug Discovery
  - Drug Development (pre-clinical)



SOUTHERN RESEARCH
INSTITUTE

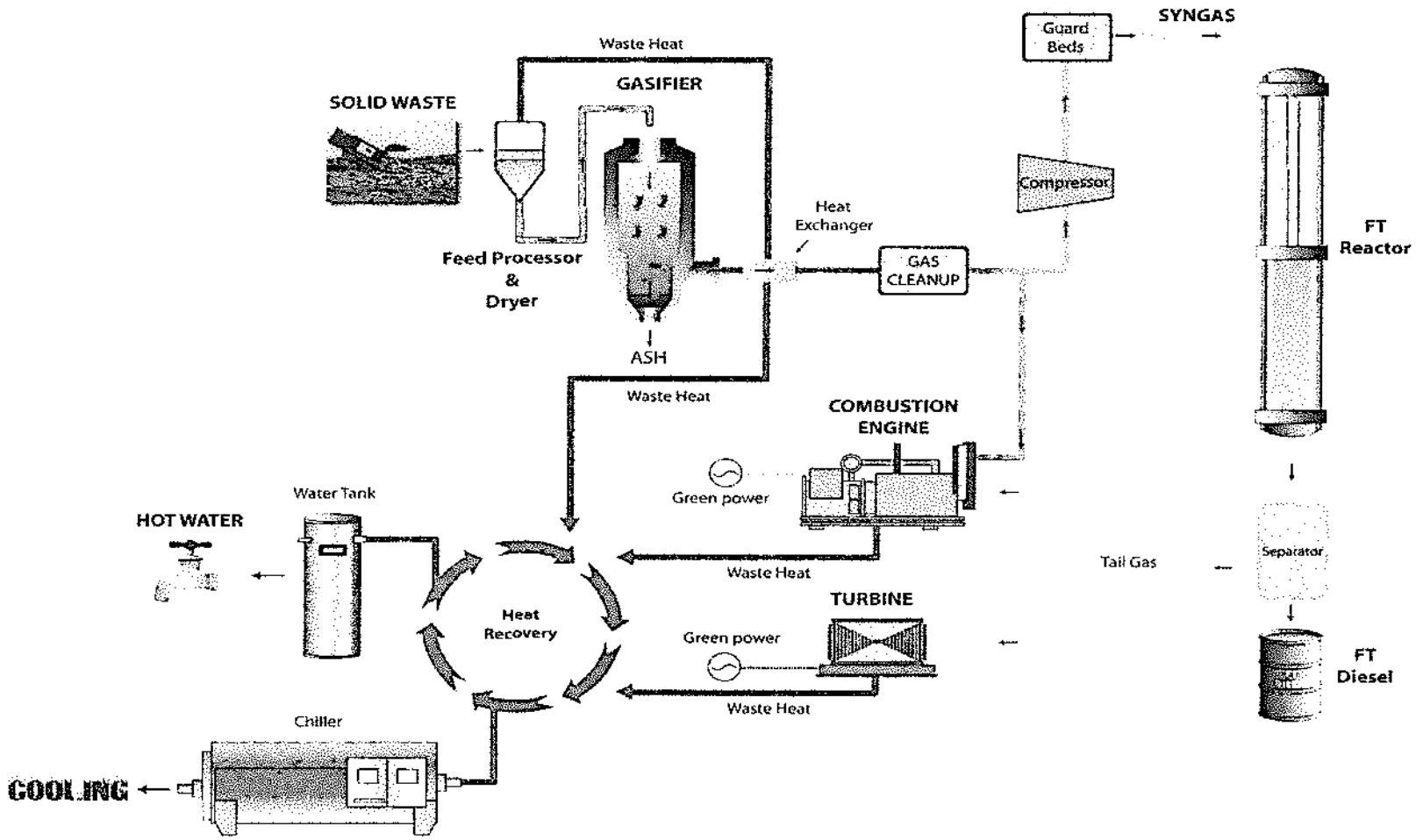
Southern Research
Micro-Thermochemical Platform

- In 2012 $4M committed by Southern Research for pilot development
- Green electrical power, biofuels, hot water, cooling, biochar
- Small distributed plants (1-200 tpd)
  - Reduced feedstock requirements and logistics
  - Reduced transportation distances and associated diesel use
  - Reduced capital cost and permitting requirements
  - Direct marketing of products in plant vicinity
  - Economic development for rural and under-developed areas

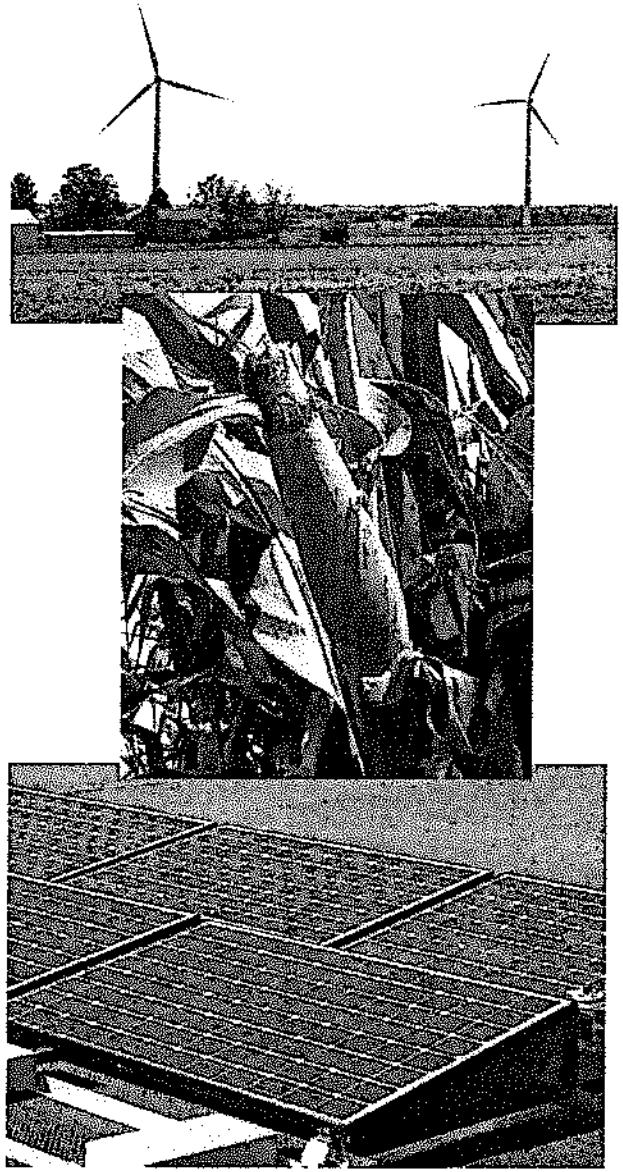


SOUTHERN RESEARCH
INSTITUTE

Modular Integrated System



SOUTHERN RESEARCH
INSTITUTE



CENTER FOR RENEWABLE ENERGY

Illinois State University

David G. Loomis, Ph.D.
Director, Center for Renewable Energy
Professor of Economics
Illinois State University

ILLINOIS STATE UNIVERSITY

Illinois' first public university

The Center for Renewable Energy is a research and public service unit formally recognized by the State of Illinois. It was approved by the Illinois State University Board of Trustees in November, 2007, and by the Illinois Board of Higher Education in August, 2008.

Director:

Dr. David Loomis, Department of Economics

Associate Directors:

Dr. Jin Jo, Department of Technology

David Kennell, Department of Technology

Dr. Randy Winter, Department of Agriculture

Staff:

Matt Aldeman, Senior Energy Analyst

Pam Fuller, Office Manager

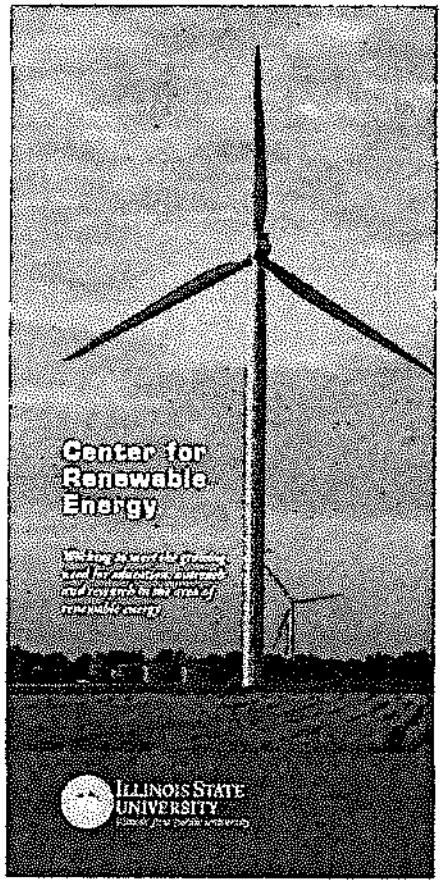
Janet Niezgoda, Marketing & Events

CENTER FOR RENEWABLE ENERGY

Illinois State University

Three major functional areas:

- Enhances the renewable energy major at Illinois State University.
- Serves the Illinois renewable energy community by providing information to the public.
- Encourages applied research concerning renewable energy at Illinois State University and through collaborations with other universities.



CENTER FOR RENEWABLE ENERGY

Illinois State University

Major Activities:

- Leads the Energy Learning Exchange as part of the Illinois Pathways STEM Education Initiative designed to support college and career readiness for all students.
- Administers the Illinois Wind Working Group affiliated with the U.S. Department of Energy's Wind Powering America state groups.
- Works as part of the team in coordinating the Illinois Wind for Schools program.
- Develops Economic Impact of Wind and Solar Energy in Illinois Reports.
- Received grants totaling over $2,270,000.

ParadigmBioAviation

Transforming Municipal Solid Waste

into

Renewable Bio-Jet Fuel

Bloomington – Normal, Illinois

Alan Robinson, President & CEO – AlanR@paradigmbioaviation.com

Presentation Team

Paradigm BioAviation LLC

Alan Robinson - CEO

Orval Yarger - Director

Lester Wm Vicary -Director of Business Services

Dr. Steven Johnson - Head of Process Research & Technology Integration

Doug Nord - Chairman Paradigm Advisory Board

Hensel Phelps Construction Co

Ian Spangler - Project Manager

Southern Research Institute

Tim Hansen - Director of Advanced Energy & Transportation Technologies

ISU

Prof. David Loomis - Director, Center for Renewable Energy,
Executive Director, Institute for Regulatory Policy Studies

Our Mission Statement

The Production of Alternative Fuels and Power for commercial, corporate and military markets through deployment of Bio-Synthetic fuel production technologies into regional Integrated Biofuel Refineries (IBR's) using locally available feedstock, to:

- Converting organic waste (Agro & MSW) to Liquid Fuels and Power
- Empower communities with green options for Energy & Jobs
- Facilitate Zero Landfill growth & single stream recycling
- Significantly reduce dependence upon imported fossil fuels.
- Buffer military against Peak Oil with local fuel production
- Reduce aviation carbon emissions to ICAO objectives

Paradigm's – Our Roots

We are historically an Aviation, Telecommunications, Chemicals, Pharmaceutical, Property and infrastructure Group - USA, UK and Europe.

- Aviation - Owned, operated, & designed regional commercial airports and FBO's in UK, Europe and South Atlantic plus part 91 & 135 operations –30 yrs experience

- Telecommunications - Owned & operated Telephony, Cable TV, Submarine cable and Wireless - founded Telewest (UK) which IPO'd for £1.4bn –24 yrs experience

- Chemical & Pharmaceutical - Managed plants in USA and Europe - 25yrs

- Infrastructure construction- Middle East & Europe - regional power generation, roads, Airports, telecoms systems –land, submarine, wireless, and IDC's

Our IBR Teaming Partners

Hensel Phelps Construction Co

Our EPC and General contractor

Southern Research Institute

Our Gasification and GTL technology development supplier

Illinois State University ISU

Our Economics and Feedstock Research provider

Paradigm's MSW to Alternative JetFuel Timeline

For MSW to Alternative Aviation Fuels & Power IBR plant in Bloomington, IL

Preparation and Development Phase

- 2006 – Investigate Carbon CO^2 reduction in Coventry Airport, operations, UK
- 2009 – ACI Europe launches Airport Carbon Accreditation ACA program at AGM.
- 2009 – EU commission announces EUETS tax on aircraft emissions will take effect in January 2012.
- 2010 – Paradigm moots vertical integration for Airport & Aircraft Carbon Emission reductions with production and use of Alternative Fuels instead of CER credits for planting "Trees in Brazil"
- 2010- 2011- Extensive research into feedstock, Algae, Jatropha, Camalina, Switchgrasses, Wood Pellets, and Organic Wastes – Crop and MSW
- 2011-2012 – Working from AIRCRAFT BACKWARDS - *Research supply chain risks,* feedstock types & availability, production methods, site locations, airport storage, blending and inter-plane infrastructure

ParadigmBioAviation

Paradigm's MSW to Alternative JetFuel Timeline

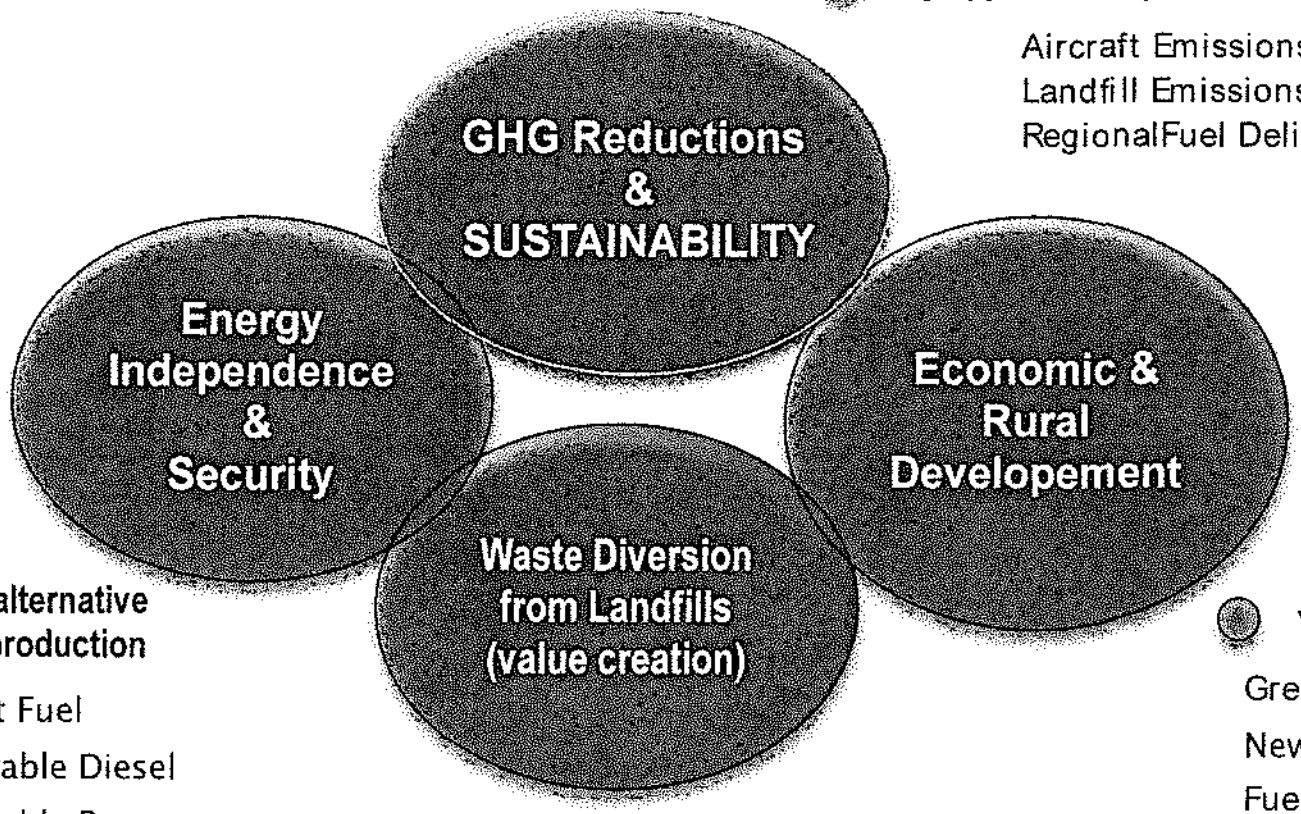
For MSW to Alternative Aviation Fuels & Power IBR plant in Bloomington, IL

Permitting, Construction and Operational Phases

- 2012 – Secured land, feedstock availability, off-take agreements, technology options, modeling, risk mitigation and routes to market.
- 2013 – site permitting, interconnection studies, EPC work, bond funding, etc.
- 2014- 2015 Construction & commissioning for MRF, Gasification, Power & GTL Pilot
- 2016 – BNL Landfill closes - Start Full commercial operation of MRF, Power & RDF plus GTL pilot
- 2017 – Commercial Alternative fuels plant constructed – based on cost scalability of GTL
- 2018 – Full production of alternative aviation fuels – JetA, 100LL, Diesel & Gasoline
- 2017 – Replication of Paradigm MRF/IBR facilities in in USA, UK and EU, regional and island communities with airports

ParadigmBioAviation

Paradigm's Answer to Aviation Emissions Challenges



By approximately 80%

Aircraft Emissions
Landfill Emissions
RegionalFuel Delivery Chain

Local alternative fuels production

SPK Jet Fuel
Renewable Diesel
Renewable Power
Renewable Heat

Sustainable alternative to landfilling

Single point recycling
Clean Energy generation
Land reclaimation

Value Creation

Green Jobs
New Industries
Fuel Self Su□ ciency
Lower Air Pollution
Local Tax Contributions

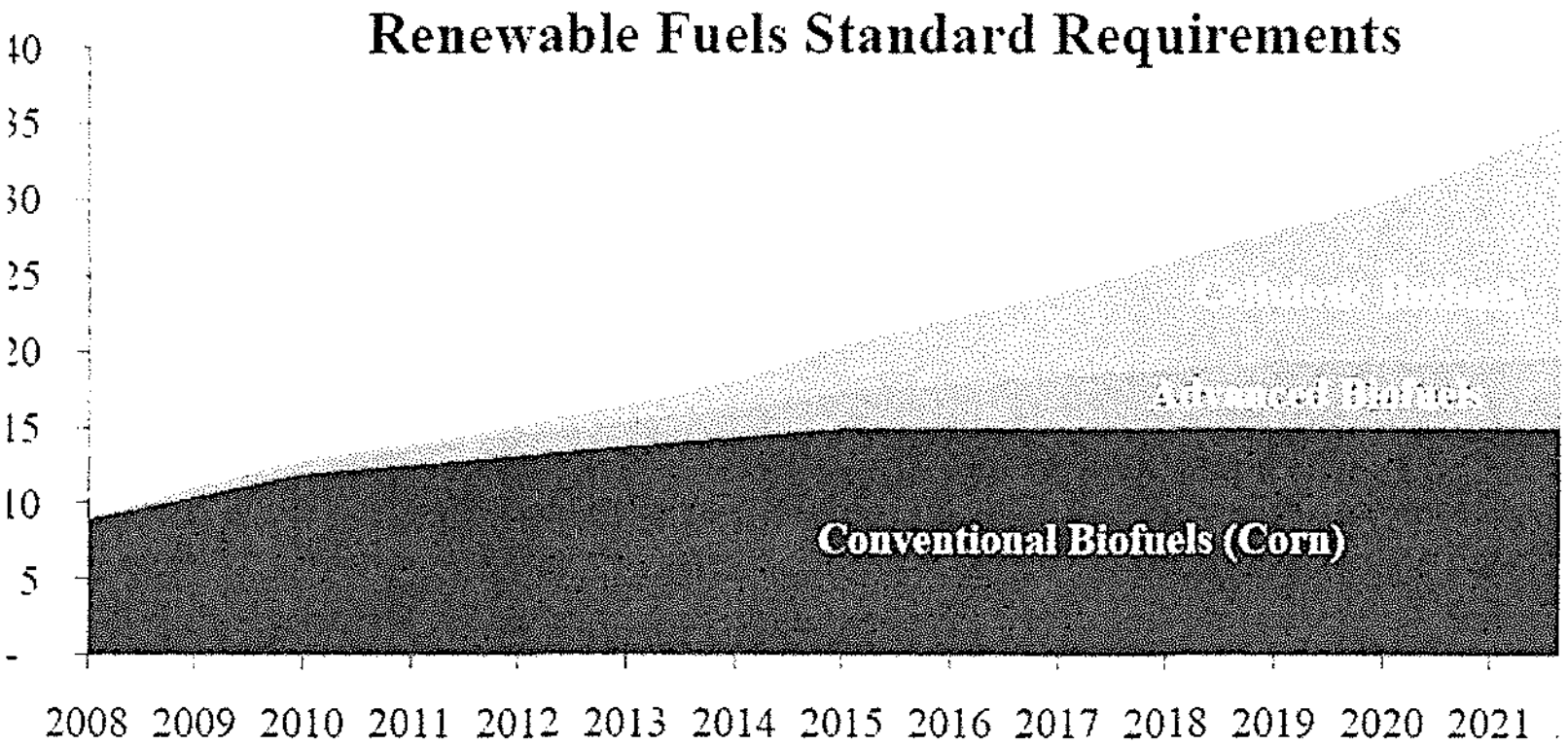
ParadigmBioAviation
10 December 2012

Why now - Global and Economic Drivers

- Peak Oil- It's going to happen, its only a matter of time - early adoption is a must.
- Commercialization of IBR technology has been a long process
- Regional fuels production is a new paradigm (& window of opportunity)
  - Obtaining sustainable local feedstock is crucial.
  - Zero new landfills is being socially responsible
- Support & Consensus with State & Local government as is essential.
- Additional airport & upgrade infrastructure will be required to meet future Carbon Neutral aviation needs.

ParadigmBioAviation

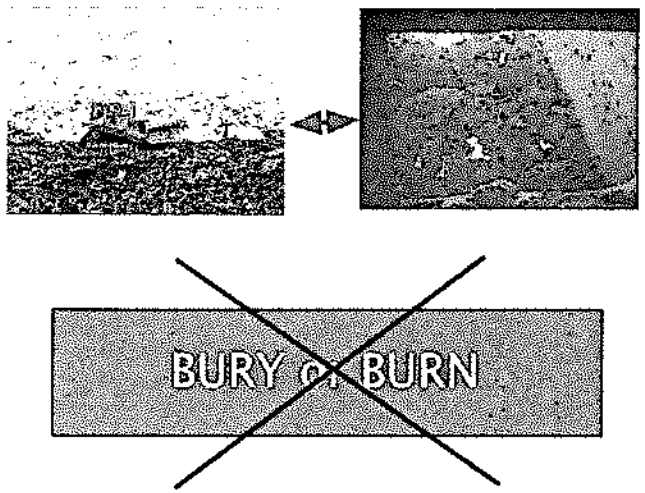
RFS2 (EPA) Calls for 36bn gpy by 2022

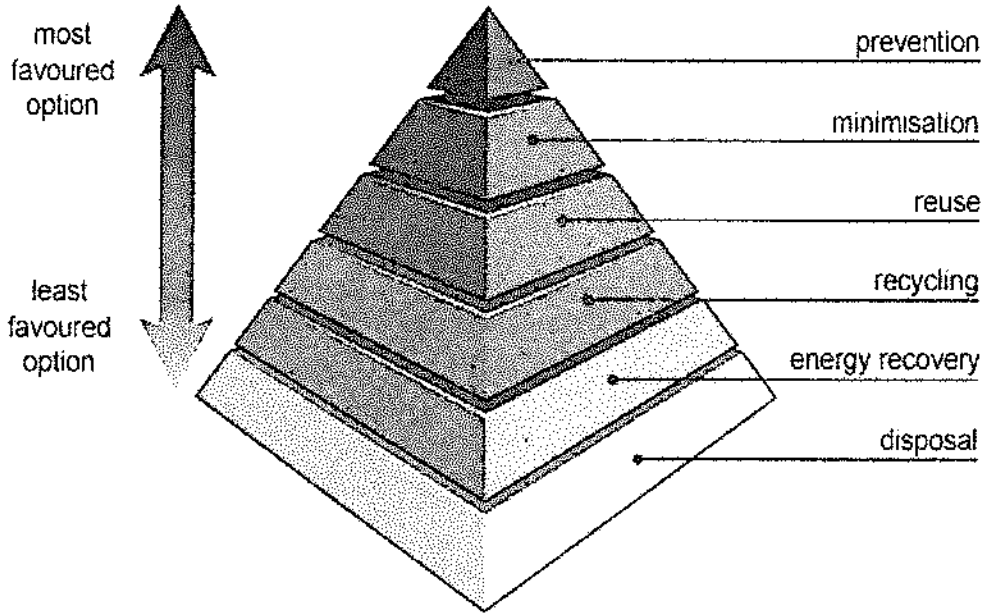


: H.R. 6 – Energy Independence and Security Act of 2007

The Renewables Fuel Standard 2 (RFS2), Calls for 36bn gallons per year to be in production by 2022

MSW Becomes an Alternative Fuel



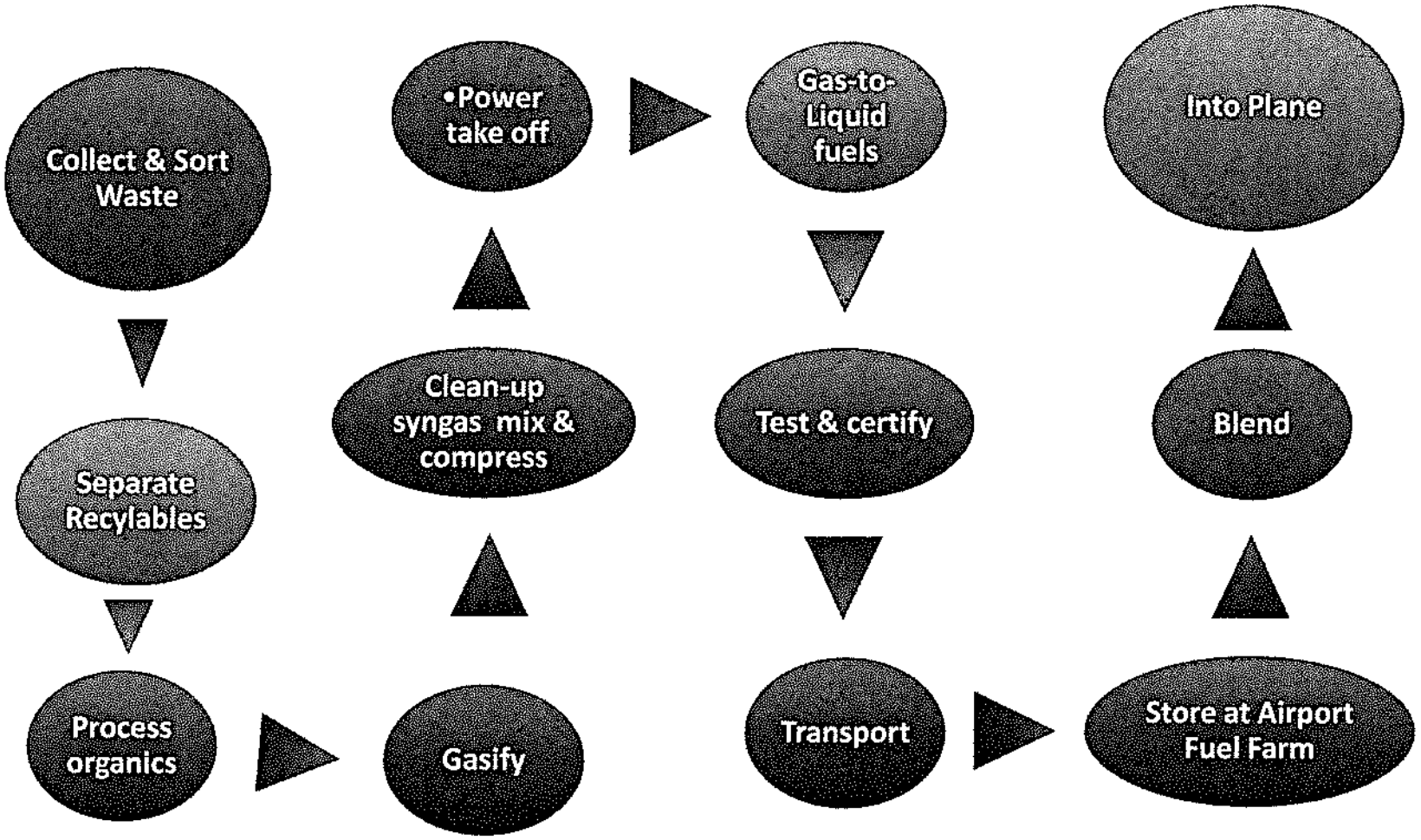


Chemical Reformation Plant rearranges molecules to specified liquid fuel

Source APP

PARTNERSHIPS FOR BNL PLANT CONSTRUCTION

PARADIGM'S SELECTED PROCESS

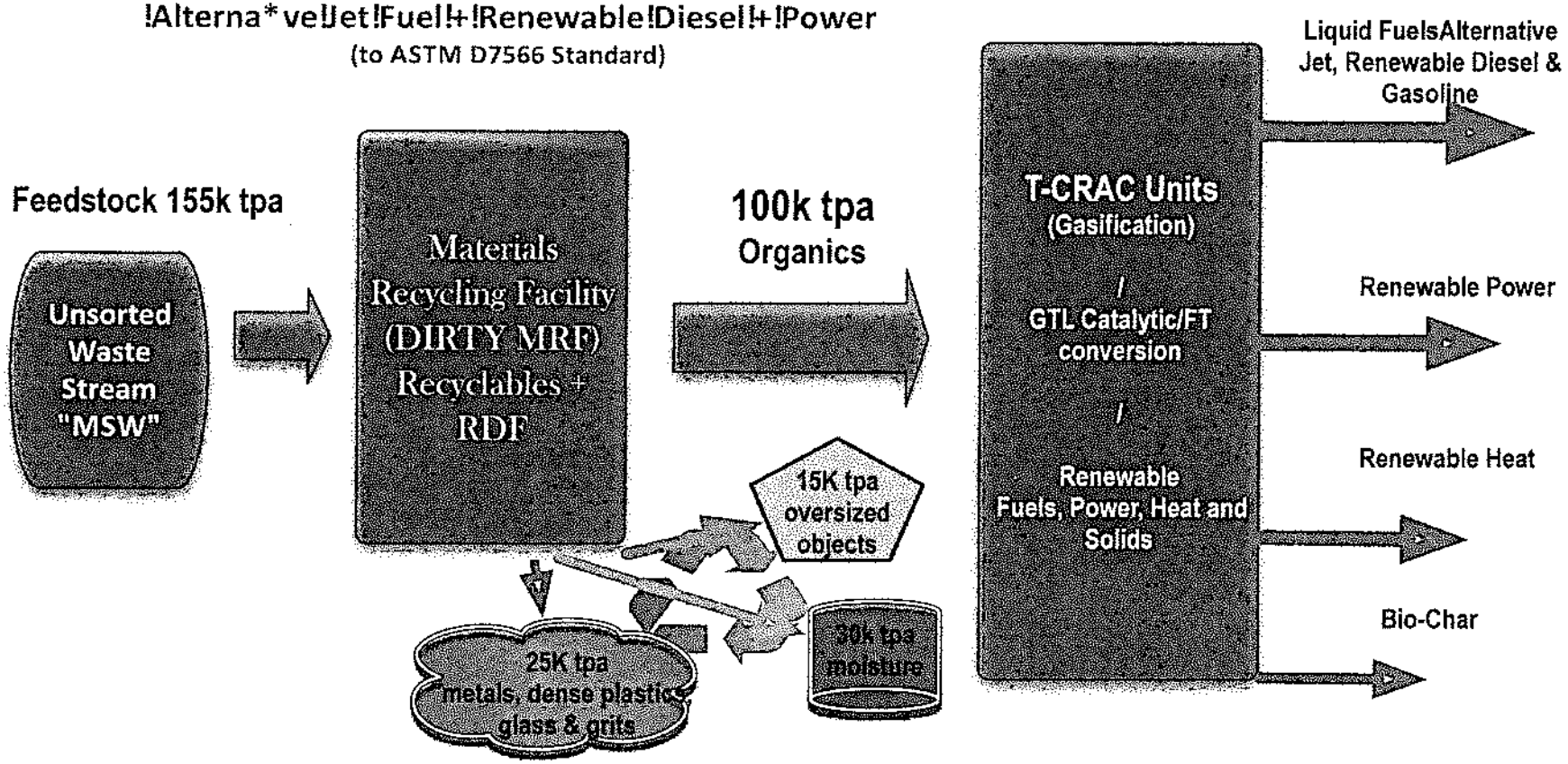


FULL COMMERCIAL PLANT– 330 tpd

MSW Waste VIA Thermochemical Carbon Reforma9on & Cogenera9on to

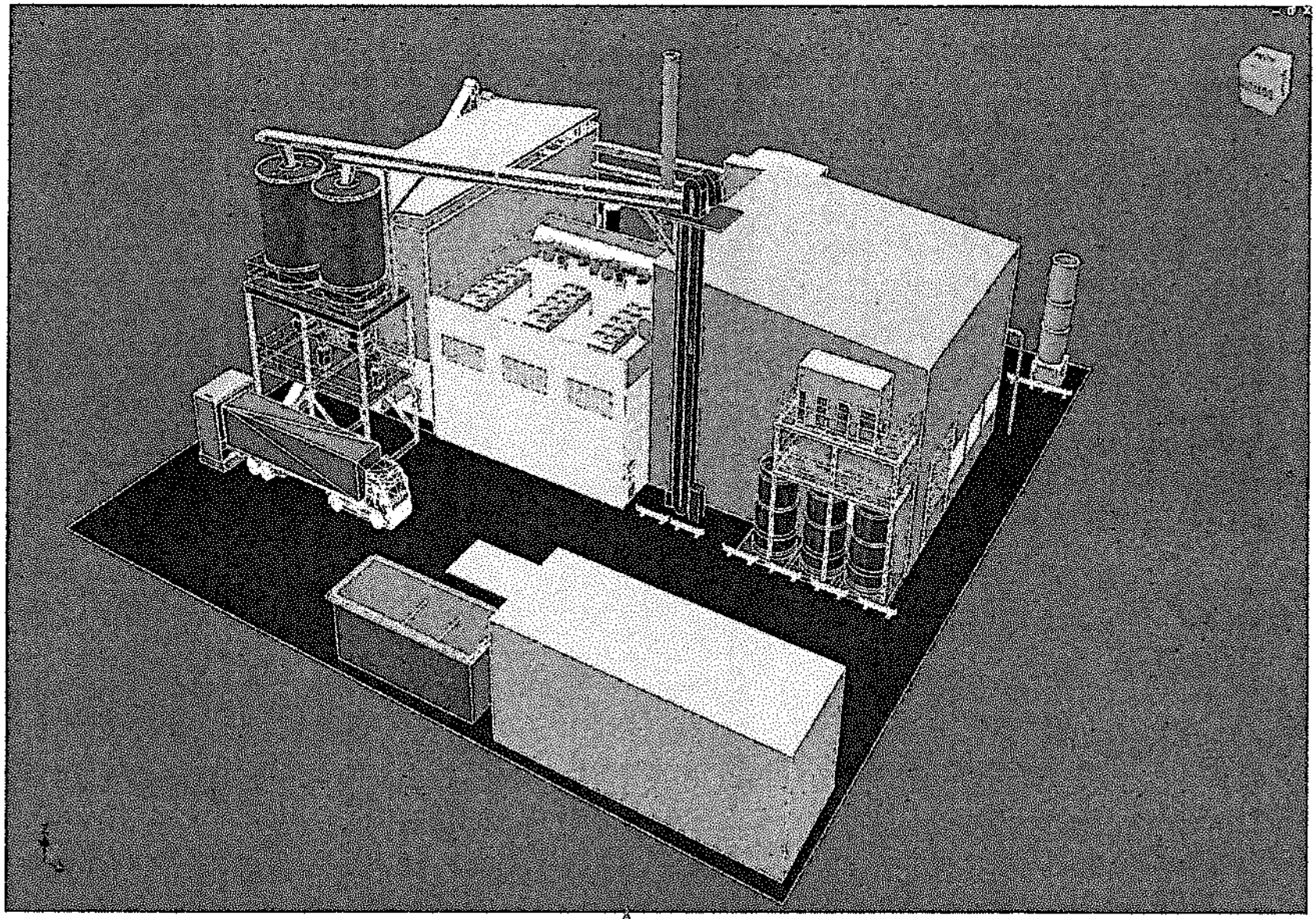
Alterna*ve Jet Fuel + Renewable Diesel + Power

(to ASTM D7566 Standard)



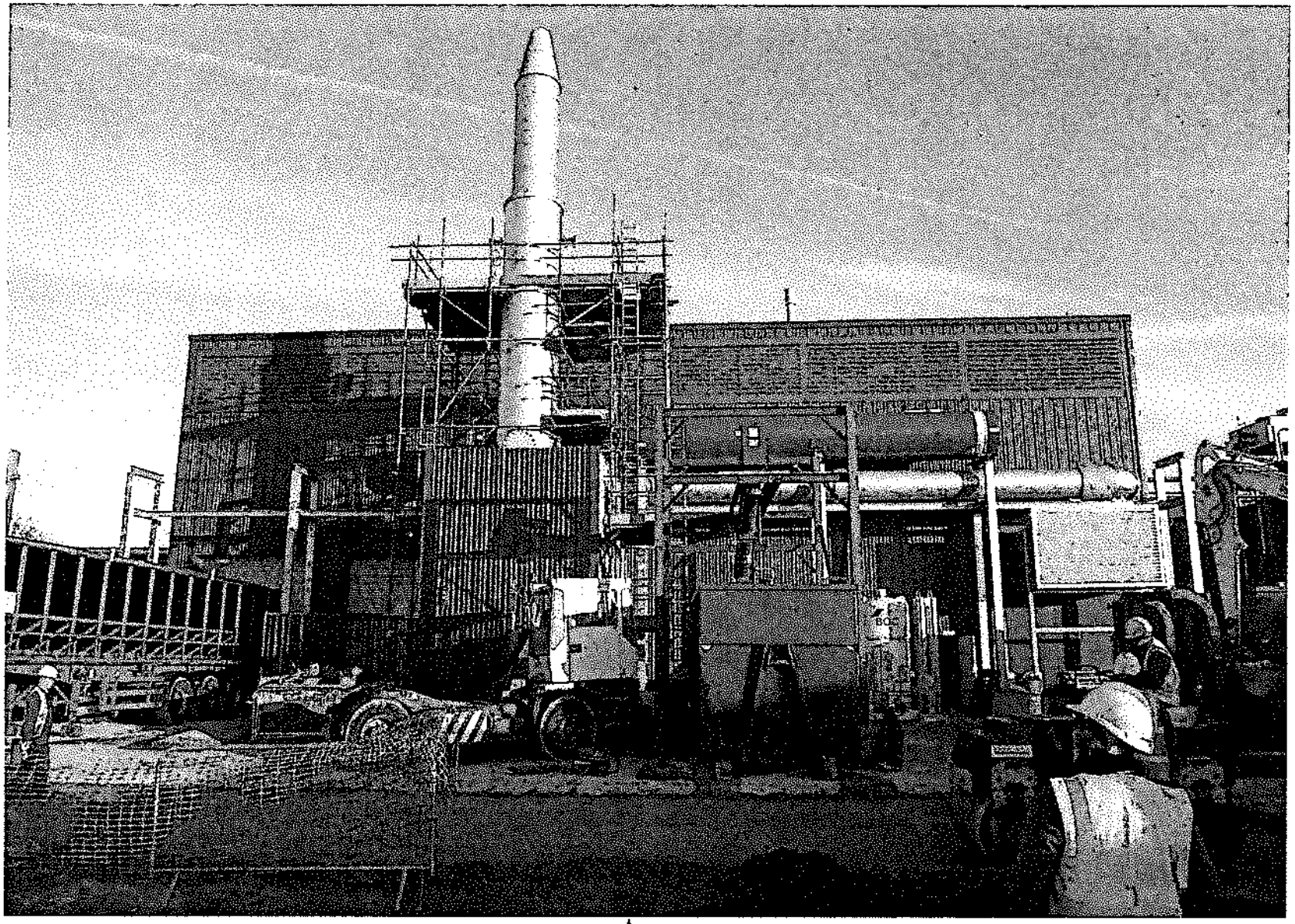
- Liquid Fuels - Alternative Jet Fuel , Renewable Diesel, & Gasoline - 8M gals
- Renewable Electrical Power Generation - 5+MWhe
- Bio-Char & Ash for fertilizers & building materials
- Jobs Creation - Direct, Indirect & Induced - c.760 jobs

Concept Drawing of 11.7 MWe MSW to Power Plant

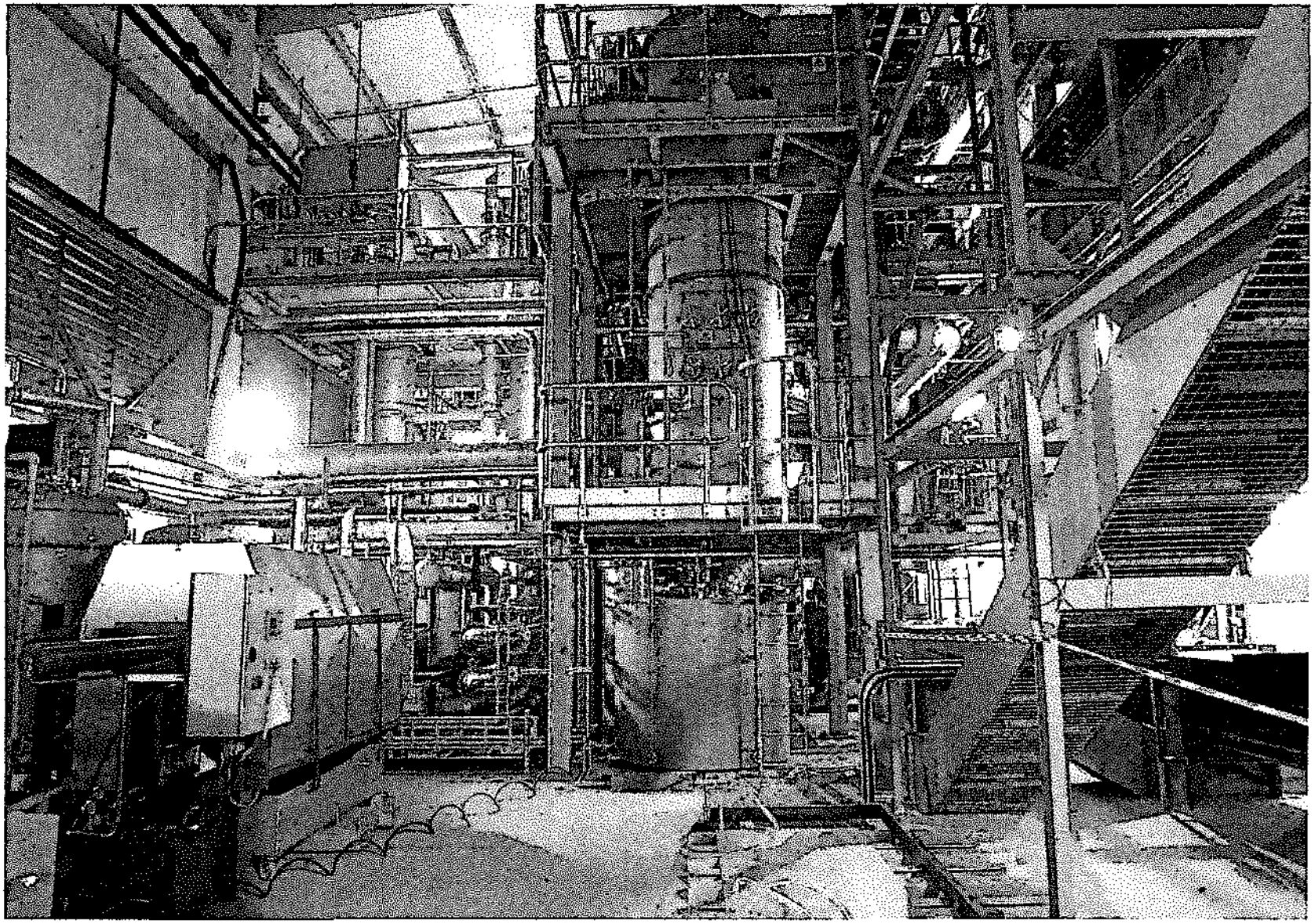


Concept Drawing of 11.7 Mwe with 6 gasifiers & generators

Actual 11.7 Mwe MSW to Power Plant at Nottingham UK



Gasifier section of Plant at Nottingham UK



Economics of Alternative Alternative Jet at BNL

- MSW is long-term sustainable feedstock
- Conversion to Alternative fuels is cost competitive to conventional fossil fuels
- Processing provides superior local recycling of metals, glass and plastics -reduces city operating costs
- Local production and local consumption reduces transportation costs and increases profitability
- Creation of 760+ direct, indirect & induced green jobs
- Circa 70% of $120 million of construction materials and labor costs will stay in Illinois.
- Alternative Jet Fuel produced at BNL plant will reduce carbon emission by 150,000 tons

Benefits to Bloomington-Normal

- **TOWARDS "ZERO LANDFILL"** – no need for new landfill post 2016
- **INCREASED EFFICIENCY** of recycling – Sophisticated MRF will increase recycling and the removal of materials from the present waste stream
- **POWER GENERATION** - opens possibility for GREEN MICRO-GRID for ISU and Electric Cars, for example
- **ALTERNATIVE FUELS** Production – Local availability of Alternative-Jet, Diesel & Gasoline reduces dependency on imported fuels, attractive to Airlines, cleaner environment
- **SPIN-OFF INDUSTRIES** – building and energy materials from bio-char and recycled waste
- **EMPLOYMENT** – Generates in excess of 700 Green Jobs
- **INWARD INVESTMENT** – c. $120 million, 70% spent in Illinois
- **MULTIFACITED R&D Platform** – Long-term benefits for ISU and U of I and association with MIT/FAA/NASA
- **POSITIVE ECONOMIC IMPACT** to regional economy of c. $200 million

Key Issues for 2013

ParadigmBioAviation

2012 What we have achieved

- Secured Land Option for BNL Plant including #1 Landfill & Metane System
- Secured Technology Partners for BNL Plant
- Secured Local Partners
- Secured take-off agreements for Alternative Jet Fuel
- Secured local key management team

2013 Critical Issues for Progress & Implementation

- To secure 20 yr MSW Supply contract with BNL to start from 2016
- Provide 10 year off-take agreement for supply of green power to BNL
- Provide 10 year renewable diesel off-take agreement to BNL
- Secure Siting Ordinance approval for BNL Plant
- To Secure Bloomington & Normal Tax Free Bonding capacity

2013	2014 & 2015	2016
Final Design & Permiting	Construction Phase 1	Phase 1 Operations

Wendy Briggs

From: Mark Peterson
Sent: Monday, July 28, 2014 11:03 AM
To: Brian Day
Cc: Wayne Aldrich; Sally Heffernan
Subject: RE: Paradigm Questions

Brian, Looks like a good list to me. Other questions may come up in the future, but this is a good start. If Wayne & Sally have no suggested additions or deletions, you can deliver this list to Paradigm (today when you meet with Rob & George is fine with me). mp

Mark R. Peterson
City Manager
Town of Normal
Normal, IL 61761
(309) 454-9777
mpeterson@normal.org

"Committed to Service Excellence"

Please consider the environment before printing this e-mail

From: Brian Day
Sent: Monday, July 28, 2014 9:13 AM
To: Mark Peterson
Cc: Wayne Aldrich; Sally Heffernan
Subject: Paradigm Questions

Mark,

Attached is my list of questions concerning the Host Agreement submitted by Paradigm. I've incorporated the questions that you submitted.

--
Brian Day
Corporation Counsel
Town of Normal
11 Uptown Circle
Normal, IL 61761
309-454-9505
bday@normal.org

Wendy Briggs

From: Wayne Aldrich
Sent: Monday, July 28, 2014 12:09 PM
To: Mark Peterson; Brian Day
Cc: Sally Heffernan
Subject: RE: Paradigm Questions

Brian,
I have no additional questions.

Thanks,
Wayne

Wayne Aldrich P.E.
Director of Public Works
Town of Normal
1301 Warriner Street
Normal, IL 61761-0589
Phone: (309) 454-9576

"Changing the definition!"

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bday@normal.org

Wendy Briggs

From: Brian Day
Sent: Monday, July 28, 2014 11:17 AM
To: Mark Peterson
Cc: Wayne Aldrich; Sally Heffernan
Subject: RE: Paradigm Questions

I'll tell him at the meeting that it is coming, but I like your idea of sending it through the mail.

I will mail it out Wednesday to give Wayne and Sally the opportunity to add something if they want.

--
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Town of Normal
11 Uptown Circle
Normal, IL 61761
309-454-9505
bday@normal.org

Wendy Briggs

From: Rodriguez, Luis Felipe <luisfr@illinois.edu>
Sent: Wednesday, February 26, 2014 12:01 PM
To: Robert Fazzini; OBrien, Kevin Charles; Tom Kirk; doug@nordpower.com; todd@midwest-fiber.com; 'Tari Renner'; billj@johnston-contractors.com
Cc: Alan S M Robinson; 'Dr Steve Johnson'; Mark Peterson
Subject: RE: Paradigm Reception at DESTIHL

Robert, Alan, Steve

Annie I enjoyed your hospitability and the conversations with all attending your reception last Sunday.
We look forward to work with you to continue our mission by supporting sustainability initiatives to help improve the environment, people and the economy of cities in Illinois.

Best regards,

Luis

From: Robert Fazzini [mailto:robert.fazzini@gmail.com]
Sent: Wednesday, February 26, 2014 10:35 AM
To: Rodriguez, Luis Felipe; OBrien, Kevin Charles; Tom Kirk; doug@nordpower.com; todd@midwest-fiber.com; 'Tari Renner'; billj@johnston-contractors.com
Cc: Alan S M Robinson; 'Dr Steve Johnson'; mpeterson@normal.org
Subject: Paradigm Reception at DESTIHL

Alan, Steve and I would like to thank you all for coming to the reception at DESTIHL on Sunday evening. We hope you all enjoyed talking with others who have an interest in our plans to establish the plant to transform Municipal Solid Waste (MSW) into Renewable Power & Alternative Jet Fuel. Alan talked about some of the advantages to our community such as being able to avoid sending material to the landfill that is scheduled to be full in two years, employing 100 people in the plant operation, employing workers to build the plant, and reducing carbon omissions by no need for trucking MSW to Clinton or Pontiac. Being part of a project to make our community the first to establish such a plant in the USA to be replicated in other communities is simply too exciting not to help become a reality. This last advantage will encourage other companies to locate in our community as well as help us attract residents.

As Alan emphasized, we want to make this a community project with all of you involved as we move forward. We certainly appreciate the encouragement already received from the City of Bloomington and the Town of Normal. The reputation of the Illinois Sustainable Technology Center from the U. of I. working with us certainly adds to the credibility of our project.

Let me close by saying thanks to Kevin for bringing Rebecca, Luis from bringing Annie, Tom for bringing Anita, Doug for bringing Deb and Tari for bringing Margo. I know that Lyn Johnson and Lynne Fazzini enjoyed meeting all of you.

Robert B. Fazzini

Wendy Briggs

From: OBrien, Kevin Charles <kcobrien@illinois.edu>
Sent: Wednesday, February 26, 2014 11:49 AM
To: Robert Fazzini; Rodriguez, Luis Felipe; Tom Kirk; doug@nordpower.com; todd@midwest-fiber.com; 'Tari Renner'; billj@johnston-contractors.com
Cc: Alan S M Robinson; 'Dr Steve Johnson'; Mark Peterson
Subject: RE: Paradigm Reception at DESTIHL

Robert,

We too enjoyed meeting everyone and continuing to explore how this project could provide value to the community.

We were excited to meet all the different stakeholders and look forward to providing support to the community as this vision moves forward.

Kevin C. OBrien, Ph.D.
Director
Illinois Sustainable Technology Center
One East Hazelwood Drive
Champaign, IL 61820-7465
http://www.istc.illinois.edu/

phone: +1 217-244-7682
fax #: +1 217-333-8944
Mobile: +1 [redacted]

ILLINOIS SUSTAINABLE TECHNOLOGY CENTER

From: Robert Fazzini [mailto:robert.fazzini@gmail.com]
Sent: Wednesday, February 26, 2014 10:35 AM
To: Rodriguez, Luis Felipe; OBrien, Kevin Charles; Tom Kirk; doug@nordpower.com; todd@midwest-fiber.com; 'Tari Renner'; billj@johnston-contractors.com
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Click here to report this email as spam.

Wendy Briggs

From: Pinnamaraju, Vasudha <VPinnamaraju@mcplan.org>
Sent: Thursday, February 13, 2014 1:15 PM
To: Wayne Aldrich; Michael Brown; Ken Springer; Tom Bierma; Jim Karch, PE CFM
Subject: RE: PHG Energy Information requested

Count me in as well.

Vasu

Vasudha Pinnamaraju, AICP
Executive Director

McLean County Regional Planning Commission
115 E. Washington St., Ste. M103
Bloomington, IL 61701-4089
Phone: 309-828-4331 ext. 22
Fax: 309-827-4773
Web: www.mcplan.org
McLean County Regional Planning Commission

From: Wayne Aldrich [mailto:waldrich@normal.org]
Sent: Thursday, February 13, 2014 1:18 PM
To: Michael Brown; Ken Springer; Tom Bierma; Jim Karch, PE CFM; Pinnamaraju, Vasudha
Subject: RE: PHG Energy Information requested

Michael,
I would like to attend a meeting with PHG.

Thanks,
Wayne

Wayne Aldrich P.E.
Director of Public Works
Town of Normal
1301 Warriner Street
Normal, IL 61761-0589
Phone: (309) 454-9576

"Changing the definition!"

From: Michael Brown [mailto:mbrown@ecologyactioncenter.org]
Sent: Thursday, February 13, 2014 9:43 AM
To: Ken Springer; Tom Bierma; Jim Karch, PE CFM; Vasudha Pinnamaraju

Cc: Wayne Aldrich
Subject: Fwd: PHG Energy Information requested

Good morning,

I had an interesting conversation about biomass gasification to energy with Mike Pawlowski of PHG Energy

yesterday
, thanks to Wayne for referring him to me. See his email below as well as some links to learn more about what their company has done in other communities such as Covington, Tennessee with biomass gasification energy generation.

Mike lives near here in Fairbury; I discussed the possibility of setting up a meeting with a few people in from Bloomington-Normal to hear more about the possibilities from this technology. My goal is simply to expose

some key
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Ecology Action Center
mbrown@ecologyactioncenter.org
www.ecologyactioncenter.org
309-454-3169 x.11

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Mike Pawlowski

PHG Energy

815.692.4220 office

[redacted] cell

Wendy Briggs

From: tbierma@ilstu.edu
Sent: Thursday, February 13, 2014 1:28 PM
To: Pinnamaraju, Vasudha
Cc: Wayne Aldrich; Michael Brown; Ken Springer; Jim Karch, PE CFM
Subject: RE: PHG Energy Information requested

Thanks, Michael. I'd like to attend.

From their web site it sounds like a similar, competing technology to Paradigm. I think both use downdraft gasification to turn the waste into syngas. But PHG appears to burn the gas to generate electricity while Paradigm would reformulate the gas into jet fuel.

Tom

Quoting "Pinnamaraju, Vasudha" <VPinnamaraju@mcplan.org>:

> Count me in as well.
>
> Vasu
>
> Vasudha Pinnamaraju, AICP
> Executive Director
>
> [cid:image001.png@01CF28BD.9AC25230]
> McLean County Regional Planning Commission
> 115 E. Washington St., Ste. M103
> Bloomington, IL 61701-4089
> Phone: 309-828-4331 ext. 22
> Fax: 309-827-4773
> Web: www.mcplan.org<http://www.mcplan.org>
> [cid:image002.png@01CF28BD.9AC25230]McLean County Regional Planning
> Commission<https://www.facebook.com/pages/McLean-County-Regional-Plann
> ing-Commission/1418403138377717>
>
> From: Wayne Aldrich [mailto:waldrich@normal.org]
> Sent: Thursday, February 13, 2014 1:18 PM
> To: Michael Brown; Ken Springer; Tom Bierma; Jim Karch, PE CFM;
> Pinnamaraju, Vasudha
> Subject: RE: PHG Energy Information requested
>
> Michael,
> I would like to attend a meeting with PHG.
>
> Thanks,
> Wayne
>
>
> Wayne Aldrich P.E.
> Director of Public Works

> Town of Normal
> 1301 Warriner Street
> Normal, IL 61761-0589
> Phone: (309) 454-9576
> "Changing the definition!"
> P Please consider the environment before printing this e-mail
>
> From: Michael Brown [mailto:mbrown@ecologyactioncenter.org]
> Sent: Thursday, February 13, 2014 9:43 AM
> To: Ken Springer; Tom Bierma; Jim Karch, PE CFM; Vasudha Pinnamaraju
> Cc: Wayne Aldrich
> Subject: Fwd: PHG Energy Information requested
>
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> learn more about what their company has done in other communities such
> as Covington, Tennessee with biomass gasification energy generation.
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> Executive Director
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> www.ecologyactioncenter.org<http://www.ecologyactioncenter.org>
> 309-454-3169 x.11<tel:309-454-3169%20x.11>
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> PHG Energy
> 815.692.4220<tel:815.692.4220> office
> [redacted] cell
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>
>
> Click here<https://www.mailcontrol.com/sr/MZbqvYs5QwJvpeaetUwhCQ==>
> to report this email as spam.
>
>
> This message has been scanned for malware by Websense.
> www.websense.com<http://www.websense.com/>
>

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