Waste-to-Biofuels:
Options for Municipal Waste Disposal

Integrated Biofuels

For

Clean Diesel – Environmentally Produced

IBC Renewables
Renewing Tomorrow's Energy Today

SPSA Presentation – 8/25/21

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Integrating Complementary Waste-Reduction Technologies

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IBC Capability / Projects 'At A Glance'

Chesapeake IBC Specifications and Benefits	
Project Cost	$780 MM (+/- 20%) wrapped by Kiewit as EPC and Ford, Bacon & Davis
Location	First project nearing shovel ready in Chesapeake, Virginia on IBC owned site
Future Sites	30^{+} specific site locations already identified
U.S. Jobs	100 full-time permanent jobs per site with a payroll of $5,000,000 plus 300 construction jobs
Waste Input	775,000 tons/year for each site consumed, with 95% of all waste taken in converted to valuable products … and minimal residual carted to landfill
Carbon Footprint	2,000,000 tons of CO_2e per year negative – equivalent to eliminating 200,000 cars/year from each plant region
Reliability	All equipment to be deployed is 'off the shelf'
Intellectual Prop.	20 process and invention patent claims perfected/owned
Output Streams	Zero-Sulfur diesel fuel, industrial wax, green power, aggregate, metals and other recyclables, industrial chemicals
ESG	Substantive Environment, Social & Governance attributes in place (see attached)
STEM	Each site will have a STEM (Science, Technology, Engineering and Mathematics) education center operated in cooperation with local colleges, universities and local school districts

MSW & Construction Waste to Fuel: How It Works

Step One:
Waste Delivery

Step Two:
MRF --
Waste Recycling

Step Three:
Gasification

Step Four:
Biofuels
Production

Process and Description			
TRASH	MSW feedstock comes in	$ → Tipping Revenues Earned	Phase I
MRF (MATERIALS RECOVERY FACILITY)	MSW is sorted	$ → Recycled Commodities Sold Cardboard, plastics, PET, steel cans, aluminum, etc.	Phase I
Plasma Power Power Generation	Inorganics are converted	$ → Power and Aggregate Sold Glass, brick/block/stone, food, ash, etc.	Phase I
TRI Gasification System	Residual organics gasified, cleaned up, turned into Synthesis Gas		Phase II
F-T Conversion / Liquefaction to End Products	$ → Renewable Diesel Sold $ → High-Quality Food Grade and Industrial Waxes Sold		Phase II

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Step One: Waste Feedstock Supply

Unlike other commodities or the fossil fuels that are used to create energy, IBC is paid to take its raw materials, which increases its profitability.

Through its series of proprietary processes, management projects that it will receive ~ $20 million per year in tipping fees from the waste streams it processes. These will include used tires and C&D wastes in addition to MSW.

MSW
Vegetative
Plastics & Fiber
Organics from C&D
Railroad Ties & Tires

Approximately 500 tons per day of commodities, including aluminum, plastics, cardboard, and glass, generates revenues of $16 million per year by selling these materials into the commodities recycling market.

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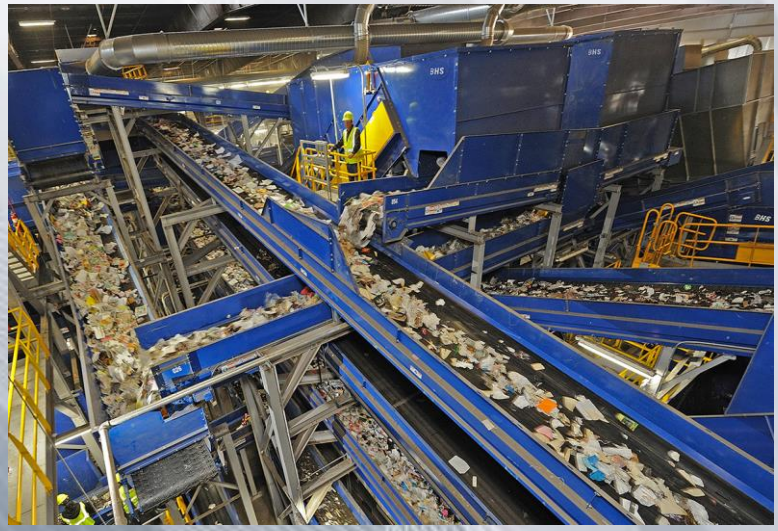
Step Two: State of the Art Recycling

IBC is developing an MSW and other waste processing facility with a total processing capacity of ~2,500 tons per day.

IBC's MSW recycling system will use a series of separators and sorters to process MSW and recover valuable commodities, including OCC/cardboard, HDPE plastics, PET, steel cans, and aluminum.

Equipment for the MSW recycling facility is being provided by Bulk Handling Systems of Eugene, Oregon, a worldwide leader in the innovative design, engineering, manufacturing and installation of sorting systems and components for the solid waste, recycling, waste-to-energy, and construction and demolition industries.

BHS has built some of the largest and most durable MRFs in the world – and they are achieving the highest throughput, recovery, and purity rates in the industry.



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Step Two (Continued): Plasma Power & Electricity

One of the critically important benefits of these technologies (which are arrayed in 'train') is the avoidance of the need to landfill the inorganic fraction of the waste stream taken into the plant (~35%). This is accomplished through the deployment of Plasma Power's technology.

The residuals that will be converted in this 'induction furnace' type system include:

Ash from the gasifier

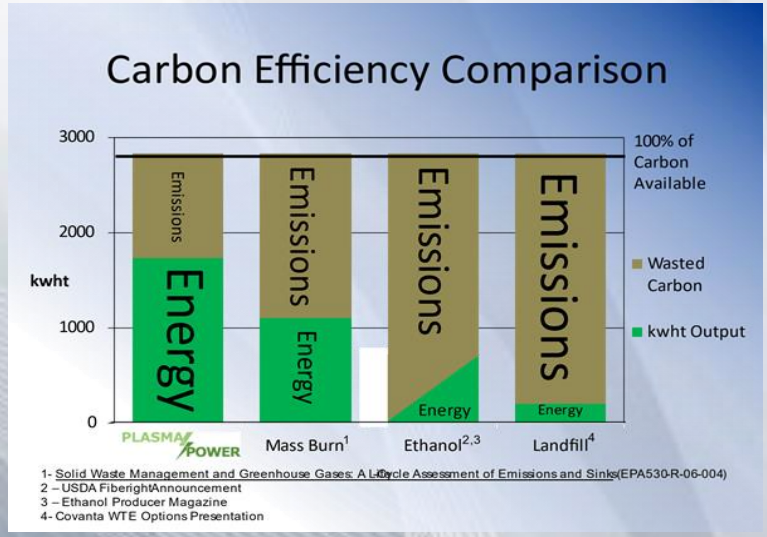
Glass, brick, block, rock, dirt and food wastes from the materials recovery facility

The products produced include:

15 MW's of green power

40,000 tons/year of construction aggregate

Demonstration facility in Ft. Lauderdale, Florida.



Substantial reduction in carbon emissions.

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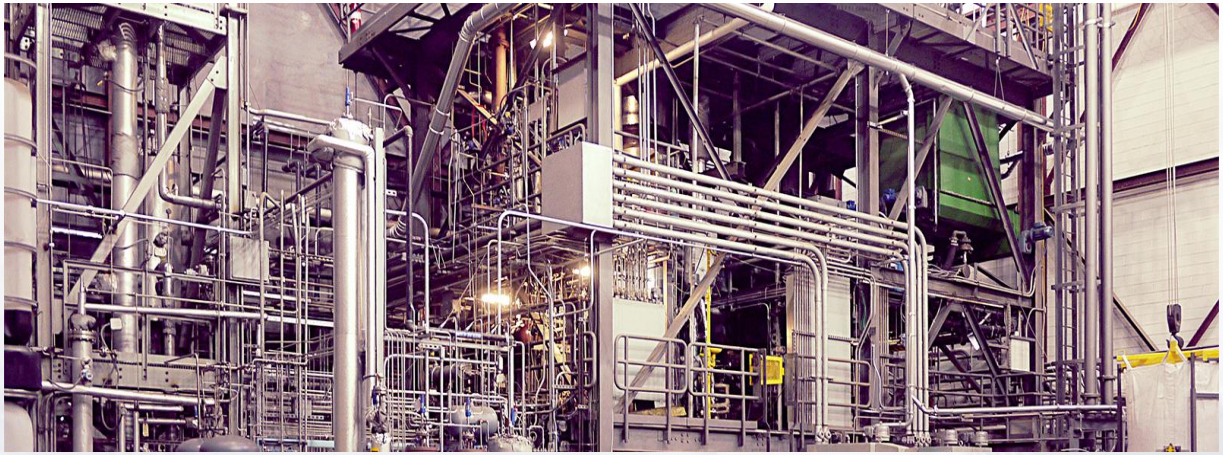
Step Three: Gasification



The technology at the heart of IBC's drop-in biofuels project is an indirectly-heated steam-reforming gasification system developed by ThermoChem Recovery International (TRI), headquartered in Baltimore, Maryland. The process has transformed MSW, wood waste, agricultural residues and other organic materials into gasoline, jet fuel, renewable diesel, chemicals, green power and other renewable energy.

TRI built and operated its first commercial (500 ton-per-day) gasification steam reformer (the same scale as planned for each of the CIBC gasifiers in this project) in 2003, processing waste from a Canadian paper mill. It operated successfully until the paper mill's closing due to economic conditions.

TRI subsequently built a four-ton per day integrated Process Design Unit (PDU) in Durham, North Carolina, which has successfully operated for more than 13,000 hours and has converted multiple feedstocks, including forest residuals and municipal solid waste (MSW), to Fischer-Tropsch (F-T) liquids.

Step Four: Sustainable Fuels & F-T Waxes

Sustainable fuels made from biomass and municipal solid waste significantly reduce CO_2 emissions on a lifecycle basis as compared to conventional fuels.

IBC's biorefinery will incorporate an advanced fixed bed (AFB) Fischer-Tropsch reactor, catalyst and product upgrading technology. The process produces "drop-in" renewable fuels and waxes that meet ASTM specifications from virtually any carbon-based feedstock.

Many companies have worked on gas-to-liquids, biomass-to-liquids and coal-to-liquids projects around the world.

Laboratory scale reactor stations that can be configured as fixed-bed, trickle bed or continuous stirred tank reactors (CSTR).

Full commercial scale tubular (fixed-bed) FT reactor) at TRI's demonstration facility in Raleigh Durham, NC.

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Chesapeake, Virginia IBC Project Highlights

Chesapeake IBC BUSINESS COMPONENTS:

- Chesapeake IBC Facility on Bainbridge Site – A MRF with the capacity to process 750,000 wet tons of waste per year, approximately 20% of which will be recyclable, with the remaining organic materials to be used as feedstock for the Bio-refinery plant and induction system.

ng Facility

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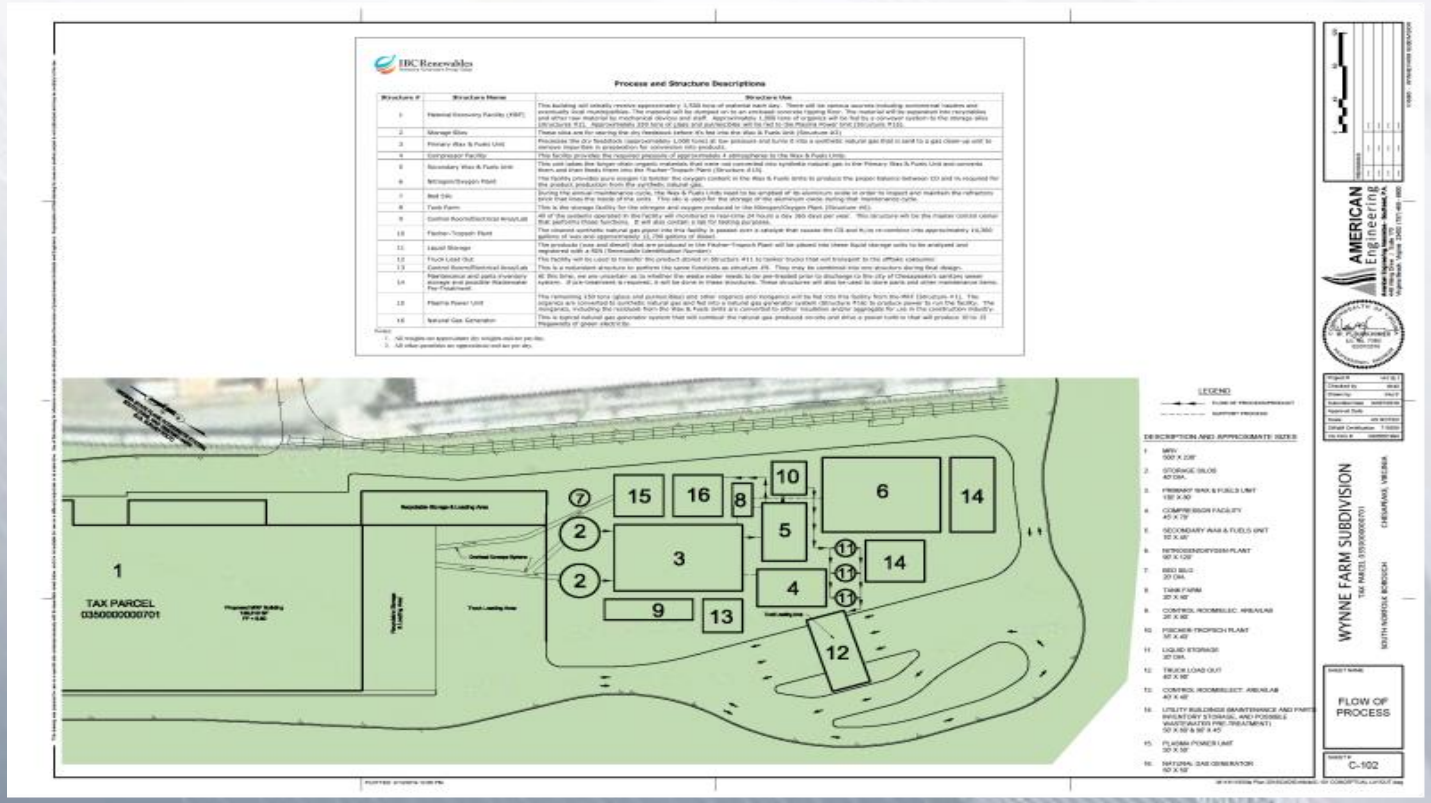
Chesapeake IBC Highlights (Continued)

Chesapeake IBC BUSINESS COMPONENTS:

- Chesapeake IBC will construct the facility in two phases. Phase I will include buildings number 1, 15 & 16 shown below with the capacity to process 350,000 dry tons of waste per year, approximately 20% of which will be recyclable. The balance of the structures will be completed as part of Phase II.



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Environmental Benefits: Significant Landfill Diversion

Golder Associates estimates each project's gasification units alone will reduce CO_2e emissions by 1,000,000 tons per year as compared to using landfills - 40 million tons over the project's lifetime - and it will reduce by 35 million tons the amount of solid waste that will be placed in landfills.

Renewable diesel, when produced by IBC from biomass, has the potential to be carbon negative when evaluated on a life-cycle basis, due to:

- Significant reductions in the consumption of fossil fuels and their related pollution
- Diverting 350,000 dry tons per year of solid waste from landfills
- Every ton of waste processed by the plant avoids the creation of a ton of landfill gas—methane which is at least 20 times more environmental damaging than CO_2
- Gray water is reused in plant operations
- Organic wastes are disposed of without being combusted or placed in landfills
- The emissions reductions achieved by recycling of all classes of materials

Production of clean drop-in fuel provides multiple benefits including the significant reduction of principal pollutants targeted by the EPA. The project will eliminate the need for producing, transporting and consuming 440 million gallons over 20 years of petroleum-based products.

The Plant will be a minor source emitter of regulated pollutants. All mist, odor, emission controls, spill prevention, contaminant systems and product handling are designed to hold process wastes well below regulated threshold limits.

RE INVENT
HAMPTON ROADS

June 16, 2021

The Honorable Mark Warner
U.S. Senator
703 Hart Senate Office Building
Washington, DC
20510

The Honorable Timothy Kaine
U.S. Senator
231 Russell Senate Office Building
Washington, D.C.
20510

RE: IBC Renewables

Dear Senators Warner and Kaine:

I am writing today to lend the strong support of Reinvent Hampton Roads to the grant application to the Department of Energy by IBC Renewables. Reinvent Hampton Roads is a non-profit 501(c)(3) created to further the economic performance of the Hampton Roads Region and the Commonwealth of Virginia.

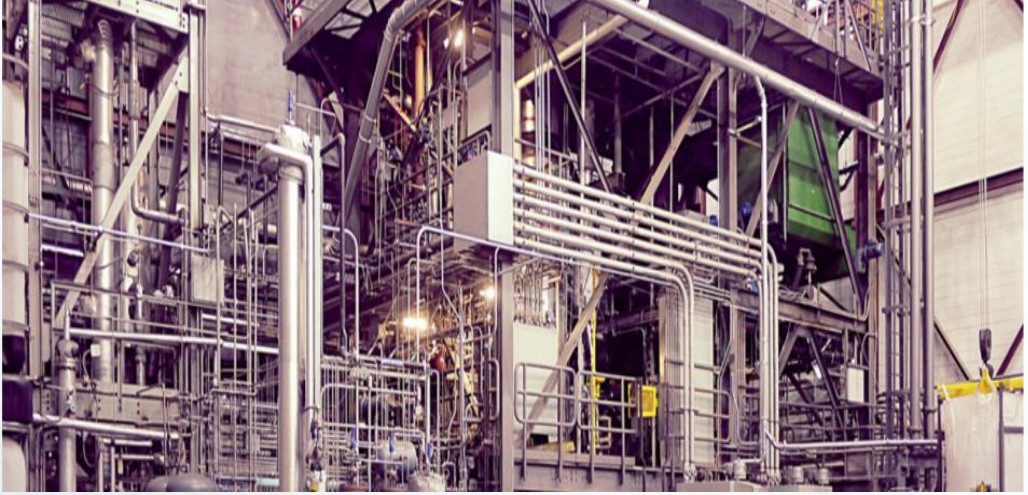
We have been engaged with IBC Renewables for approximately three years. The innovative technology exhibited and patented by IBC Renewables would literally transform the management of solid waste in our region. We have worked with the Cities of Chesapeake and Newport News for the potential location of two facilities that would together resolve the worsening solid waste situation in Hampton Roads in an environmentally sound manner. In doing so, the patented process would also produce usable products including sulfur free diesel or jet fuel, electricity and wax as well as recyclable metals.

Reinvent believes the technology has the ability to transform the recycling/solid waste disposal issues throughout the Commonwealth and the United States. We have reviewed IBC Renewables' business plan for the first two facilities and the entire Commonwealth of Virginia. We believe the potential is there for replication across the country and globally.

We urge you to lend your support to the grant application now before the Department of Energy's merit review process. If you have questions or need additional information, please do not hesitate to call on me.

With Pride In Our Region

James K. Spore
President & CEO



Waste-to-Biofuels and Nearly Total Municipal Waste Elimination

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