Moving as a Society Toward Zero Waste
PRESENTERS

- Gary Sondermeyer
- Cynthia Andela
- Ray Crabbs
- Rocco D’Antonio
A technological paradigm shift in glass recycling processing
In the US, 75% of all glass that enters the waste stream ends up in the landfill.
Recycling programs in the country

- Based on the assumption that the only market for glass is the container & fiberglass industries

- United States generates approximately 11 Million tons of waste glass

- About 20% of that glass is collected through recycling programs

- Only 45% - 50% of that glass is recycled back into bottles or fiberglass

- The rest goes into the landfill
Traditional Glass Recycling

Current recyclers rely on optical sorting to separate color
Which is then sent to a furnace to be melted
Sioneer’s process is able to pulverize and sanitize 100% of glass in the recycling stream.
Sioneer Technology processing the glass into Amorphous Silica
Industrial Minerals

Profit

Commodity Markets
- Fiberglass
- Concrete
- Bottle
- Foam Glass

Specialty Markets
- Abrasives
- Water Filtration

Premium Markets
- High-Performance Pozzolans
- Coatings

Niche / Emerging Markets
Product Sustainability

- Reduces landfilled glass
- Reduces energy needed to melt
- Slows the disappearance of sand
- Produces cleaner water
- Reduces risk of Silicosis
- Eliminates exposure to heavy metals
- Reduces carbon dioxide emissions
- Eliminates harmful chemicals in food
Pozzolan in concrete:

- Reduces and filled glass
- Reduces carbon dioxide emissions
- Eliminates exposure to heavy metals
- Reduces energy needed to melt
- Reduces risk of Silicosis
- Produces cleaner water
- Slows the disappearance of sand
- Eliminates harmful chemicals in food
### Greenhouse Gas Reduction

<table>
<thead>
<tr>
<th>GHG Reduction from Beverage Industry</th>
<th>Potential GHG reduction from glass in Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio of cullet used to GHG - 6 to 1</td>
<td>Ratio of cullet used to GHG - 1 to 1</td>
</tr>
<tr>
<td>Glass cullet requires less energy to re-melt and increases new bottle production rates.</td>
<td>One ton of CO$_2$ required to make one ton of cement Glass Pozzolan replaces 20% of the cement in concrete</td>
</tr>
</tbody>
</table>
## Other Commodity Markets

<table>
<thead>
<tr>
<th>Market</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beach Sand Restoration</td>
<td>Slows the disappearance of the world’s 2nd largest commodity—sand. (<a href="http://sand-wars.com">sand-wars.com</a>)</td>
</tr>
<tr>
<td>Blasting Abrasives</td>
<td>Replace carcinogenic coal slag with glass abrasives in sand blasting applications</td>
</tr>
<tr>
<td>Use Amorphous Silica as a replacement for Crystalline Silica (ordinary sand)</td>
<td>Minimize risk of Silicosis—a respiratory disease caused by inhaling Crystalline Silica dust</td>
</tr>
<tr>
<td>Feedstock for Foam Glass</td>
<td>Lightweight aggregate for construction</td>
</tr>
<tr>
<td>Use glass in water filtration markets</td>
<td>Cleaner water due to the natural negative charge of the glass</td>
</tr>
<tr>
<td>Replacement for Diatomaceous Earth</td>
<td>Use as a natural pesticide in agriculture</td>
</tr>
</tbody>
</table>
Evolution of the Clean Glass Process

Pilot Plant
Richfield Springs NY

Source Separated
Momentum Recycling, Salt Lake City, Utah

Single Stream
Tricentris, Quebec

Single Stream
Next Generation 20 TPH Facility
Public Private Partnership

Local Government is ultimately responsible for recycling and disposal of the glass.

Local Government is responsible for the environment and sustainability.

Local Government is responsible for public infrastructure, cleaner safer products and to stimulate local economic development.
Public – Private Partnership Opportunity - Example

- New Jersey City
  - Support from local political leaders
  - Local support in the form of low cost loans
  - Local support for the request of State loan programs
  - Local Support for location of facility
  - Local support for use of products

- Benefits to City
  - Perpetual Revenue stream based on market development
  - Reduction of landfill costs
  - Long term infrastructure savings due to 100 year concrete
  - Additional jobs and stimulation to the local economy
  - Dramatic reduction the GHG
Contact:  Cynthia Andela
Candela @ Sioneer.com
607-435-0276
Moving as a Society toward Zero Waste
Organic waste recycling is all we do

- Vertically integrated
  - From collection to end products sales
- Multi-feedstock processors
- Dual Technology
  - High-solids digestion
  - In vessel composting
- Completely indoor facility
- Production model vs waste model
  - *End product focused*
Management Team

Experienced management team

- 25 years food service experience
- 25 years transportation experience
- 15 years renewable energy experience
- 25 years indoor composting experience
- 25 years composting sales experience
- 7 years food waste collection experience
Business Philosophy

- To build and operate medium-scale organics recycling facilities in the Northeast.

- To extract the highest environmental and economic value from the organic waste stream in the form of renewable energy and high-quality compost.

- Operate world class facilities using the best available control technologies, while encompassing fully enclosed, odor-free organics receiving and processing facilities.

- *Serve the communities by offering organics recycling and renewable energy to the community and businesses within 25 miles of each plant.*
Gloucester City Organic Recycling, LLC

850 Water Street
Gloucester City, NJ 08030

- Former BP / Arco Terminal Site
- Brownfield Site vacant for 30 years
- Three party settlement agreement with City, BP / Arco and NJDEP
- Remediation at no cost to the City
Moving toward Zero Waste

There is no “Zero waste” without dealing with food waste

<table>
<thead>
<tr>
<th>Biomass Waste in MSW (2010) (Tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% MSW</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Total MSW</td>
</tr>
<tr>
<td>Food waste¹</td>
</tr>
<tr>
<td>Paper Waste²</td>
</tr>
<tr>
<td>Other Biomass³</td>
</tr>
<tr>
<td>Total Biomass</td>
</tr>
</tbody>
</table>

Sources:
1 USEPA
2 Percentage given by Ray Worob of NJDEP
5 Data given by Joseph Davis MPA, Data base Analyst 1 of NJDEP that was received 11/9/12
The Food Waste Issues

- Lack of receiving infrastructure
- Multiple closed facilities in NJ and the US
- Waste model vs manufacturing model
- Development / Investment risk factors
- Stakeholder issues
The Food Waste Solutions

Government Regulation
- REC’s / Feed-in Tariffs
- Compost Market Development
- Food Waste Disposal Ban

*Investments are being made and jobs are being created in States that have at least two of the above*

Appropriate Technology Deployment for the Market
Technology Platform

- Multi-feedstock
  - Wide Variety of Organic Waste

- Dual Technology
  - High-Solids Anaerobic Digestion
  - In Vessel Composting

- Odor Management
  - Completely Indoors
  - O&M
  - Housekeeping
  - Negative Pressure
  - Biofilters & Scrubbers
High-Solids Digestion
High-Solids Digestion

- Materials are mixed and filled with a wheel loader into concrete digesters
- Biogas sent to a combined heat and power unit
- Organic waste is processed generating biogas
- Air, liquid, and gas tight
Indoor composting operations utilizes Aerated Static Pile (ASP) technology

- Industrial-scale composting facilities
- Modified Aerated Static Pile (ASP) processes and stabilizes organic materials into high-quality compost
- Refined over forty years of operations
- All operations are done indoors under controlled conditions
In Vessel Composting

- Materials loaded into aerated composting bays with sliding doors
- No mixing or turning
- Reaches temperatures over 140°F **eliminating odor causing compounds**
- Handles any residual liquids from digestion
Odor Management & Control

Odor management is a fundamental business practice required for successful organics recycling in New Jersey. *ALL operations are conducted indoors under negative pressure.*

Integrated odor management into every aspect of business planning and the business model including:

- Business Philosophy
- Generator Training Programs
- Equipment & Supplies Selection
- Collection Methodology
- Collection Equipment
- Truck Routing
- Technology Selection
- Facility Design
- Operations Plan
- Housekeeping Procedures
- End Product Marketing & Sales
Compost Production

The Organic Diversion team formulates and markets compost-based products

- In-house designed process produces consistent, high-quality compost
- 400,000 cubic yards of compost sold annually
- Customers include base in bagged, bulk, wholesale, landscaping, construction, nurseries, erosion-control industries and the agricultural market

Compost

- Saves Water
- Reduces chemical fertilizer use
- Reduces topsoil loss, curbs erosion
- Restores and replenishes depleted soil
- Improves resistance to pests and diseases
Soil Amendment Program

Before a newly constructed premise may be landscaped, property owners must amend their soil with compost so the soil more efficiently retains water. This rule applies to all new residential, commercial, government and industrial properties within Denver Water’s service area.

- Importance of Soil Amendment
- To Pass a Soil Amendment Inspection
- Schedule a Soil Amendment Inspection
- Winter Extension
- Phased Projects

For more information:

Soil amendment: 303-893-2444 or customercare@denverwater.org
Tap issues: 303-628-6100
Meter set/inspection: 303-628-6145
Food Waste Recycling in NJ

New Jersey can easily lead the nation in food waste recycling if we take the time to build the necessary foundation to attract investment and create jobs to deploy the proper technology platforms throughout the State.
IS ZERO WASTE A PRACTICAL REALITY?

IF SO, WHAT IS THE POTENTIAL ROLE FOR:
THE COMMUNITIES OF NEW JERSEY?
INEOS New Planet BioEnergy – Waste to Energy

Organic Waste to Ethanol & Power:

Integrated BioEnergy Complex
Operational Design:

INTEGRATED BIOENERGY COMPLEX

PHASE 1 TECHNOLOGIES
(Waste Stream Processing Center)

Waste Streams from a 'sister' technology(ies) as a feedstock.

Waterway Recycling
120,000 T/Y C&D

Creating RDF (Adv BioFuels, GTL & Plasma)
- 100,000 T/Y

PHASE 2 TECHNOLOGIES
(Thermal Conversion Processing Center)

IBC
Landlord & Infrastructure

INTEGRATED BIOENERGY COMPLEX

Landlord & Infrastructure

Red Text = Waste Streams from a ‘sister’ technology(ies) as a feedstock.
Integrated BioEnergy Complex
Operational Design:

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**PHASE 1 TECHNOLOGIES**
(Waste Stream Processing Center)

- **Waterway Recycling**
  - 120,000 T/Y C&D

- Creating RDF (Adv BioFuels, GTL & Plasma)
  - 100,000 T/Y

**PHASE 2 TECHNOLOGIES**
(Thermal Conversion Processing Center)

- **Waterway Materials**
  - 120,000 T/Y Aggregate

- Concrete, Brick/Block & Asphalt (Plasma)
  - 120,000 T/Y

**Red Text = Waste Streams from a ‘sister’ technology(ies) as a feedstock.**
Waterway Materials

Brick, Block, Concrete & Asphalt:
Integrated BioEnergy Complex
Operational Design:

INTEGRATED BIOENERGY COMPLEX

PHASE 1 TECHNOLOGIES
(Waste Stream Processing Center)

RePower South
350,000 T/Y RDF

MSW, Scrubbers & Sorbents
(E-Recycle & Transfer Station)
- 200,000 T/Y

PHASE 2 TECHNOLOGIES
(Thermal Conversion Processing Center)

Waterway Recycling
120,000 T/Y C&D

Creating RDF
(Adv BioFuels, GTL & Plasma)
- 100,000 T/Y

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Operational Design:

INTEGRATED BIOENERGY COMPLEX

PHASE 1 TECHNOLOGIES
(Waste Stream Processing Center)

- RePower South
  350,000 T/Y RDF
  - MSW, Scrubbers & Sorbents
    (E-Recycle & Transfer Station)
    - 200,000 T/Y

- E-Recycling
  60,000 T/Y Metals

- Waterway Recycling
  120,000 T/Y C&D

- Creating RDF
  (Adv BioFuels & GTL)
  - 100,000 T/Y

PHASE 2 TECHNOLOGIES
(Thermal Conversion Processing Center)

- Waterway Materials
  120,000 T/Y Aggregate

- Concrete, Brick/Block & Asphalt (Plasma)
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Integrated BioEnergy Complex
Operational Design:

INTEGRATED BIOENERGY COMPLEX

PHASE 1 TECHNOLOGIES
(Waste Stream Processing Center)

- RePower South
  350,000 T/Y RDF

- CNG Fuel Station
  65+ Truck Fleet

- E-Recycling
  60,000 T/Y Metals

- Waterway Recycling
  120,000 T/Y C&D

- Waterway Materials
  120,000 T/Y Aggregate

- MSW, Scrubbers & Sorbents
  (E-Recycle & Transfer Station)
  - 200,000 T/Y

- Hauling MSW/C&D & Adv BioFuels
  Materials To & From HRIBC

- Electronics, Washers, Dryers, TV's
  (Adv BioFuels & GTL)
  - 100,000 T/Y

- Creating RDF
  (Adv BioFuels, GTL & Plasma)
  - 100,000 T/Y

PHASE 2 TECHNOLOGIES
(Thermal Conversion Processing Center)

- Concrete, Brick/Block & Asphalt
  (Plasma)
  - 120,000 T/Y

Red Text = Waste Streams from a ‘sister’ technology(ies) as a feedstock.
**Integrated BioEnergy Complex**

**Operational Design:**

**INTEGRATED BIOENERGY COMPLEX**

**PHASE 1 TECHNOLOGIES** (Waste Stream Processing Center)

- **RePower South**
  - RDF: 350,000 T/Y

- **CNG Fuel Station**
  - Fleet: 65+

- **E-Recycling**
  - Metals: 60,000 T/Y

- **Waterway Recycling**
  - C&D: 120,000 T/Y

- **Waterway Materials**
  - Aggregate: 120,000 T/Y

- **E-Recycling**
  - Metals: 60,000 T/Y

- **Waterway Recycling**
  - C&D: 120,000 T/Y

- **Concrete, Brick/Block & Asphalt (Plasma)**
  - (Plasma): 120,000 T/Y

- **Creating RDF (Adv BioFuels, GTL & Plasma)**
  - (Plasma): 100,000 T/Y

- **Electronics, Washers, Dryers, TV’s (Adv BioFuels & GTL)**
  - (Plasma): 100,000 T/Y

- **Waste To Liquid**
  - Jet/Diesel: 10 M/G/Y

- **NatGas To Liquid**
  - Jet/Diesel: 10 M/G/Y

- **CNG Fuel Station**
  - Fleet: 65+

- **Hauling MSW/C&D & Adv BioFuels Materials To & From HRIBC**
  - 200,000 T/Y

- **MSW, Scrubbers & Sorbents (E-Recycle & Transfer Station)**

**PHASE 2 TECHNOLOGIES** (Thermal Conversion Processing Center)

- **MSW/C&D**
  - (RePower, Waterway & E-Cycling)
  - (Plasma): 175,000 T/Y

- **Concrete, Brick/Block & Asphalt (Plasma)**
  - (Plasma): 120,000 T/Y

- **Electronics, Washers, Dryers, TV’s (Adv BioFuels & GTL)**
  - (Plasma): 100,000 T/Y

- **Creating RDF (Adv BioFuels, GTL & Plasma)**
  - (Plasma): 100,000 T/Y

- **Waterway Recycling**
  - C&D: 120,000 T/Y

- **Waterway Materials**
  - Aggregate: 120,000 T/Y

- **E-Recycling**
  - Metals: 60,000 T/Y

- **Waterway Recycling**
  - C&D: 120,000 T/Y

- **Concrete, Brick/Block & Asphalt (Plasma)**
  - (Plasma): 120,000 T/Y

- **Creating RDF (Adv BioFuels, GTL & Plasma)**
  - (Plasma): 100,000 T/Y

- **Electronics, Washers, Dryers, TV’s (Adv BioFuels & GTL)**
  - (Plasma): 100,000 T/Y

- **Waterway Recycling**
  - C&D: 120,000 T/Y

- **Waterway Materials**
  - Aggregate: 120,000 T/Y

- **E-Recycling**
  - Metals: 60,000 T/Y

**Red Text = Waste Streams from a ‘sister’ technology(ies) as a feedstock.**
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Operational Design:

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**PHASE 1 TECHNOLOGIES**
(Waste Stream Processing Center)

- RePower South
  - 350,000 T/Y RDF
- CNG Fuel Station
  - 65+ Truck Fleet
- E-Recycling
  - 60,000 T/Y Metals
- Waterway Recycling
  - 120,000 T/Y C&D
- Waterway Materials
  - 120,000 T/Y Aggregate
- MSW, Scrubbers & Sorbents
  - (E-Recycle & Transfer Station)
  - 200,000 T/Y
- Hauling
  - MSW/C&D & Adv BioFuels Materials To & From HRIBC
- Electronics, Washers, Dryers, TV’s
  - (Adv BioFuels & GTL)
  - 100,000 T/Y
- Creating RDF
  - (Adv BioFuels, GTL & Plasma)
  - 100,000 T/Y
- Concrete, Brick/Block & Asphalt (Plasma)
  - 120,000 T/Y

**PHASE 2 TECHNOLOGIES**
(Thermal Conversion Processing Center)

- Waste To Liquid
  - 10 M/G/Y Jet/Diesel
- Plasma Converter
  - 28K T/Y Insulation
- NatGas To Liquid
  - 10 M/G/Y Jet/Diesel
- MSW/C&D
  - (RePower, Waterway & E-Cycling)
  - 175,000 T/Y
- MSW/C&D, Glass/Ash
  - (RePower, Waterway & E-Recycle)
  - 70,000 T/Y
- 30 – 40 MM MCF Natural Gas

Red Text = Waste Streams from a ‘sister’ technology(ies) as a feedstock.
# Integrated BioEnergy Complex

## Operational Design:

**INTEGRATED BIOENERGY COMPLEX**

**PHASE 1 TECHNOLOGIES**
(Waste Stream Processing Center)

- **RePower South**
  - RDF
  - 350,000 T/Y

- **CNG Fuel Station**
  - 65+ Truck Fleet

- **E-Recycling**
  - 60,000 T/Y Metals

- **Waterway Recycling**
  - 120,000 T/Y C&D

- **Waterway Materials**
  - 120,000 T/Y Aggregate

- **MSW, Scrubbers & Sorbents**
  - (E-Recycle & Transfer Station)
  - 200,000 T/Y

- **Hauling MSW/C&D & Adv BioFuels Materials To & From HRIBC**

- **Electronics, Washers, Dryers, TV’s (Adv BioFuels & GTL)**
  - 100,000 T/Y

- **Creating RDF (Adv BioFuels, GTL & Plasma)**
  - 100,000 T/Y

- **Concrete, Brick/Block & Asphalt (Plasma)**
  - 120,000 T/Y

**PHASE 2 TECHNOLOGIES**
(Thermal Conversion Processing Center)

- **Waste To Liquid**
  - 10 M/G/Y Jet/Diesel

- **Plasma Converter**
  - 28K T/Y Insulation

- **NatGas To Liquid**
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- **MSW/C&D, Glass/Ash**
  - 70,000 T/Y

- **MSW/C&D, Adv BioFuels, GTL & Plasma**
  - 175,000 T/Y

- **30 – 40 MM MCF Natural Gas**

---

Red Text = Waste Streams from a ‘sister’ technology(ies) as a feedstock.
Integrated BioEnergy Complex

Regional Impact:
Integrated BioEnergy Complex

Estimated Annual Regional Impact:

- **Waste Materials Processed** – ~895,000 tons/year:
  - ~120,000 tons/year of C&D waste;
  - ~120,000 tons/year of aggregate;
  - ~350,000 tons/year of municipal solid waste;
  - ~60,000 tons/year of electronic waste;
  - ~175,000 tons/year of IBC organic by-product waste;
  - ~70,000 tons/year of IBC inorganic by-product waste.

- **Environmental Impact** – (500,000+) tons/year CO₂ equivalents:
  - Each of the technologies have a negative carbon footprint;
  - RePower South’s MSW process = eliminating ~50,000 cars/year;
  - All systems will use best of class environmental practices.

- **Annual Total Revenue Stream** - ~$85,000,000:
  - ~120,000 tons/year of recycled metals, plastics, etc.
  - ~200,000 tons/year of organic RDF;
  - ~120,000 tons/year of reclaimed aggregate;
  - ~175,000 tons/year of BioFuel for coal power plants;
  - ~20 million gallons of green liquid fuels;
  - ~28,000 tons/year of fire retardant insulation.
## Integrated BioEnergy Complex

### Estimated Regional Impact:

<table>
<thead>
<tr>
<th></th>
<th>2016 &amp; 17</th>
<th>2020</th>
<th>5 Year Total</th>
<th>10 Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIRECT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payroll (~400 Employees – Total)</td>
<td>$4,000,000</td>
<td>$16,000,000</td>
<td>$55,000,000</td>
<td>$135,000,000</td>
</tr>
<tr>
<td>Property Tax (at 1% CapEx)</td>
<td>$100,000</td>
<td>$5,000,000</td>
<td>$11,000,000</td>
<td>$37,000,000</td>
</tr>
<tr>
<td>Construction Payroll</td>
<td>$7,500,000</td>
<td>$1,000,000</td>
<td>$27,500,000</td>
<td>$50,000,000</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>$11,600,000</td>
<td>$22,000,000</td>
<td>$93,500,000</td>
<td>$222,000,000</td>
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<tr>
<td><strong>INDIRECT</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Potential Peripheral Employment</td>
<td>$2,000,000</td>
<td>$60,000,000</td>
<td>$200,000,000</td>
<td>$540,000,000</td>
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<tr>
<td><strong>Total</strong></td>
<td>$13,600,000</td>
<td>$82,000,000</td>
<td>$293,500,000</td>
<td>$762,000,000</td>
</tr>
</tbody>
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INTEGRATED BIOENERGY COMPLEX
for the
Hampton Roads, Virginia Region

Energy Independence Through World Class Technologies®

Ray Crabbs, President & CEO
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vsnasoc@cox.net