

# Carbon

**Management inc**

Lowering your carbon footprint ...



one step at a time

## CMI CORPORATE OVERVIEW

August 22, 2011

## ▣ CMI Company Highlights

**Who We Are:** An environmental solutions provider offering a next-generation technology platform that transforms municipal, industrial, forestry and agricultural waste into renewable energy using a process that contributes to the restoration of our land, sea and air

**Our History:** Formally launched in January 2010 after more than 3-years of research and development, as well as operational insight gleaned from our first platform implemented in 2009.

**Our Mission:** Accept that the generation of waste is a reality but treat it as a resource rather than as a liability

Employ a decentralized/distributed approach to overcome the challenges presented by current waste management practices and energy production methods

## ▣ Current Waste Disposal Quagmire

- Over 1.5 billion tons of waste are generated in the US each year, with some 100 billion tons already in landfills
- Health and human safety is compromised by current waste management practices
- 16% of all US man-made GHG emissions are from landfills
- Nitrate, ammonia, solvents, PCB and heavy metal runoff and leaching from landfills is causing groundwater contamination
- Fuel-inefficient trucks transporting waste hundreds of miles prematurely wear our roadways and produce toxic exhaust
- Waste removal costs and tipping fees continue to rise while disposal space dwindles at alarming rates
- Closed landfills continue to pose a significant societal

## ▣ Current Energy Production and Consumption Quagmire

- By 2030, US energy demand could rise by 25%, adding \$10 trillion in capital costs, while increasing CO<sub>2</sub> emissions by almost 30%
- 1950's-era centralized generation plants dump over 55% of the energy they produce right back into our air and water
- 10% of all energy from centralized generation is lost during transmission and distribution, adding between 10% and 20% to the price of our electricity
- Coal-fired plants are the world's largest source of mercury air emissions and cause 36% of all US man-made GHG emissions
- Hidden costs of coal (health and environmental tolls) are making renewable alternatives more attractive financially
- Energy security is now a serious concern to our nation; i.e., brownouts, blackouts, service interruptions and terrorist attacks
- Iron and steel production consume 19% of all US energy and

## ▣ The CMI Waste Transformation Platform

- A decentralized renewable energy platform that transforms waste into energy
- Two-stage, moderate-temperature, slow-gasification process optimized to combat today's waste management challenges
- Beat all EPA, European and California air quality standards in over 200 independent emissions tests
- Available in prefabricated 50 ton-per-day processing modules for quick implementation and easy future scalability
- Utilizes advanced automation, control and monitoring technologies for trouble-free operation
- Powered by self-generated renewable energy
- Few moving parts result in low total cost of ownership

## ▣ CMI Waste Transformation Platform Highlights

- No sorting, shredding or preprocessing of waste is required
- Process is unaffected by moisture, dirt, rocks, combustibles, metal or glass
- Waste is reduced 98% by volume with sterile bottom-ash as the only byproduct
- Residual glass is mixed with the non-toxic bottom ash and is used as filler for concrete or asphalt
- All ferrous materials are recycled after processing
- Process creates no slag, dross or clinkers

## ▣ CMI Waste Transformation is Not Incineration

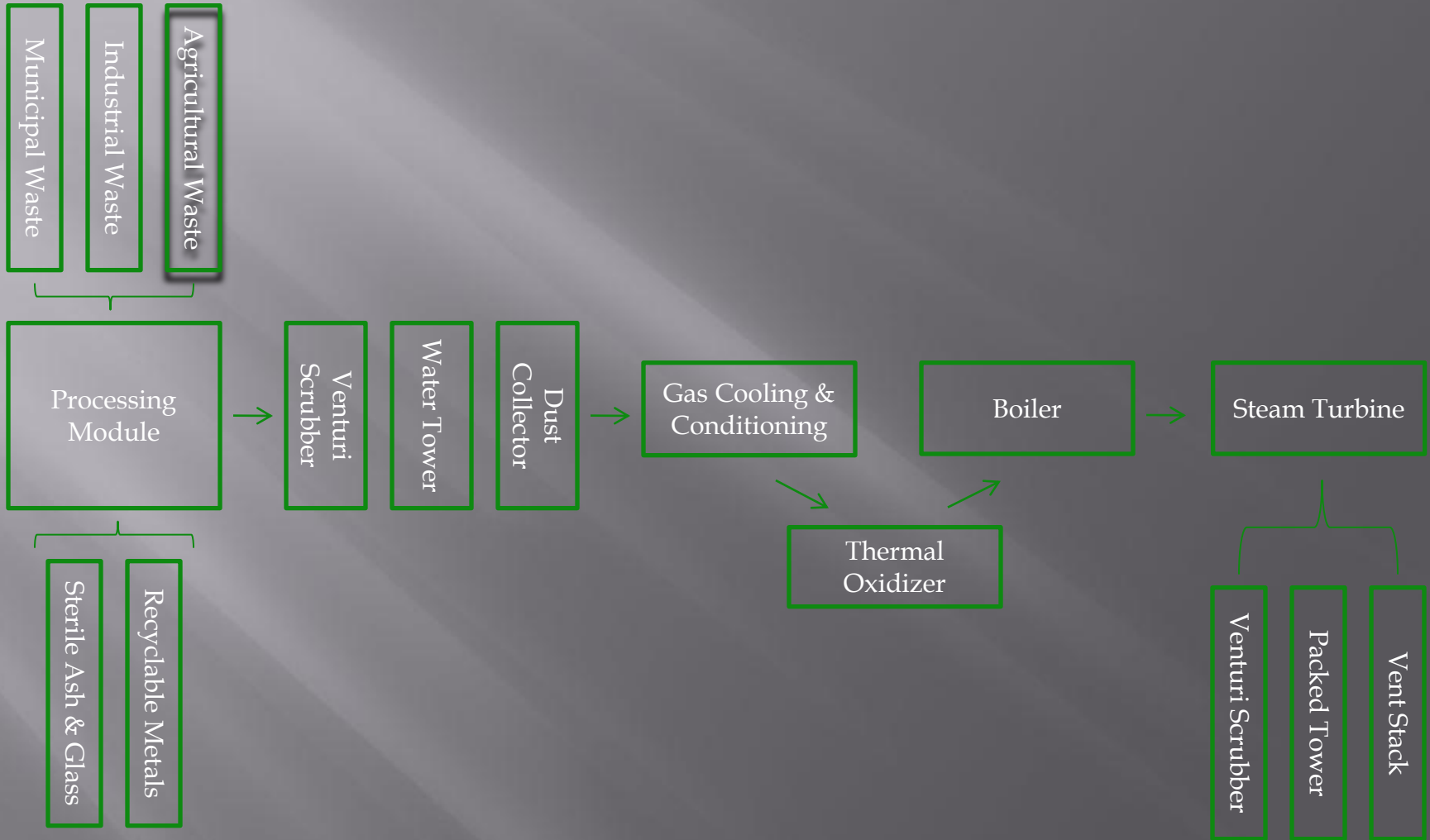
### Incineration

- High-Temperature Burning; waste is converted inefficiently into heat
- Air added to increase volatility and speed of burning
- Disposal
- Runs dirty
- Can only reduce waste to about 30% of original volume, requiring use of landfills
- Ash is toxic with dross, clinkers and slag as additional byproducts
- Ferrous and glass materials cannot be recycled
- Requires supplementary energy
- Continuous emissions challenges

### Transformation

- Moderate Temperature Pyrolytic Gasification; converts waste into energy-rich fuels
- Oxygen starved to create complex chemical reactions
- Resource recovery
- Runs clean
- Can reduce waste to about 2% of original volume and byproduct can be utilized in concrete or asphalt
- Ash is sterile without any dross, clinkers or slag
- All ferrous and glass materials are recycled after processing
- Sustains on self-generated energy
- Manages contaminants before they become emissions

# □ CMI Waste Transformation Process



## ▣ Average Energy Recovery Rates Per Type of Waste

Type of Waste	Net Kilowatt Hours per Ton Steam Turbine	Net Kilowatt Hours per Ton Syngas Generator	Net Barrels of Diesel (42 US Gallons)
Unsorted MSW	480 kWh	600 kWh	.75 barrels
Post-Recycled MSW	320 kWh	400 kWh	.50 barrels
Industrial Waste	560 kWh	700 kWh	1.0 barrels
Construction Waste	640 kWh	800 kWh	1.1 barrels
Scrap Tires	1,600 kWh	2,000 kWh	3.0 barrels
Plastics	1,440 kWh	1,800 kWh	2.9 barrels
Sewage Sludge	800 kWh	1,000 kWh	1.5 barrels
Animal Waste	800 kWh	1,000 kWh	1.5 barrels
Agricultural Waste	480 kWh	600 kWh	.75 barrels
Yard Waste	320 kWh	400 kWh	.50 barrels
Woody Biomass	640 kWh	800 kWh	1.1 barrels

Above figures are net outputs after parasitic processing load. Actual energy recovery will depend on the composition and moisture content of the waste, the effectiveness of fuel conversion and the efficiency of power train selected.

## ▣ The WTP Beats US EPA Standards

Category	US EPA 60 CFR Part 60.33 Capacity > 250 Tons Per Day	Cocurrent WTP Test Results
Dust	0.03 gr/ dsci	.019 gr/ dsci
Hydrogen Chloride	25 ppm	7.12 ppm
Hydrogen Fluoride	No Standard	None Detected
SO <sub>x</sub>	50 ppm	5.44 ppm
NO <sub>x</sub>	150 ppm	30.74 ppm
CO	150 ppm	3.73 ppm
CO <sub>2</sub>	350 ppm	54 ppm
VOCs	150 ppm	21 ppm
Dioxins and Furans	125 mg/ cft	2.71 mg/ cft
Total Metals	No Standard	1.54 mg/ m <sup>3</sup>
Mercury and Compounds	.08 mg/ m <sup>3</sup>	0.05 mg/ m <sup>3</sup>
Lead and Compounds	<0.20 mg/ m <sup>3</sup>	0.07 mg/ m <sup>3</sup>
Cadmium and Compounds	<0.02 mg/ m <sup>3</sup>	0.01 mg/ m <sup>3</sup>

## ▣ WTP Bottom-Ash Beats US EPA Standards

Category	US EPA RCRA Limits	Cocurrent WTP Test Results
Chlorides	No Limit	76.07 mg/L
Silver	No Limit	0.02 mg/L
Barium	100 mg/L	0.25 mg/L
Cadmium	1 mg/L	0.14 mg/L
Nickel	No Limit	0.04 mg/L
Lead	5 mg/L	0.16 mg/L
Arsenic	5 mg/L	0.02 mg/L
Selenium	1 mg/L	0.03 mg/L
Chromium	1 mg/L	0.04 mg/L
Mercury	.2 mg/L	0.00 mg/L
Thallium	No Limit	0.01 mg/L

## ▣ WTP Processes a Wide Range of Solid and Liquid Wastes

- Municipal Solid and Urban Waste
- Industrial Waste
- Construction and Demolition Waste
- Medical Waste
- Scrap Tires and Textiles
- Sewage Sludge
- Oil Sludge
- Liquid Waste
- Animal Waste and Litter
- Food and Beverage Processing Residues
- Agricultural Residues
- Yard Waste
- Forestry Waste

## ▣ Unique Business Model

- CMI finances, constructs, owns and operates municipal Waste Transformation Platform
- No out of pocket expense or investment by the municipality
- CMI provides budgetary certainty through fixed 20-year waste tipping fee agreements
- Taxpayers can reap the benefits of the WTP but need not bear any financial burden.
- Simple program requirements
  - Guaranteed waste stream
  - Guaranteed sale of electricity or other energy components
  - Suitable site and/or existing building for the WTP
  - Entitlements and permitting

## ▣ Our Competitors Have Their Shortcomings

- Many disregard baseline economics
  - Prohibitively expensive with high cost of ownership
  - Require huge tipping fees to offset high pricing/low efficiencies or even necessitate the purchase of feedstock
- Most are not decentralized/distributed in nature
  - Huge space requirements, materials handling challenges and staggering pollution control burdens
  - Cannot be located at the source of the garbage, thus waste transportation over long distances remains a necessity
- Several are not adaptive
  - Can only convert very specific, sorted waste streams into energy
  - Large footprints that are difficult to scale or customize
- Few qualify as being sustainable
  - Consume more power to operate than they can produce
  - Frequently require the continued use of a landfill for by-products

## ▣ Competitive Advantage of the CMI WTP

- Decentralized
  - Reduces cost and environmental effects of waste transportation
  - Cuts and/or eliminates capital expense of transfer stations
  - Communities take responsibility for their own waste
- Distributed
  - Electricity is generated and consumed locally
  - Loss during conventional electricity transmission and distribution is eliminated
- Adaptive
  - Processes widest range of solid and liquid wastes
  - Optimal size with capacity that can be easily scaled and customized
- Sustainable
  - Highly efficient and operates entirely on its own renewable electricity
  - Emissions are completely mitigated
  - Displaces fossil fuel use and reduces landfill disposal
- Financially Sound
  - Low cost of ownership and high return on investment