Leading provider of environmental solutions

WM’s 2012 Financial Stats

- $13.6B in revenue
- $829M in free cash flow
- $658M returned to shareholders
- $1.5B in capital expenditure

WM Sustainability Facts

- Creates enough energy to power more than 1.1M homes every year
- Manages more than 10 million tons of recyclable commodities
- Dedicates 26,000 protected acres to wildlife habitats

WM’s 2012 Operational Stats

- +21 million customers
- 390 collection operations
- 1 active hazardous waste underground injection facility
- 18 secondary processing facilities
- 310 transfer facilities
- 5 independent power production plants, 2 produce renewable energy
- 137 landfill-gas-to-energy projects
- 264 active solid waste landfills
- 114 traditional recycling facilities
- 42 are single stream
- 14 are C&D recycling facilities
- 36 organic processing facilities
- 14 construction & demolition recycling facilities
- 17 waste-to-energy plants
- 5 active hazardous waste landfills
- Over 43,500 employees

As of February 2013
Processing Materials to their highest value

1. Goods Collection
   - We work to find the best possible use for the waste streams we are charged with managing. Landfilling is the last option.

2. Discards Collection
   - We work to recapture value from waste streams by using new recycling technologies.

3. Recycling
   - Investing in Technology
     - Emerging technologies help us process residual materials into renewable energy and fuels, compost and chemicals.
   - Post-Recycling
     - Sorted MSW to electricity, fuel, or chemicals
     - Plastic to fuel or chemicals
     - Organics to electricity, fuel or chemicals
     - Organics processing
       - Compost
       - Residuals to energy
         - Landfill gas to energy and waste to energy
There is a growing trend to think broadly about “materials management” and overall GHG emission reduction goals.

There is increasing connectivity between solid waste/recycling, energy and transportation fuel. This is an important trend since they are all intertwined and we have the ability to influence policy that will positively impact us all.

State and local solid waste policies play a key role, which can ultimately have global environmental implications.
Natural Gas Fleets

- WM will replace 80% of its new class 8 vehicles with natural gas trucks.
- By the end of 2012 we will have 2,000 natural gas trucks at 40 sites in 22 states and 2 Canadian provinces.
- We will build 25 natural gas fueling stations each year and we are investing in public fueling stations at most sites.
Landfill Gas Projects: Environmental Protection is the First Priority

Landfill gas is about 50% methane, which is produced from the natural anaerobic decomposition of organic waste in the landfill.

The collection of LFG is required by regulation at larger landfills, and is an integral responsibility and cost of operating a landfill:

– Off-Site Underground Migration (RCRA Subtitle D)
– Groundwater Contamination (RCRA Subtitle D)
– Odor control
– Organic Carbon Emissions through cap (CAA - NSPS)

The use of LFG for renewable energy must be implemented in a manner so as not to interfere with the landfill owner’s first priority of compliance and environmental protection.
Landfill Gas Collection

- Perforated pipe wells are drilled into the waste, about one every acre.

- The wells are connected to a header pipe. A blower places a vacuum on the header pipe to withdraw the gas.

- If it is not used as fuel for renewable energy, the gas is simply burned off in a flare.
Most Common Types of Landfill Gas Projects

Any technology or application that uses natural gas can also use landfill gas

**Power** - Fuel for engines or turbines in power plant on landfill, with electricity delivered to nearby utility power distribution line.

**Medium Btu (MBTU)** - Delivered in dedicated pipe to off-site industrial plant, as fuel for steam boilers, kilns, burners, utility power plants, etc.

**High Btu (HBTU)** - Cleaned to natural gas specifications and delivered to a natural gas pipeline, and sold at natural gas market prices.
Greenhouse Gas Offsets from LFG Power Plant

Landfills that are large enough to support a power plant are typically required by regulation to install a gas collection system and destroy the methane.

Because the methane destruction is not voluntary, no direct carbon offsets are generated.

If the landfill gas collection system does not qualify for carbon offsets, then a power plant at this landfill also does not qualify for direct carbon offsets from methane destruction.

However, the buyer of electricity from a landfill gas project is offsetting fossil fuel use, which indirectly reduces carbon dioxide emissions.
Indirect Greenhouse Gas Offsets

Indirect offsets are a function of the fuel source of the power being displaced by the renewable energy project.

The US EPA Clean Energy eGRID lists the annual CO2 output emission rate for energy subregions.

The emission rate is calculated in pounds per megawatt-hour of energy production.

Ohio is in the RFC West subregion, with an emission rate of 1,520 lbs/mwh.

Other regions range from 498 in Upstate NY to 1,825 in WECC Rockies.
## WM Projects in Ohio

<table>
<thead>
<tr>
<th>Landfill</th>
<th>City</th>
<th>Type</th>
<th>Size (MW or mmbtu/yr)</th>
<th>Buyer</th>
<th>Calculated Indirect GHG Offsets (tpy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suburban</td>
<td>Glenford</td>
<td>Power</td>
<td>5.6 MW</td>
<td>Buckeye Power</td>
<td>28,600</td>
</tr>
<tr>
<td>Mahoning</td>
<td>New Springfield</td>
<td>Power</td>
<td>4.0 MW</td>
<td>City of Oberlin</td>
<td>20,200</td>
</tr>
<tr>
<td>Geneva</td>
<td>Geneva</td>
<td>Power</td>
<td>4.0 MW</td>
<td>City of Oberlin</td>
<td>20,700</td>
</tr>
<tr>
<td>American</td>
<td>Waynesburg</td>
<td>HBTU</td>
<td>650,000</td>
<td>Dominion</td>
<td>36,000</td>
</tr>
<tr>
<td>Stony Hollow</td>
<td>Dayton</td>
<td>HBTU</td>
<td>557,000</td>
<td>Dominion</td>
<td>30,800</td>
</tr>
<tr>
<td>Evergreen</td>
<td>Northwood</td>
<td>MBTU</td>
<td>255,000</td>
<td>Toledo Refinery</td>
<td>14,100</td>
</tr>
<tr>
<td>Cuyahoga</td>
<td>Solon</td>
<td>MBTU</td>
<td>168,000</td>
<td>Nestles</td>
<td>9,300</td>
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</tbody>
</table>
WM GHG Reporting and Compliance Program

EPA’s Greenhouse Gas Reporting Program (40 CFR Part 98 Rules) requires MSW landfills that accepted MSW after January 1, 1980 and generate methane in amounts equivalent to 25,000 metric tons of CO$_2$e or more per year to report annual GHG emissions. This includes emissions from the landfill, landfill gas collection systems, and destruction devices for landfill gases (including flares).

Over 1200 MSW Landfills report emissions. In 2012, the MSW Landfills reported 79 million metric tons CO$_2$e, which is 2.5% of the total reported for all sectors (3.13 billion). Power plants account for roughly 1/3 of total GHG emissions in 2012.

WM reports for 241 active and closed MSW Landfills, of which 214 sites have active gas collection, 89 have WM-owned landfill gas projects, and 49 have third party landfill gas projects. WM must also report emissions from small stationary combustion units (e.g., water heaters, building comfort heaters). WM has reported its emissions since CY2010. WM is in process of preparing its CY2013 reports due March 31, 2014. WM has complied with EPA’s reporting rule for all reporting sites.

Lessons learned from reporting. It is a time consuming process given the amount of data EPA requires each site to report. Required reporting forms have not been available until late February/early March, which significantly challenges reporters to re-configure data mapping to conform to EPA form changes and still meet reporting deadline.
Renewable Energy Plant
Fuel Skid
Compresses, filters, and dewater the gas
Engine Room
WM uses 1,070 Hp or 2,140 Hp Engines
Computer diagnosis of engines
Switch gear converts electricity to utility specifications
Radiators and Engine Exhaust Stacks
Transformer converts power to utility line voltage
Transmission line delivers power to utility
## LFGTE compared to Wind & Solar

<table>
<thead>
<tr>
<th>Type</th>
<th>Wind</th>
<th>Solar</th>
<th>LFG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Resource</td>
<td>High</td>
<td>High</td>
<td>Finite</td>
</tr>
<tr>
<td>Capacity Factor</td>
<td>25% - 45%</td>
<td>10% - 20%</td>
<td>&gt;90%</td>
</tr>
<tr>
<td>Base Load Resource</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Distributed Generation</td>
<td>No</td>
<td>Excellent</td>
<td>Good</td>
</tr>
<tr>
<td>Peak Load Generation</td>
<td>Poor-Mod</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>Transmission Cost</td>
<td>Can Be High</td>
<td>None</td>
<td>Negative</td>
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</tbody>
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Curbside to Power