

Waste Management is Critical

Municipal Solid Waste (MSW) management is one of the world's biggest challenges. The US currently produces over **250 million tons** of MSW each year, almost 2/3 of which continues to be landfilled. Other forms of waste (forest/wood waste, agricultural waste, industrial waste and other solid wastes) increases this quantity significantly. Worldwide, the total MSW number is **1.3 billion tons** per year and projected to grow to **2.6 billion tons** per year by 2025 (*The Worldwatch Institute*), and that number is projected to triple by 2100. The increased pressure to find alternative ways to deal with MSW will increase the catalytic forces propelling bioenergy projects forward, especially waste-to-energy projects.

Why Bio-Energy from MSW?

- About 33% of the over 250 million tons per year of MSW in the US is recycled.
- 11% is converted to energy through old incinerators
- Over **135 million tons** per year are still deposited into 1,700 existing landfills, leading to immense methane emissions exceeding **1 million tons of CO₂** equivalent per month.
- Many countries have governmental mandates that support our MSW to Bio-Fuel initiatives.
 - EU and Brazil have landfill elimination plans
 - EU, Mexico, Brazil, India, Australia & New Zealand are creating renewable energy plans
- The potential market is over 1,000 projects in the US, just using MSW.
- The worldwide opportunity is almost 20 times that amount (20,000 potential projects just using MSW).

Emerging Hydrogen Merchant Markets

Total consumption of hydrogen is **11.5 million tons** in North America and **52 million tons** in the world, most of which is used in petroleum and chemical processing.

We are now at the forefront of a new and emerging hydrogen market. Almost all car manufacturers around the world are working on their version of the Fuel Cell Electric Vehicle (FCEV). Several (including Toyota, Honda, Hyundai & Mercedes) have formally announced the introduction of production FCEV for the US market. California and other states are proactively looking to setup the infrastructure needed to support the projected demand for hydrogen fueling stations. These States have authorized millions to establish the initial H₂ fueling stations, and have also mandated that 33% of all H₂ be produced from renewable sources. Navigant forecasts this H₂ merchant market to grow from less than \$2 Billion now, to \$50 billion by 2030.

Eco H₂® Bio Reformation Advantages

The Eco H₂ Bio Reformation process has several advantages over traditional reformation technologies:

- It is green energy since it uses renewable feedstocks
- It is green because it does not produce Greenhouse Gases (GHG, i.e. CO and CO₂)
- It is economically scalable to meet local H₂ demand
- It produces pure hydrogen without secondary steps
- It can be co-located with fuel cells to produce power

These modular and scalable features allow on-site H₂ production, reducing or eliminating the high costs of transporting hydrogen typically seen today.

Eco Energy International

Eco Energy International is a joint venture of **Bio Carbon Fuels** (BCF) and **Energy Technologies, Inc.** (ETI), working together to develop technologies that totally recover municipal solid waste, producing clean renewable energy with zero carbon emissions and reducing the overall need for landfills.



Bio Carbon Fuels LLC
Clean Fuels & Energy

Bio Carbon Fuels, LLC is a California company developing renewable energy and fuels projects, especially in the bioenergy space, with more than a dozen projects at different stages of development. Bioenergy includes several technologies that take in biogenic or carbon-based feedstocks (wood, MSW, agricultural and industrial wastes) and convert them into some form of renewable energy (power, fuels, gas, heat).



Energy Technologies Inc.

Rugged Power ♦ Global Solutions

Energy Technologies, Inc. is an Ohio manufacturer that has been supporting defense and industrial clients for over 25 years. ETI has 25 US and International patents covering the low cost, direct conversion of multiple feedstocks, such as MSW, into pure hydrogen (H₂) while sequestering all of the carbon.

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ISO 9001-2008 Quality Certified

Total Waste Recovery™

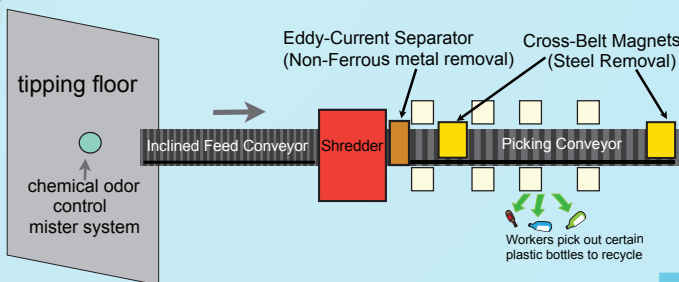
CLEAN RENEWABLE ENERGY



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Self Sustaining Total Recovery Facility

Energy Technologies Inc. (ETI) is combining our technologies with those of Bio Carbon Fuels (BCF) to reduce landfill use while maximizing waste recovery and producing clean energy. ETI's bio reformation technology extracts clean, usable Hydrogen (H_2) from the organic materials in Municipal Solid Waste (MSW) while capturing their carbon content. BCF is then taking the left over materials and converting them to re-engineered fuel to be the feedstock for gasifiers, creating Syngas suitable for generation of electricity or the production of additional H_2 . The result: instead of sending waste materials to a landfill, we utilize all materials to produce both H_2 and electricity. Additionally, remaining materials are recycled and water utilized in this process is reclaimed for reuse.



Processing Waste

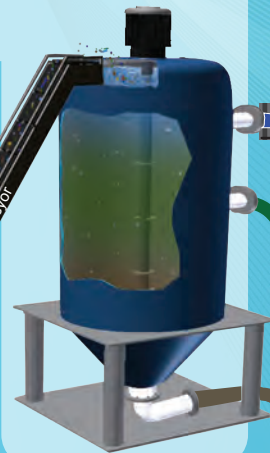
Trucks deliver unsorted waste materials to the facility, dumping it on a tipping floor. An Inclined feed conveyor carries this material into a Shredder, which grinds up all of the waste into smaller pieces and deposits it onto the next conveyor. An Eddy Current Separator draws out non-ferrous metals. Cross-Belt Suspension Magnets pull out any small pieces of ferrous metal remaining on the conveyor. The Picking Conveyor is the only step that involves manual labor to pick out any items that the automated processes might not be able to break down. Next a Grinder shreds the remaining waste into small bits before it is conveyed into the Bio Separation Vessel.



Bio Separation Vessel (BSV)

** Patent Pending*

Ground up MSW is delivered into the top of the vessel via an inclined conveyor. The vessel contains a caustic solution (i.e. Caustic Soda, Caustic Potash, or Slaked Lime). A large stirring mechanism in the vessel helps dissolve the organic or bio-materials (i.e. paper, cardboard, wood, food waste, non-synthetic fibers/fabrics, grass clippings, etc.) into the caustic solution. To speed up the process, waste heat can be recovered from the downstream process.



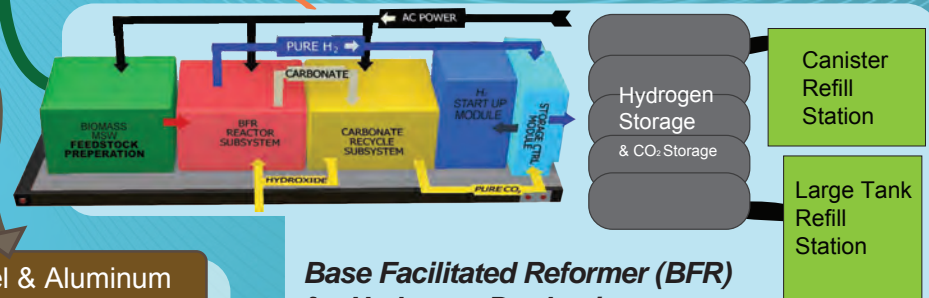
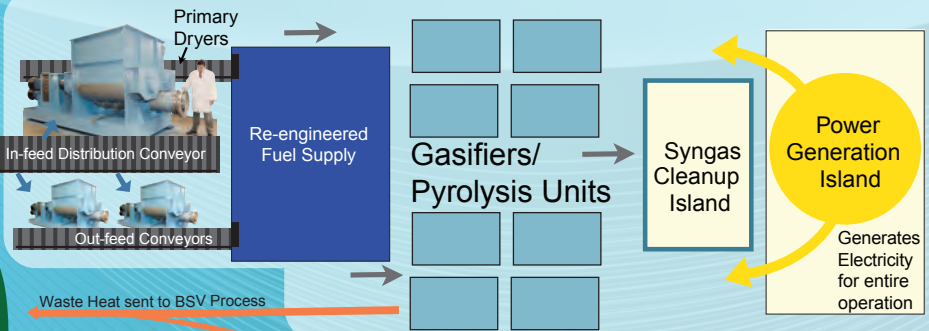
Steel & Aluminum pieces to be sold

Heavy inorganic materials (metal, glass, etc.) will sink to the bottom of the BSV where a drag chain conveyor will remove them. Along with the metals removed by the Eddie-Current and the Cross Belt Magnets, these metals are sent for separation, recycling and resale. The glass can be recycled or given away.

Bio Carbon Fuels (BCF) for Power Generation

** Patented*

Lighter materials (i.e. plastics, undissolved wood, etc.) float to the surface of the solution in the BSV, where a drag chain can extract these materials. The materials are fed along conveyors into the patented BCF Dryers which re-engineer these materials into a dry blend and granulate. The dry materials can then be fed into gasifiers creating syngas. The syngas is then cleaned and used to power generators, a portion of which can be used to power this entire waste reclamation facility.



Base Facilitated Reformer (BFR) for Hydrogen Production

** 25 US & International Patents*

The aqueous solution in the middle of the BSV contains dissolved organic materials which become the feedstock to ETI's patented BFR process. This system is a low cost direct conversion of feedstocks into pure hydrogen (H_2) without producing greenhouse gas as a by-product. All carbon from the waste is sequestered and not released to the atmosphere. Renewable feedstocks include biomass, biogas, landfill gas, municipal solid waste, agricultural waste, forest/lumber industry waste, food processing waste, restaurant/food industry waste and other organic materials. The hydrogen produced through this process can then be stored in canisters/vessels and sold and/or used in fuel cells to make electricity.