Southern California Conversion Technology

Technical Database

Last Updated: 2014

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Public Works
LOS ANGELES COUNTY

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1. **Company Name:** Abengoa Bioenergy

   Company Url: http://www.abengoabioenergy.com

   Technology Name: Waste to Biofuels - Enzymatic Hydrolysis

   Type: Developer

   Technology: Other

   First Name: N/A

   Last Name: N/A

   Title: N/A

   Phone: N/A

   Fax: N/A

   Email: N/A

   Street Address: N/A

   City: N/A

   State: N/A

   Zip: N/A

   Capacity Range: From >1,000 tpd to <1,500 tpd

   Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Other (Cellulose-Rich Streams)

   Company Specified Type: Waste to Biofuels - Enzymatic Hydrolysis

   Tech Description: Abengoa Bioenergy's proprietary waste to biofuels technology converts MSW into biofuels (W2B) and energy, based on the biological conversion of organic matter, paper and cardboard via enzymatic hydrolysis and fermentation. MSW is pre-treated to separate recyclables, remove contaminants, and obtain a high-purity cellulosic fiber stream suitable for conversion into ethanol. The cellulosic fiber stream is thermochemically treated (using steam) to liberate sugars and is then sent to enzymatic hydrolysis (using proprietary enzymes) followed by yeast fermentation and distillation. Non-converted solids removed during distillation are used (together with auxiliary fuel, as needed) to generate energy for the process (boiler/steam turbine).

   Tech Rights: The W2B enzymatic hydrolysis technology is owned by Abengoa Bioenergy. The company holds more than 90 patents covering all aspects of the technology and has an ongoing patent for the whole W2B process (including pre-treatment, enzymatic hydrolysis, fermentation, etc). Abengoa Bioenergy has a license from Dyadic providing non-exclusive rights for the use and modification of an organism that produces enzymes necessary for the conversion process.

Bus Structure: Abengoa is a large international company (more than 22,000 people in more than 70 countries) that applies innovative technology solutions for sustainability in the energy and environmental sectors. Abengoa Bioenergy is a subsidiary of Abengoa. Its activities can be included under six large areas: procurement of raw materials, bioethanol origination, production, marketing of bioethanol, DGS and sugar, co-generation and new technologies.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The demonstration plant (Ref. Facility 1) also recovers PET, aluminum and ferrous from the pre-processing of MSW. This demonstration plant can be visited to observe the technology in operation. Upon start of operations in January 2014, the commercial facility in Kansas (Ref. Facility 2) will also be available for visits. Abengoa also has a 1 tpd demonstration plant in York, Nebraska (USA), that has been intermittently operational since 2007 (more than 27,500 hours of operation with different feedstock including MSW at a laboratory scale).

Facility Location: Babilafuente (Salamanca, Spain)

Technology: W2B - Enzymatic Hydrolysis

Energy Product: Bioethanol

Commercial/Demo: Demonstration Plant

Design Capacity: 112.5 tpd (33,490 tpy) (one unit)

Actual Capacity: 45.5 tpd (13,650 tpy)

Feedstock: Currently MSW, food waste, green waste, biosolids and cellulose-richstreams, previously (2009-2011) Corn Stover and Wheat Straw

Owner: Abengoa Bioenergy

Operator: Abengoa Bioenergy

Size: 3-acre site

Date Operational: April 1, 2013, for MSW; 2009-2011 for other feedstock; has operated over 5.000 hours continuously

Still Operating: Yes

Facility Location: Hugoton, Kansas

Technology: W2B - Enzymatic Hydrolysis

Energy Product: Fuel-grade ethanol (26 million gallons per year) and electrical power (18 MW, neutral to grid)

Commercial/Demo: Commercial Plant

Design Capacity: 876.7 tpd (320,000 tpy) (one unit)

Actual Capacity: not yet operating

Feedstock: Corn Stover and Switch Grass

Owner: Abengoa Bioenergy

Operator: Abengoa Bioenergy

Size: 400-acre site

Date Operational: Under construction; anticipated date of operation is January 2014

Still Operating: Not applicable

Optimum Design Capacity: 1,442 tpd (450,000 tpy throughput)

Optimum Feedstock: MSW

Optimum Area Required: Minimum of 29 acres; 37 acres preferred

Optimum Diversion Percentage: Up to 89.5%, depending on feedstock composition and marketability of products. Landfill disposal of the non-recyclable, non-fermentable fraction removed during pre-processing would reduce diversion to an estimated 64% (Abengoa calls this RDF and specifies external management).

Optimum Marketable Products: Bioethanol (for sale), plastics and metal (for sale), and steam and electricity (for self-consumption)

2. **Company Name:** adaptiveARC Inc.

   Company Url: http://www.adaptivearc.com

   Technology Name: Cool Plasma® Gasification

   Type: Supplier

   Technology: Plasma Gasification

   First Name: Karl

   Last Name: Yoder

   Title: Business Development Associate

   Phone: 619-240-5413

   Fax: 858-704-0508

   Email: karl@adaptivearc.com

   Street Address: 251 South Van Ness Avenue

   City: San Francisco

   State: CA

   Zip: 94103

   Capacity Range: From <100 tpd to 1,000 tpd

   Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other

   Company Specified Type: Cool Plasma® Gasification

   Tech Description: Cool Plasma® Gasification converts waste, or other carbonaceous feedstock, into valuable outputs using plasma field dynamics. The proprietary process uses multi-stage, downdraft gasification with a high-energy, pulsed-plasma torch. Waste flows through a plasma arc generated by pressurizing a gas (a combination of diesel, air and electricity) and passing it through an electrical field in an oxygen-deprived chamber. This produces a high-heat environment (800-1000°C), which instantaneously breaks down the waste feedstock into its molecular components. Cool Plasma® Gasification creates a syngas (synthesis gas), a portion of which is recycled within the gasifier to provide extended residency times (called Regenerative Cleaning), and which is enhanced with Dry Sorbent Injection to produce a clean syngas. The syngas can be used to generate a wide range of valuable outputs including electricity, liquid fuels, and specialized chemicals. The only solid byproducts are inert materials: dry fly ash (which is commonly used as a construction aggregate), glass, and metals. The technology is modular and portable. The current model (ce25) is designed to process 15-25 tpd of feedstock with net electrical output of 500 kW; a common configuration is four units to process up to 100 tpd of feedstock and generate up to 2 MW of electricity (net).

Tech Rights: adaptiveARC holds all patents and other intellectual property relating to its Cool Plasma® Technology. adaptiveARC does not license any outside technology for its purpose.

Bus Structure: adaptiveARC is a Delaware C-Corporation registered to do business in the state of California. All of the company's design and manufacturing to date has been performed in California. The company is privately held.

Data Source: Company RFEI response to Los Angeles County August 2013

Additional Notes: Reference Facility 1 (Mexico City) is a private operation and not open to the public. Reference Facility 2 (Riverside, CA) is available for touring at a time corresponding with the facility's operating and testing schedule. AdaptiveARC's first commercial application (Missouri) shipped in May 2013 with commissioning scheduled for August 2013 (processing 15 tpd hazardous waste).

Facility Location: Mexico City

Technology: Cool Plasma® Gasification

Energy Product: Electricity (402 kW) (Caterpillar 3500-series Reciprocating Internal Combustion Engine)

Commercial/Demo: Demonstration

Design Capacity: 25 tpd (9,000 tpy) (one ce25 plasma arc gasifier)

Actual Capacity: 10 tpd (3,000 tpy)

Feedstock: Biomass, manure, hazardous waste, industrial waste, MSW residuals, plastic packaging, cardboard, paper pulp, sludge, carpet backing, construction debris

Owner: Bio Sistemas Sustentables S.A.P.I de C.V.

Operator: Bio Sistemas Sustentables S.A.P.I de C.V.

Size: 0.25 acres

Date Operational: July 2010

Still Operating: No (operated for 300 hours for demonstration purposes)

Facility Location: Riverside, CA

Technology: Cool Plasma® Gasification

Energy Product: Electricity (500 kW) (Caterpillar 3500-series Reciprocating Internal Combustion Engine)

Commercial/Demo: Demonstration (used exclusively for validation and commercial acceptance testing)

Design Capacity: 25 tpd (9,000 tpy) (one ce25 plasma arc gasifier)

Actual Capacity: 4-8 tpd

Feedstock: Residual waste from a material recovery facility

Owner: adaptiveQRC

Operator: adaptiveQRC

Size: 0.25 acres

Date Operational: January 2013

Still Operating: Yes (operating schedule varies according to testing schedule; 67 operating hours to date)

Optimum Design Capacity: Project 1: 300 tpd curbside recycled waste with 225 tpd recycled and 75 tpd gasified (five ce25 gasifiers); Project 2: 15 tpd medical waste (one ce25 gasifier)

Optimum Feedstock: 1: residue from curbside recyclables; 2: medical waste (red bag, canister and pharmaceuticals)

Optimum Area Required: 1: 4 acres; 2: 0.5 acres

Optimum Diversion Percentage: 1 and 2: 95% to 100% diversion, depending on feedstock composition and marketability of products.

Optimum Marketable Products: 1: electricity (2.5 MW) and recovered recyclables (metals, glass, plastic); 2: electricity (500 kW)

Optimum Additional Notes: Feedstock requires shredding or grinding to reduce size to approximately 3-inches. Electricity generated using standard reciprocating internal combustion engine.

3. **Company Name:** Alter NRG Corp.

   Company Url: http://www.westinghouse-plasma.com

   Technology Name: Westinghouse Plasma Gasification Technology

   Type: Supplier

   Technology: Plasma Gasification

   First Name: Mark

   Last Name: Wright

   Title: Vice President, Business Development

   Phone: 770-696-7698

   Fax: N/A

   Email: mwright@westinghouse-plasma.com

   Street Address: P.O. Box 410

   City: Madison

   State: PA

   Zip: 15668

   Capacity Range: From <100 tpd to >1500 tpd

   Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Tires, Hazardous Waste

   Company Specified Type: Westinghouse Plasma Gasification Technology

   Tech Description: The Westinghouse Plasma gasification technology was originally developed for foundry (metal-melting) applications in the 1980's, and subsequently was further developed for waste management applications. The Alter NRG Plasma Gasification System includes waste handling equipment, plasma gasification, gas cooling and clean-up, and syngas management options. The plasma gasification reactor is a refractory-lined vessel, with plasma torches located around the periphery near the bottom of the reactor. Limited pre-treatment of feedstock is required but could include segregation and sorting of recyclables (typically metals and glass), shredding, and/or crushing as appropriate. Waste is fed into the reactor near or at the top: it begins to gasify as it falls onto a bed of coke heated by the plasma torches, where gasification is completed. Syngas exits the top of the reactor for clean-up and conversion to energy products. Inorganic materials that cannot be gasified are melted and flow out the bottom of the reactor as molten slag. The technology is scalable and modular.

   Tech Rights: Alter NRG acquired Westinghouse Plasma Corporation in 2007 and owns the Westinghouse Plasma gasification technology.

Bus Structure: Westinghouse Plasma Corporation is a wholly owned subsidiary of Alter NRG Corp. Alter NRG is a publically traded alternative energy company.

Data Source: Company RFEI response to Los Angeles County, August 2011 Company review of summary information, March 2012, and Company submittal of updated RFEI response, (August and September 2013).

Additional Notes: The Westinghouse Plasma gasification technology is reported to have been used in commercial facilities around the world processing municipal solid waste for over nine years.

Facility Location: Utashinai, Japan

Technology: Westinghouse Plasma Gasification

Energy Product: Electricity

Commercial/Demo: Commercial

Design Capacity: 220 tpd MSW or 160 tpd MSW combined with auto shredder residue

Actual Capacity: N/A

Feedstock: MSW and auto shredder residue

Owner: Hitachi Metals

Operator: Hitachi Metals

Size: N/A

Date Operational: 2003

Still Operating: Yes

Facility Location: Teesside, United Kingdom

Technology: Westinghouse Plasma Gasification

Energy Product: Electricity (50 MW gross combined cycle generation power sold directly to end-use retail customer)

Commercial/Demo: Commercial

Design Capacity: 1,100 tons per day

Actual Capacity: Plan under construction; data available Q2/2014

Feedstock: Post-recycled MSW

Owner: Air Products

Operator: Air Products

Size: Approximately 20 acres

Date Operational: Pending; Q2/2014

Still Operating: Plan under construction

Optimum Design Capacity: 1) 1,100 tpd MSW to Electricity via Combined Cycle

Optimum Feedstock: 90% MSW, 10% Industrial / Medical Waste

Optimum Area Required: 120 meters x 140 meters (approx. 4 acres)

Optimum Diversion Percentage: 85%-95%, depending on feedstock composition and marketability of products

Optimum Marketable Products: Syngas to Electricity, Optional: Cellulosic Ethanol, Heat Generation, Slag

Optimum Additional Notes: The facility under construction in Teesside, United Kingdom, is almost identical to the conceptual optimum project, and represents the most likely economically viable application of the technology in Southern California.

4. **Company Name:** American Waste to Energy, LLC

   Company Url: http://www.americanwaste2nrg.com

   Technology Name: Bulk Handling Systems MRF - Rentech - SilvaGas Indirect Gasifier - Solar Combustion Turbine

   Type: Developer

   Technology: Gasification

   First Name: George

   Last Name: Sterzinger

   Title: CEO

   Phone: 202-255-8119

   Fax: N/A

   Email: gsterzinger@gmail.com

   Street Address: Two Riverway, Suite 725

   City: Houston

   State: TX

   Zip: 77056

   Capacity Range: 100 tpd to 500 tpd, and >1,000 tpd to 1,500 tpd

   Feedstock List: MSW

   Company Specified Type: Bulk Handling Systems MRF - Rentech - SilvaGas Indirect Gasifier - Solar Combustion Turbine

   Tech Description: The process consists of a traditional Material Recovery Facility (equipment by Bulk Handling Systems) to recover recyclables, remove inert materials not suitable for gasification, and produce a refuse derived fuel (RDF) for gasification. The Rentech/SilvaGas Indirect Gasifier is a double-vessel configuration, with fluidized bed gasification (no air or oxygen) followed by char combustion and reheat recirculation of the fluidizing medium (sand Folivine). The product gas is cleaned and used to generate electricity (using Solar combustion turbines). Ash is a byproduct of the char combustion process and requires landfill disposal.

   Tech Rights: As a project developer, American Waste to Energy (AWE) will obtain each of the technologies from equipment providers with appropriate performance warranties or may pursue possible Joint Venture agreements.

   Bus Structure: AWE is a development company focused on renewable energy projects.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The Bulk Handling System MRF equipment and Solar combustion turbines are commercially available technologies. However, the Rentech/SilvaGas Indirect Gasifier has not be demonstrated in combination with these companion technologies.

Facility Location: Burlington, VT (McNeil Generating Station)

Technology: SilvaGas Indirect Gasifier

Energy Product: Syngas

Commercial/Demo: Demonstration

Design Capacity: 200 tpd (one unit)

Actual Capacity: 300+ tpd

Feedstock: Woodchips

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 1994

Still Operating: No (operated for 2,000 hours between 1994 and 1997 and was then moth-balled).

Optimum Design Capacity: 1. 60 MW (up to 2,000 tpd) 2. 20 MW (300 tpd) 3. 10 MW (117 tpd)

Optimum Feedstock: Refuse Derived Fuel

Optimum Area Required: <3 acres for 300 tpd

Optimum Diversion Percentage: N/A

Optimum Marketable Products: Electricity

5. **Company Name:** Anaergia

   Company Url: http://www.anaergia.com

   Technology Name: MSW Organics Extrusion, Preprocessing, Digestion and Resource Recovery (OEP-D-RR)

   Type: Developer & Supplier

   Technology: Anaerobic Digestion

   First Name: David

   Last Name: Schneider

   Title: Director of Business Development

   Phone: 760-436-8870 x130

   Fax: N/A

   Email: david.schneider@anaergia.com

   Street Address: 5780 Fleet Street, Suite 310

   City: Carlsbad

   State: CA

   Zip: 92008

   Capacity Range: 100 tpd to >1,500 tpd

   Feedstock List: MSW, Food Waste, Green Waste, Biosolids

   Company Specified Type: Anaerobic Digestion

   Tech Description: The OEP-D-RR process is an integrated organics management solution that incorporates proven technologies to maximize diversion of organics directly from MSW without the need for source separation. OEP-D-RR is a set of technologies that overlays within existing waste infrastructure with the flexibility to implement the digestion and resource recovery at either existing wastewater treatment plants or stand-alone centralized digestion facilities. Preprocessing of MSW takes place with a "wet preprocessing line" that uses the Organic Extrusion Press to extract the wet (organic) fraction from MSW (can be sited at existing transfer stations/MRFs). The wet fraction is then diluted (using centrate from the digestion process) and further cleaned (using the Organic Polishing System) to remove minor contaminants such as grit and plastic. The cleaned, wet fraction is then digested, either through enhanced digestion at existing wastewater treatment plants or in stand-alone, dedicated digesters. Anaergia has different types of digesters available, including its Triton® Digester system that is constructed as a "tank in tank" design. In the Triton® system, prepared material is fed to the outer ring of the digester and then pumped to the inner part of the tank; biogas is stored under a membrane cover located over the

top of the inner tank (no separate storage tank). Following digestion, biogas is upgraded to fuel or used to generate electricity and heat. Digestate is dewatered, with the filtrate partially recirculated to the Organic Polishing System, and with the dewatered digestate used as a fertilizer, composted, or disposed, depending on project-specific conditions.

Tech Rights: Anaergia's European subsidiary, UTS Biogas, has developed many anaerobic digestion technologies over their 20-year history. Anaergia owns and manufactures these digestion technologies. Anaergia has worked with global partners to exclusively license, as necessary, all other components of its technology portfolio.

Bus Structure: Anaergia, Inc. is the parent for a group of companies each with complementary expertise in the field of wastewater treatment and anaerobic digestion (UTS Biogas - technology, Pharmer Engineering - design, and The Stover Group - operations). Anaergia has global headquarters in Burlington, ON and U.S. headquarters in Carlsbad, CA. In North America alone, Anaergia has over 150 people between all of its operating companies to develop projects, integrate the suite of technologies, and provide operation and financing for the projects it develops.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The OEP reference facility in Germany is part of a much larger waste management site (including a MRF, landfill and composting), with approximately 3 acres dedicated to the OEP and digestion process; the OEP is located in a building that is 3 times bigger than is needed. Both reference facilities are available to be visited, with coordination through Anaergia.

Facility Location: Kaiserslautern, Germany

Technology: Organics Extrusion Press

Energy Product: Combined Heat and Power; upgraded Biomethane

Commercial/Demo: Commercial

Design Capacity: 264-308 tpd (110,000 tpy) (One OEP)

Actual Capacity: Currently 250 tpd (66,000 tpy); limited by feedstock availability

Feedstock: MSW

Owner: Zentralen Abfallwirtschaft Kaiserslautern (ZAK)

Operator: ZAK

Size: 3 acres

Date Operational: 2006

Still Operating: Yes

Facility Location: Binns Farm, Glenfarg (near Perth), Scotland

Technology: Anaerobic Digestion

Energy Product: Electricity (800 kW) and heat for process uses

Commercial/Demo: Commercial

Design Capacity: 40-50 tpd (17,600 tpy) (two digestion tanks arranged in a two-stage configuration)

Actual Capacity: Not known

Feedstock: Source Separated Organics and Food Waste

Owner: TEG Environmental

Operator: TEG Environmental

Size: 1-2 acres

Date Operational: 2013

Still Operating: Yes

Optimum Design Capacity: 700 tpd (200,000 tpy) (two Organic Extrusion Presses, two Organic Polishing Systems, and one digester with a capacity of 1.75 million gallons; integration of MRF equipment as applicable)

Optimum Feedstock: MSW; performance would be enhanced with the addition of wet commercial waste, food waste and FOG (fats, oils and grease)

Optimum Area Required: Minimum of 1 acre for the OEP system and 2 acres for the balance of the system, which can be co-located or at separate sites; preferred acreage is 1.5 to 2 times those areas. Composting of dewatered digestate, if applicable, would require additional area.

Optimum Diversion Percentage: Up to 61%, depending on feedstock composition and marketability of products

Optimum Marketable Products: Electricity and/or biomethane, heat (if CHP units are used), organic fertilizer (compost), ammonium sulfate

Optimum Additional Notes: The optimum design capacity is based on the nominal operating capacity of the Organic Extrusion Press, and Anaergia's design preference to install two OEPs

6. **Company Name:** Arrow Ecology and Engineering Overseas Ltd

   Company Url: http://www.arrowbio.com

   Technology Name: ArrowBio Wet Anaerobic Digestion Technology

   Type: Supplier

   Technology: Anaerobic Digestion

   First Name: Yair

   Last Name: Zadik

   Title: CEO

   Phone: +972-484-11100 Mobile: +972-505-42439

   Fax: +972-484-22200

   Email: yair@arrowecology.com

   Street Address: 2, HaCarmel st.

   City: Yoqnean 20692

   State: ISRAEL

   Zip: N/A

   Capacity Range: From 100 tpd to 1,500 tpd

   Feedstock Lis: Mixed MSW, sorted or partly sorted MSW, Food Waste, Biosolids, High organic wastewater, Agriculture Waste

   Company Specified Type: ArrowBio Wet Anaerobic Digestion Technology

   Tech Description: The ArrowBio anaerobic digestion technology consists of a water-based, up-front, integrated MSW separation and preparation system followed by a two-stage wet anaerobic digestion process (acetogenic bioreactor followed by a methanogenic Upflow Anaerobic Sludge Blanket (UASB) bioreactor + digesters). During the preparation and separation process, the recyclable materials like cardboard, paper, plastics, metals, and glass, are separated. The biological conversion process produces digestate (to be marketed as a compost or soil improver) and a methane-rich biogas. The digestate does not require cleaning due to the extensive amount of separation and preparation that occurs before digestion. The digestate is dewatered, and passive aerobic composting is conducted, as necessary. The biogas can be combusted on-site to generate electricity or be used in other ways as a renewable fuel. Examples of potential renewable fuel uses for the biogas include introduction into a natural gas pipeline distribution system and compression or liquefaction for use as vehicle fuel.

   Tech Rights: The technology has been developed and patented by Arrow.

Bus Structure: ArrowEcology and Engineering Overseas Ltd., based in Israel, provides operational, engineering, and consulting services in municipal waste management and sludge treatment. The company offers a proprietary anaerobic digestion technology, the ArrowBio Process.

Data Source: Company Participation in LA County Phase II Process, Company review of summary information (April 2012), and Company submittal of updated RFEI response (August 2013).

Additional Notes: Arrow reports that the Reference Facility in Hiriya, Israel is going to double its capacity in 2014, and has received approval for Government Investment as a result of operating success. Other business development activities reported by Arrow include entering into three contracts: 660 tpd plant in China, 330 tpd plant in Nigeria, and 330 tpd plant in Argentina. In addition, Arrow reports that based on a feasibility study, it has been selected for the city of Monte Silvano, Italy.

Facility Location: Hiriya, Israel

Technology: ArrowBio Anaerobic Digestion

Energy Product: Biogas

Commercial/Demo: Commercial

Design Capacity: 220 tpd

Actual Capacity: 220 tpd

Feedstock: mixed MSW

Owner: Arrow Ecology and Engineering Overseas Ltd.

Operator: Arrow Ecology and Engineering Overseas Ltd.

Size: 2 acres

Date Operational: 2003

Still Operating: Yes

Optimum Design Capacity: 330 tpd

Optimum Feedstock: Food waste, other wet organic waste

Optimum Area Required: 3-4 acres

Optimum Diversion Percentage: Around 70%-80%+ depending on feedstock composition and marketability of products

Optimum Marketable Products: Green energy, plastics

7. **Company Name:** Axpo Kompogas AG

   Company Url: http://www.axpo.com/kompogas

   Technology Name: Kompogas E Dry Anaerobic Digestion Process

   Type: Developer & Supplier

   Technology: Anaerobic Digestion

   First Name: Stephane

   Last Name: Maechler

   Title: Sales Director

   Phone: 41 44 809 77 76

   Fax: +41 44 809 77 00

   Email: stephane.maechler@axpo.com

   Street Address: Flughofstrasse 54

   City: 8152 Glattbrugg

   State: Switzerland

   Zip: N/A

   Capacity Range: <100 tpd to >500 tpd

   Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Other (Commercial/Industrial Organic Waste)

   Company Specified Type: Kompogas E Dry Anaerobic Digestion Process

   Tech Description: The core of the Kompogas dry AD process is the patented horizontal Kompogas plug flow digester, which operates continuously (24 hours/day, 365 days/year) at a temperature of 54°C/129°F (thermophilic process). Material is shredded before being fed to the digester, which has a retention period of 2-3 weeks. The digester core module (PF1300) is a horizontal concrete vessel with a steel roof and steel in-liner, having a nominal fill volume of 1,300 m3 (45,900 ft3), equipped with a longitudinal single shaft agitator device, as well as internal inoculation, heat distribution, safety, control and auxiliary systems. The throughput capacity of a single digester core module is approximately 18,000 to 20,000 metric tons per year (20,000 to 22,000 short tons per year or approximately 55-60 tons per day). (With actual throughput capacity subject to feedstock composition). The minimum standard plant size is 50 tpd (one PF1300 digester), with use of multiple digesters to achieve larger capacities.

   Tech Rights: Axpo Kompogas holds all intellectual property and trademark rights regarding the patented Kompogas process and protected Kompogas brand.

Bus Structure: The Swiss company Axpo Kompogas AG is a 100% subsidiary of Axpo Group, the largest electric utility of Switzerland. Beyond its home markets, Axpo Kompogas operates globally through license and OEM-partnerships.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: Axpo Kompogas has installed more than 70 plants worldwide and owns and operates 16 Kompogas plants in Switzerland. The oldest plant is in Rumlang, Switzerland, and has operated since 1991 (over 20 years). The largest plant is in Doha, Qatar, which operates 15 Kompogas digesters in parallel for a total throughput capacity of approximately 300,000 tons per year. The two reference facilities listed can be visited to tour the process in operation. Both reference facilities were designed, built, and commissioned on a turn-key basis. Operational data for both facilities may be available from the facility operator.

Facility Location: Backnang-Neuschontal, Germany

Technology: Kompogas® dry AD

Energy Product: Electricity (7.9 million kWh/year to grid via gas engines) and heat for wastewater sludge drying plant

Commercial/Demo: Commercial

Design Capacity: 108 tpd (39,600 tpy) (two units type PF1300 at approx. 55 tpd each)

Actual Capacity: 108 tpd (39,600 tpy)

Feedstock: Source separated food/bio waste and garden waste, from households and commercial entities

Owner: Abfallwirtschaftgesellschaft des Rems-Murr-Kreises mbH

Operator: Abfallwirtschaftgesellschaft des Rems-Murr-Kreises mbH

Size: 1.5 acres

Date Operational: 2011

Still Operating: Yes

Facility Location: Montpellier, France

Technology: MBT and Kompogas® dry AD

Energy Product: Electricity (30 million kWh/year to grid via gas engines)

Commercial/Demo: Commercial

Design Capacity: MBT plant: 223,300 tpy AD: 316 tpd (115,500 tpy) (eight units type PF1300 at approx. 55 tpd each)

Actual Capacity: 316 tpd (115,500 tpy)

Feedstock: Organic fraction sorted from MSW and source separated food/bio waste, from households and commercial entities

Owner: Public Community of Montpellier Agglomeration

Operator: Ametyst (SITA France)

Size: several acres

Date Operational: 2008

Still Operating: Yes

Optimum Design Capacity: 120 tpd (44,000 tpy) (two PF1300 standard sized Kompogas digesters, with preprocessing consisting of shredder, star sieve (50 mm) and magnetic separator).

Optimum Feedstock: Source-separated food waste from households and commercial entities.

Optimum Area Required: At least 1.5 acres, preferably more.

Optimum Diversion Percentage: Close to 100% of organic materials; actual diversion would depend on contaminants in feedstock and marketability of compost product.

Optimum Marketable Products: Biogas with a methane content of approximately 55%, which could be upgraded for fuel or used to produce electricity/heat; compost and liquid fertilizer also produced, and CO2 in the case of biogas upgrading.

8. **Company Name:** Bharco Ecotechnologies LLC

   Company Url: http://www.bharco.com

   Technology Name: HydraConvertor Wet Air Oxidation Deep Well Chemical Reactor

   Type: Developer & Supplier

   Technology: Other

   First Name: Bharat

   Last Name: Kris ("BK") Rao

   Title: CEO

   Phone: (310) 480-5365

   Fax: (310) 544-2347

   Email: 4bkrao@gmail.com

   Street Address: 28126 Peacock Ridge Road, Unit 307

   City: Rancho Palos Verdes

   State: California

   Zip: 90275

   Capacity Range: <100 tpd to >1,500 tpd

   Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other (River and lake dredgings, any organic containing waste)

   Company Specified Type: HydraConvertor Wet Air Oxidation Deep Well Chemical Reactor

   Tech Description: The HydraConvertor is a deep well chemical reactor that operates on the principles of wet air oxidation, which is the conversion of organic matter in aqueous solutions with dissolved oxygen under elevated temperature and pressure. The entire oxidation reaction occurs in a liquid phase, producing thermal energy. The HydraConvertor uses a commercial diameter deep well chamber (3,000 feet to 12,000 feet below ground surface), typical to the water bore well and oil industry, modified to be a sealed vacuum chamber. Processed feedstock (suspended solids slurry, which can be prepared from MSW using a water based MRF) enters the inner annulus of the HydraConvertor, passing downwards, pre-heating and accumulating pressure, to a reaction chamber at the bottom. The treated feedstock rises up an outer pipe leading from the reaction chamber, transferring heat to a viscous fluid in an outer annulus pipe. Heat exchange equipment/steam turbines are used to generate electricity. The treated feedstock (output) is collected in holding/sedimentation tanks for further processing.

Tech Rights: Bharco Ecotechnologies LLC is the sole and exclusive owner of the intellectual property and patents pending related to the HydraConvertor. Pending patents add to existing patented technology that is now in the public domain (vertical tube reactor technology). The company also offers a proprietary mathematical model for data gathering (trade secret/know how). The HydraConvertor is marketed exclusively under granted Licenses.

Bus Structure: Bharco Ecotechnologies is a Limited Liability Corporation that licenses its proprietary technology and process globally on a project-by-project basis. Island Energy International, Inc. is the corporate marketing arm of the company. The company offers flexible business models including BOT, BOOT, JV, and turnkey custom solutions.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The plant contract finished in 2004 and was not renewed due to an alternate, low-cost, long-term option that was available for biosolids. The Apeldoorn waterworks site still exists and can be toured but the vertical tube reactor is no longer in place. Plans are underway to build a HydraConvertor facility in the Netherlands, using the same basic technology principles as the vertical tube reactor used in Apeldoorn (with engineering design improvements).

Facility Location: Apeldoorn, Netherlands

Technology: Wet Air Oxidation using a Vertical Tube Reactor (Deep Well Chemical Reactor)

Energy Product: Steam generated by heat exchange system (>5,000 Btu per pound of dry weight feedstock)

Commercial/Demo: Commercial

Design Capacity: 100 tpd (30,000 tpy) (one unit)

Actual Capacity: 100 tpd (30,000 tpy)

Feedstock: 90% biosolids (sewage sludge) and 10% industrial aqueous waste testing using the biomass fraction of MSW and other waste feedstocks

Owner: Providentia Environment Solutions BV

Operator: Prenso Engineering

Size: 1.5 acres

Date Operational: 1990-2004 (14 years)

Still Operating: No

Optimum Design Capacity: 500 tpd (182,500 tpy) (one HydraConvertor module, with a front-end water density separation MRF tied into a slurry tank, with slurried feedstock fed to the HydraConvertor.

Optimum Feedstock: MSW and biosolids (generally in a 10:1 ratio) can also accept green waste and other organic-rich waste streams

Optimum Area Required: Approximately 5 acres for 500 tpd (with MRF)

Optimum Diversion Percentage: Approximately 99% of the input to the HydraConvertor, depending on feedstock composition and marketability of by-products.

Optimum Marketable Products: Steam and/or electricity (using heat exchange system coupled with steam turbines), recovered recyclables, water, acetic acid, sand ash (intended to be used to make refractory bricks)

9. **Company Name:** BIOFerm Energy Systems

   Company Url: http://www.biofermenergy.com

   Technology Name: BIOFerm® Dry Fermentation and Schmack COCCUS® Complete-Mix Anaerobic Digester

   Type: Supplier

   Technology: Anaerobic Digestion

   First Name: Amber

   Last Name: Blythe

   Title: Applications Engineer

   Phone: (608) 467-5523

   Fax: (608) 233-7085

   Email: blya@biofermenergy.com

   Street Address: 617 N Segoe Road, Suite 202, P.O. Box 5408

   City: Madison

   State: WI

   Zip: 53705

   Capacity Range: <100 tpd to >1,500 tpd

   Feedstock List: Food Waste, Green Waste, Biosolids

   Company Specified Type: BIOFerm® Dry Fermentation and Schmack COCCUS® Complete-Mix Anaerobic Digester

   Tech Description: BIOFerm® dry fermentation is typically used for food and yard waste applications, and the Schmack COCCUS® complete-mix anaerobic digester is typically used for food and liquid organic waste (e.g., biosolids and dairy manure) applications. BIOFerm® offers other technologies and hybrid systems, as applicable, to suit specific waste streams. The BIOFerm dry fermentation system is a batch process/stationary system that operates in the lower temperature mesophilic range (approximately 35/95). Plants are made up of a series of modular, vehicle-accessible, garage-style fermentation chambers. The concrete fermentation chambers are air- and gas-tight preventing the infiltration of oxygen as well as the leakage of biogas. Feedstock is loaded into the chamber by a front-end loader and remains in place for approximately 28 days. Heat is delivered to the fermentation chambers through in-wall radiant heat and through percolate, which is sprayed onto the biomass through over-head sprinklers. Percolate also acts as an inoculum source since it contains the appropriate anaerobic digestion bacteria. Feedstock remains stationary but the percolate and water produced during the digestion process are continuously captured through floor drains and

re-circulated. The biogas that is produced by the anaerobic digestion process is collected into a flexible gas storage bag from where it is continuously fed to the biogas utilization source. Biogas is either used in a combined heat power unit that generates electricity and heat or it can be upgraded to pipeline quality natural gas. The Schmack COCCUS® complete-mix anaerobic digester is also designed to run at the mesophillic temperature range. It consists of a concrete tank with paddle mixers and hydronic heat distribution on the interior tank wall. Gas storage is provided in a dual-membrane roof structure. The system is scalable using different tank sizes and multiple tanks in combination.

Tech Rights: BIOFerm® Energy Systems utilizes the wide range of technology offerings of the Viessmann Group in the development of biogas plants.

Bus Structure: BIOFerm® USA, Inc., dba BIOFerm® Energy Systems, was founded in Madison, WI in 2007 and is part of the Viessmann Group. BIOFerm has been the provider of the anaerobic digestion system by Schmack Biogas, GmbH, another member of the Viessmann Group, for the US market since 2011. The Viessmann Group is an international manufacturer of heating systems. Founded in 1917, the family business maintains a staff of 9,400 employees and generates roughly 2 billion dollars in annual sales volume. The Viessmann Group has 23 production and project management divisions in 11 countries, business activities in 74 countries, 32 subsidiaries and 120 sales offices around the world. Export activities account for 56% of sales.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The biodigester at UW-Oshkosh is the first industrial-scale dry fermentation AD plant in the U.S. and was a $3.5 million capital investment. The facility serves as a living, learning laboratory for students and faculty and furthers the University's goals to create a sustainable campus. The Akron facility is being expanded to increase the total capacity to 13,000 dry tons and will eventually include the addition of food waste. The expansion will add two EUCO® digesters and two COCCUS® digesters, and will increase the power to 1.2 MW. Both reference facilities can be visited to view operations. BIOFerm® has also identified a reference facility in Fulda, Hessen Germany with a capacity of 35,400 tons per year of organic feedstock (including food waste and processed food), which will produce pipeline-quality renewable natural gas. The facility is scheduled to be operational in December 2013 and is also available to visit.

Facility Location: University of Wisconsin, Oshkosh

Technology: BIOFerm® Dry Fermentation

Energy Product: Electricity (370 kW electric capacity) and heat (495 kW thermal capacity)

Commercial/Demo: Commercial

Design Capacity: 8,000 tpy (four batch systems, each with a capacity of 150 tons, and designed for 13 exchanges per unit per year)

Actual Capacity: 8,000 tpy

Feedstock: 40% food waste and 60% yard and crop residuals

Owner: University of Wisconsin, Oshkosh

Operator: University of Wisconsin, Oshkosh

Size: 1 acre

Date Operational: August 2011

Still Operating: Yes

Facility Location: Akron, Ohio

Technology: Schmack COCCUS® complete mix digester and Schmack EUCO® plug flow digester

Energy Product: Electricity (330 kW electric capacity) and heat (405 kW thermal capacity): 25% parasitic energy consumption

Commercial/Demo: Commercial

Design Capacity: 5,000 dry tons per year (EUCO® digester with capacity of 160,000 gallons: COCCUS® digester with capacity of 500,000 gallons).

Actual Capacity: 5,000 dry tons per year

Feedstock: Biosolids from the City of Akron WWTP, with a solids content of 25% - 30%

Owner: KB Compost Services

Operator: KB Compost Services

Size: Approximately 2 acres

Date Operational: 2007

Still Operating: Yes

Optimum Design Capacity: Variable across a wide range, depending on the feedstock and the corresponding technology (e.g., 5,000-100,000 tpy for a dry system and 2,000-320,000 tpy for a wet system)

Optimum Feedstock: Food waste, green waste, and biosolids, including various materials that fall into these categories, which may be used in varying ratios and in many cases 100% of any one item can be fed to the digest

Optimum Area Required: Variable, typically up to 15 acres

Optimum Diversion Percentage: Depends on feedstock composition and marketability of by-products. If incoming feedstock is unsorted MSW, sorting will produce recycling and residue streams. If incoming feedstock is source-separated organics, may have full diversion.

Optimum Marketable Products: Renewable natural gas, CNG, electricity, thermal output, liquid fertilizers, compost.

10. **Company Name:** Biogas Energy, Inc.

    Company Url: http://www.biogas-energy.com

    Technology Name: Anaerobic Digestion

    Type: Developer & Supplier

    Technology: Anaerobic Digestion

    First Name: Brian

    Last Name: Gannon

    Title: President

    Phone: 510.200.3609

    Fax: 815.301.3432

    Email: bgannon@biogas-energy.com

    Street Address: 195 Amherst Ave.

    City: Kensington

    State: CA

    Zip: 94708

    Capacity Range: From <100 tpd to >1,500 tpd

    Feedstock List: Food Waste, Green Waste

    Company Specified Type: Anaerobic Digestion

    Tech Description: Feedstocks are macerated and fed to a tank where the slurry is mixed and heated. This material is fed to a digester. In the digester, biogas is produced. The temperature is maintained at either mesophilic range or thermophilic range. Heat is provided by CHP or a boiler. The biogas is either used to generate electricity using CHP or is cleaned further of CO2 and compressed for CNG.

    Tech Rights: Biogas Energy has an exclusive license in the US for the technology by Bioenergy Concept GmbH, a German company. The project would be designed by Bioenergy Concept and constructed by Biogas Energy.

    Bus Structure: Biogas Energy has exclusive rights to the technology which is designed by Bioenergy Concept GmbH.

    Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

    Additional Notes: The RFEI submittal indicated that additional information about reference facilities operating in Europe is available upon request.

Facility Location: Modesto, California

Technology: Anaerobic Digestion

Energy Product: Electricity and Heat (CHP)

Commercial/Demo: Commercial

Design Capacity: 200 tpd

Actual Capacity: 120 tpd; is expected to increase to 200 tpd

Feedstock: cow manure; whey from cheese processing plant; green agricultural waste; greasetrap waste; food waste.

Owner: Fiscalini Farms, Modesto, California

Operator: Fiscalini Farms, Modesto, California

Size: N/A

Date Operational: 2008

Still Operating: Yes

Facility Location: Chico, California (under construction)

Technology: Anaerobic Digestion

Energy Product: Electricity, CNG

Commercial/Demo: Commercial

Design Capacity: 100 tpd

Actual Capacity: 100 tpd

Feedstock: food waste and grease trap waste

Owner: North State Rendering, Chico, California

Operator: North State Rendering, Chico, California

Size: N/A

Date Operational: under construction 2012

Still Operating: Facility is under construction.

Optimum Design Capacity: 1) distributed network of several projects, each processing 200 tpd; 2) centralized facility to process 2,000+ tpd

Optimum Feedstock: food waste, green waste, and source separated organic MSW

Optimum Area Required: 1) 10 acres; 2) 100 acres

Optimum Diversion Percentage: 50% (this assumes organic portion of MSW, and paper is diverted from landfill disposal; depends on feedstock and marketability of products).

Optimum Marketable Products: waste heat; electricity; CNG; digestate

11. **Company Name:** BIOGAS Equity 2, Inc.

    Company Url: http://www.biogas2.com

    Technology Name: Bionic anaerobic UDR fixed bed register digester system, used with the BioTec MSW Sorting technology if processing MSW

    Type: Developer & Supplier

    Technology: Anaerobic Digestion

    First Name: Michael

    Last Name: Muller, Founder

    Title: COO

    Phone: (650) 283-9555

    Fax: (650) 556-9640

    Email: mikemuller@biogas2.com

    Street Address: 130 Eleanor Drive

    City: Woodside

    State: CA

    Zip: 94062

    Capacity Range: <100 tpd to >1,500 tpd

    Feedstock List: MSW, Food Waste, Green Waste, Biosolids

    Company Specified Type: Bionic anaerobic UDR fixed bed register digester system, used with the BioTec MSW Sorting technology if processing MSW

    Tech Description: The patented Upflow/Downflow/Reflow (UDR) fixed bed register digester system is designed to emulate the rumen of a cow. It has fixed size upflow and downflow tanks that are paired together with a stirred reflow tank. Prepared organic feedstock is pumped into the bottom of the upflow tank; it flows upward and "overflows" into the top of the downflow tank. The retention time in the upflow/downflow tank pair is 1-2 days. The upflow and downflow reactors are fitted with a fixed-bed register consisting of many vertical corrugated pipes, providing a large surface area for settlement of bacteria. Material exiting the downflow tank goes into the stirred reflow tank, which provides additional retention time. Material is pumped out of the reflow tank, mixed with new feedstock, and fed back to the upflow tank. Recirculation occurs until digestion is complete; total retention times are typically 10-15 days. Heavy material sinks in the downflow tank as digestate and is removed for further handling.

    Tech Rights: enCO2, an engineering company based in Germany and Michigan, USA, is solely sublicensed for the UDR technology rights for North America.

BIOGAS Equity 2 has partnered with enCO2 and has a 20-year Agent Agreement to market the UDR technology based on enCO2 engineering and manufacturing support. BIOGAS Equity 2 has also partnered with InterEngineering, which is solely sublicensed for the BioTec MSW Sorting Technology rights for North America.

Bus Structure: BIOGAS Equity 2, Inc. (Biogas2) is a Delaware Corporation. It is independent from BIOGAS Equity, AG in Germany, however, the owner of Biogas 2 is the main shareholder and owner of a BIOGAS Equity AG plant in Germany. Biogas 2 relies on its Freiburg, Germany and Grand Rapids, Michigan based engineering partner, enCO2, for engineering calculation, design, construction overview, start up and training. Biogas2 has partnered with TSS Consulting for permitting and regulatory support and DPR Construction for project management and construction. Biogas2 arranges project financing based on long term guaranteed tipping fees and a power purchase agreement, based on S&P-rated corporation and municipalities, with plant ownership/operation by Biogas2.

Data Source: Company RFEI response to Los Angeles County (August 2013) and followup correspondence.

Additional Notes: Both plants are in operation and can be visited; visits must be organized by BIOGAS Equity 2 and escorted by their engineering partners. Both reference facilities use the BioTec sorting system with AD, but not the UDR AD technology. Biogas Equity 2 cites numerous UDR plants, several of which are shown on their website. Plants that are being engineered for Ohio and Alberta will represent the first combination of BioTec and UDR.

Facility Location: Turkey

Technology: BioTec Sorting with Anaerobic Digestion

Energy Product: Combined heat and power

Commercial/Demo: Commercial

Design Capacity: 20,000 tpy

Actual Capacity: 16,500 tpy

Feedstock: organic fraction of MSW

Owner: Hexagon Biosun A.S.

Operator: Hexagon Biosun, A.S.

Size: 11 acres (includes MRF)

Date Operational: March 2012

Still Operating: Yes

Facility Location: Bellersheim, Germany

Technology: BioTec Sorting with Anaerobic Digestion

Energy Product: Combined heat and power

Commercial/Demo: Commercial

Design Capacity: 36,000 tpy

Actual Capacity: 41,000 tpy

Feedstock: organic fraction of MSW

Owner: Bellersheim, GmbH

Operator: Bellersheim, GmbH

Size: 2.5 acres (excludes MRF)

Date Operational: 2001

Still Operating: Yes

Optimum Design Capacity: 2,000 tpd MSW, pre-processed using the BioTec sorting system to recover 704 tpd of organic material for AD processing; would use 8 UD pairs with 5 reflow tanks for AD.

Optimum Feedstock: Organic fraction recovered from MSW

Optimum Area Required: 5.5 acres (AD processing and ancillary components; excludes BioTec sorting of raw MSW)

Optimum Diversion Percentage: 90% of the recovered organic fraction, depending on feedstock composition and marketability of products

Optimum Marketable Products: Electricity (60.8 million kWh/year estimated), heat, liquid organic fertilizer, digestate or compost

12. **Company Name:** BioGold Fuels Corporation

    Company Url: http://www.biogoldfuels.com

    Technology Name: Westinghouse Plasma Gasification Technology

    Type: Developer

    Technology: Plasma Gasification

    First Name: Steve

    Last Name: Racoosin

    Title: CEO

    Phone: 760.728.8224

    Fax: N/A

    Email: sracoosin@biogoldfuels.com

    Street Address: 10920 Via Frontera, Suite 520

    City: San Diego

    State: CA

    Zip: 92127

    Capacity Range: From 1,000 tpd to 1,500 tpd

    Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Tires, Hazardous Waste

    Company Specified Type: Westinghouse Plasma Gasification Technology

    Tech Description: BioGold Fuels Corporation constructs Alternative Energy Centers, designed to process multiple wastestreams under one roof using applicable licensed technologies. The key technology is the Westinghouse Plasma gasification technology. The Westinghouse Plasma gasification technology was originally developed for foundry (metal-melting) applications in the 1980's, and subsequently was further developed for waste management applications. The Alter NRG Plasma Gasification System includes waste handling equipment, plasma gasification, gas cooling and clean-up, and syngas management options. The plasma gasification reactor is a refractory-lined vessel, with plasma torches located around the periphery near the bottom of the reactor. Limited pre-treatment of feedstock is required but could include segregation and sorting of recyclables (typically metals and glass), shredding, and/or crushing as appropriate. Waste is fed into the reactor near or at the top; it begins to gasify as it falls onto a bed of coke heated by the plasma torches, where gasification is completed. Syngas exits the top of the reactor for clean-up and conversion to energy products. Inorganic materials that cannot be gasified are melted and flow

out the bottom of the reactor as molten slag. The technology is scalable and modular.

Tech Rights: Alter NRG wholly owns the Westinghouse Plasma gasification technology. In October 2010, Technip USA entered into a collaboration agreement with Alter NRG to market the Westinghouse Plasma Technology and provide design, engineering, and procurement services as well as overall performance guarantees, in conjunction with Alter NRG, to support project financing for plasma facilities. Technip USA has a corresponding agreement with BioGold Fuels Corporation to construct all of its Alternative Energy Centers.

Bus Structure: BioGold Fuels Corporation is a renewable fuels and energy producer. It was formed in 2007 by way of a merger between BioGold Fuels Corporation (BGF), a developer of organic fuels, and Full Circle Industries, Inc. (FCI), a provider of municipal solid waste processing technologies. In October 2007, pursuant to a merger agreement, it became the wholly owned subsidiary of Cab-tive Advertising, Inc., a Nevada corporation. BioGold then changed the name of Cab-tive to BioGold Fuels Corporation and changed the company's ticker symbol to BIFC, which is traded on the over-the-counter bulletin board, as well as the Frankfurt Xetra exchange in Germany.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Utashinai, Japan

Technology: Plasma Gasification

Energy Product: Electricity

Commercial/Demo: Commercial

Design Capacity: 220 tpd MSW; 160 tpd MSW combined with auto shredder residue

Actual Capacity: N/A

Feedstock: MSW and auto shredder residue

Owner: Hitachi Metals

Operator: Hitachi Metals

Size: N/A

Date Operational: 2003

Still Operating: Yes

Facility Location: Nagpur, India

Technology: Plasma Gasification

Energy Product: Electricity (1.6 MW net to grid)

Commercial/Demo: Commercial

Design Capacity: 72 tonnes per day

Actual Capacity: N/A

Feedstock: Hazardous Waste and Industrial Waste

Owner: SMS Envocare, Ltd

Operator: SMS Envocare, Ltd

Size: N/A

Date Operational: 2010

Still Operating: Yes

Optimum Design Capacity: 1) 500 to 1,000 tpd MSW to Electricity via Combined Cycle; 2) 100 tpd MSW to Electricity via Rankine Cycle; 3) 150 MSW to Electricity via Gas Engines

Optimum Feedstock: MSW, Industrial / Medical Waste

Optimum Area Required: approximately 7 acres for 1,100 tpd MSW combined cycle project

Optimum Diversion Percentage: Approximately 91%, depending on feedstock composition and assuming the slag is marketed for beneficial use. The diversion percentage can be increased to approximately 95% by shredding bulky items, recovering the metal, and processing the remaining components in the gasifier. The diversion percentage can be increased up to approximately 97% by re-processing (i.e., gasifying) some of the wastewater residues that are generated from the syngas cleanup process.

Optimum Marketable Products: Electricity (approx. 39 MW for 1,100 tpd MSW via combined cycle); Optional: Ethanol; Slag; Sulfur compounds (depends on syngas cleanup technology used)

13. **Company Name:** CBES Global, LLC

Company Url: http://www.concordblueenergy.com

Technology Name: Concord Blue Reformer (Blue Tower System)

Type: Developer

Technology: Pyrolysis

First Name: Van

Last Name: Rainey

Title: Director of Operations, Western Division

Phone: 925.960.0430

Fax: 925.373.0691

Email: vr@jaxumglobal.com

Street Address: 816 Lucerne Street

City: Livermore

State: CA

Zip: 94551

Capacity Range: From <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Tires, pet-coke, lumber, chicken litter, manure, hazardous organics

Company Specified Type: Concord Blue Reformer (Blue Tower System)

Tech Description: The feedstock is shredded and dried. Pre-processing includes the removal of inert materials. The feedstock is introduced into the reactor vessel. It is heated to 550C to 650C in an oxygen free environment. Inert solid heat-carrier pellets are circulated throughout the reactor to distribute the heat through the feedstock. The feedstock is gasified (referred to as thermolysis). The gas flows up to the reformer. In the reformer, steam mixes with the gas. The temperature of the reformer is 850C to 950C. The gas is cracked and reformed into high quality syngas, consisting mainly of hydrogen and methane. The syngas exists the reformer for use as fuel. The char material flows to the bottom of the reactor to the char/heat-carrier separator. The char is separated from the heat carrier pellets. The char is removed from the reactor, and the heat carrier pellets are recycled, reheated, and recirculated within the reactor to maintain the operating temperatures. The char material is then gasified in a second reactor unit to release additional syngas.

Tech Rights: Concord Blue Energy Systems, LLC (one of the merger partners in CBES Global, LLC) is the license holder for provisioning the technology of Concord Blue Engineering, GmbH in the western hemisphere and Pacific Rim.

Bus Structure: CBES Global, LLC is a recent merger between JUM Global, LLC, the construction arm, and Concord Blue Energy Systems, LLC.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012)

Additional Notes: Additional facilities are now operating in India.

Facility Location: JPO, Izumo, Japan

Technology: Blue Tower Gasification System

Energy Product: 1 MW electrical output

Commercial/Demo: Commercial

Design Capacity: 30 tpd

Actual Capacity: 30 tpd

Feedstock: wood chips

Owner: Japan Planning Organization (JPO)

Operator: Japan Planning Organization (JPO)

Size: N/A

Date Operational: 2006

Still Operating: Yes

Facility Location: HJ1, Herten, Germany

Technology: Blue Tower Gasification System

Energy Product: 100 kW equivalent

Commercial/Demo: Demonstration

Design Capacity: 250 pounds per hour

Actual Capacity: 250 pounds per hour

Feedstock: various feedstocks, including: press mud, cane trash, bagasse, distillers dried grains with solids (DDGS), MSW, bio-medical wastes, wood chips, hotel and restaurant waste, agri-waste (grain waste)

Owner: Concord Blue Energy GmbH

Operator: Concord Blue Energy GmbH

Size: N/A

Date Operational: 2006

Still Operating: Yes

Optimum Design Capacity: 10 tpd up to 10,000 tpd

Optimum Feedstock: any and all of those listed above

Optimum Area Required: 1 acre up to 100 acres

Optimum Diversion Percentage: Approximately 95% depending on feedstock composition and marketability of products

Optimum Marketable Products: Syngas to Electricity, Renewable Hydrogen, Synthetic Diesel, Gasoline and Jet Fuel, Synthetic Ethanol, Carbon Black

Optimum Additional Notes: For the development of synthetic diesel, gasoline, jet fuel, and ethanol, would require an MSW input of at least 100 tpd.

14. **Company Name:** CCI Bioenergy, Inc.

Company Url: http://www.ccibioenergy.com

Technology Name: BTA Process

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Kevin

Last Name: Matthews

Title: President

Phone: 905.830.1160 ext. 26, cell phone 416.230.9391

Fax: 905.830.0416

Email: kmatthews@candacomposting.com

Street Address: 390 Davis Drive, Suite 301

City: Newmarket

State: ON, Canada

Zip: N/A

Capacity Range: From 100 tpd to 1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Paper

Company Specified Type: BTA Process

Tech Description: The BTA Process is a patented process. It is a German developed and owned technology that integrates sophisticated hydromechanical waste pre-treatment techniques with anaerobic digestion, all within a fully enclosed and highly automated facility. The technology is designed specifically to process a very broad range of organic wastes generated in both the residential and industrial, commercial, and institutional sectors. The objective of the technology is to maximize the resource value inherent in organic waste and to provide the ability to use it in a renewable and sustainable way to produce bioenergy and other high value products.

Tech Rights: CCI is the exclusive licensee in North America of the BTA Process.

Bus Structure: CCI Bioenergy, Inc. is a privately held company, wholly owned by Canada Composting, Inc. (CCI)

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Toronto, Canada

Technology: Anaerobic Digestion

Energy Product: Biogas to electric/thermal energy, biomethane or liquid fuel, soil amendments, liquid fertilizer

Commercial/Demo: Commercial

Design Capacity: 100 tpd

Actual Capacity: 162 tpd

Feedstock: source separated organics

Owner: City of Toronto

Operator: CCI

Size: 3 acres

Date Operational: September 2002

Still Operating: Yes

Optimum Design Capacity: 1) from 100 tpd to 300 tpd; 2) 400 tpd

Optimum Feedstock: 1) Source Separated Organics (SSO); 2) Municipal Solid Waste (MSW)

Optimum Area Required: 4 to 5 acres

Optimum Diversion Percentage: 1) 80%, based on SSO with a contamination rate of up to 15% and based on marketability of products; 2) depends on feedstock composition and marketability of products

Optimum Marketable Products: Biogas to electrical/thermal energy, biomethane or liquid fuel, soil amendments, fertilizer

15. **Company Name:** Clean World Partners

Company Url: http://www.cleanworldpartners.com

Technology Name: Anaerobic Phased Solids (APS) Digester, High-Rate Digester (HRD), Dynamic Film Bioreactor (DBR)

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Warren

Last Name: Smith

Title: Senior Vice President, Business Development

Phone: 916.853.0328

Fax: 916.635.6549

Email: wsmith@cleanworldpartners.com

Street Address: 2330 Gold Meadow Way

City: Gold River

State: CA

Zip: 95670

Capacity Range: From <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Agricultural Waste, Food Processing Waste, Waste Paper, Biofuel Production Residue

Company Specified Type: Anaerobic Phased Solids (APS) Digester, High-Rate Digester (HRD), Dynamic Film Bioreactor (DBR)

Tech Description: The APS Digester includes hydrolysis and bio-gasification reactors. It is a two-phased, sequenced batch fed solids digester. In the hydrolysis reactor, waste is acted on by hydrolytic and acidogenic bacteria for production of organic acids. In the bio-gasification reactor, methanogenic organisms convert the organic acids into biogas. CWP provides integrated, pre-tested systems with standardized and automated components amenable to off-site monitoring. Options are also available for pre-processing depending on the composition of the feedstock. Solids grinding and mechanical mixing are provided at a minimum for each system.

Tech Rights: Clean World Partners is the exclusive license holder for five UC-Davis developed novel technologies. CWP designs systems around customers' waste profiles and will recommend a certain technology or use the best attributes of each of their technologies to provide a complete solution for businesses and communities of all sizes. CWP solutions include all processes needed to convert

food waste, agricultural residue and other organic wastes to renewable energy, soil enhancements and other valuable byproducts with on-site anaerobic digestion systems.

Bus Structure: Clean World Partners (CWP) is a subsidiary of Synergex International Corporation.

Data Source: Company RFEI response to Los Angeles County (August 2011) | Company review of summary information (April 2012)

Additional Notes: A 25 tpd High-Rate Digester (HRD) is also under construction at the Sacramento County South Area Transfer Station. Owned by California Bioenergy One, LLC, and operated by Clean World Partners, the 25 tpd commercial facility will produce compressed natural gas (CNG), electricity and heat from pre and post-consumer food waste and food processor residue. The facility is expected to be operational by May 31, 2012. The system is designed to scale up to 100 tpd and is expected to expand in 2013.

Facility Location: Davis, California

Technology: Anaerobic Phase Solids (APS) Anaerobic Digestion

Energy Product: N/A

Commercial/Demo: Demonstration

Design Capacity: 10 tpd

Actual Capacity: 3-6 tpd

Feedstock: animal manure; source separated municipal organic waste solids; cannery food processing waste

Owner: University of California, Davis

Operator: University of California, Davis and Clean World Partners

Size: N/A

Date Operational: June 2008 - June 2009. The facility is scheduled to resume operations in August 2011.

Still Operating: No. At the time of the RFEI submittal, the facility was not operating.

Facility Location: American River Packaging

Technology: High-Rate Digestion (HRD)

Energy Product: Electricity and Heat

Commercial/Demo: Commercial

Design Capacity: 10 tpd

Actual Capacity: 10 tpd

Feedstock: Food Waste and Corrugated Cardboard

Owner: Clean World Partners

Operator: Clean World Partners

Size: 1/4 acre

Date Operational: March 22, 2012

Still Operating: Yes

Optimum Design Capacity: 1) 10 tpd Fortune 100 National Food Processor; 2) 25 tpd Regional Waste Collection Company

Optimum Feedstock: 1) source separated food waste; 2) MSW source separated food, green, and paper waste; 3) agricultural crop residue

Optimum Area Required: 1) 1 acre; 2) 2 acres

Optimum Diversion Percentage: 49.7% organic waste and paper from MSW, depending on feedstock composition and marketability of products

Optimum Marketable Products: Biogas, Electricity, Compost, Soil Amendments

Optimum Additional Notes: Projects are scaleable and modular, which allows for quick deployment to project site.

16. **Company Name:** Cortus Energy

Company Url: http://www.cortusenergy.com

Technology Name: WoodRoll® Gasifier

Type: Supplier

Technology: Gasification

First Name: Bjorn

Last Name: Millang

Title: Consultant

Phone: 949-423-8511

Fax: N/A

Email: torbjorn.millang@avancee-europe.com

Street Address: 30842 Driftwood Drive

City: Laguna Beach

State: CA

Zip: 92651

Capacity Range: <100 tpd to >1,500 tpd

Feedstock List: MSW, Green Waste, Biosolids, Other

Company Specified Type: WoodRoll® Gasifier

Tech Description: Thermal gasification of biofuels using three integrated and continuous process steps: drying, pyrolysis, and gasification. Feedstock is dried using heat from process operations. The dried feedstock goes to a pyrolysis chamber, producing pyrolysis gas and a char. The pyrolysis gas is combusted, with the heat used for process operations, and with exhaust gas vented through a stack. Combustion of the pyrolysis gas is separate from the downstream gasification process. The char from pyrolysis is ground to a powder and injected into a gasification chamber together with steam, producing syngas. The hydrogen-rich syngas is used to generate electricity and heat in a combined heat and power process, can be used to displace natural gas for industrial applications, or otherwise can be upgraded as needed and used as a fuel. The WoodRoll® system is reported to be scalable from 6 to 600 tpd in a single installation, with multiple parallel installations for larger facility capacities. The system has been demonstrated at about 5 tpd, with the first commercial installation under development at about 40 tpd.

Tech Rights: Cortus Energy has patented the WoodRoll® gasification process.

Bus Structure: Cortus Energy is a Swedish company founded in 2006. Since 2013, it has been listed on the NASDAQ OMX in Stockholm, Sweden. As of January 2014, Cortus Energy had 8 employees. The company was formed around the patented WoodRoll® process, which was developed and verified in cooperation with university, industrial, and governmental partners. The Company's business concept is to provide environmentally friendly and cost-effective renewable energy gas to energy intensive industries.

Data Source: Company RFEI response to Los Angeles County (February 2014)

Additional Notes: The demonstration facility in Sweden can be visited, with coordination through Cortus Energy. Future visitation to the commercial facility (under development) will also be accommodated. The existing demonstration facility and the commercial facility (under development) are both co-located with a lime processing plant, replacing part of the natural gas used in lime processing operations.

Facility Location: Koping, Sweden

Technology: WoodRoll® System

Energy Product: Syngas for fuel to replace natural gas (0.5 MW)

Commercial/Demo: Demonstration

Design Capacity: 2.5 – 5.5 tpd (900 – 1,900 tpy) (depends on feedstock; one unit)

Actual Capacity: 2.6 – 5.5 tpd (0.6 MW)

Feedstock: Various for testing purposes, including: wood chips, manure, pulp mill sludge, sorted waste, energy wood

Owner: Cortus Energy

Operator: Cortus Energy

Size: <0.25 acres

Date Operational: Since 2011

Still Operating: Yes (intermittently for demonstration purposes, usually one week at a time)

Facility Location: Rakke, Estonia

Technology: WoodRoll® System

Energy Product: Syngas for fuel to replace natural gas (5 MW)

Commercial/Demo: Commercial (not yet in operation)

Design Capacity: 26 – 55 tpd (9,000 – 19,000 tpy), depending on the feedstock. 40 tpd (13,500 tpy) for the planned feedstock.

Actual Capacity: Not yet in operations

Feedstock: Combination of wood chips and sludge byproduct from pulp mill

Owner: Cortus Energy

Operator: Cortus Energy

Size: 0.25 acres

Date Operational: Construction anticipated to start in June 2014. Testing anticipated to start in January 2015 with commercial operations in April 2015.

Still Operating: Not yet operational.

Optimum Design Capacity: 20 MW of delivered syngas with throughput capacity dependent on type of feedstock (100-210 tpd; 30,000 – 70,000 tpy)

Optimum Feedstock: Several alternatives possible, including sorted green waste, sorted paper, or other organic waste.

Optimum Area Required: 0.5 – 0.75 acres

Optimum Diversion Percentage: 99% diversion for the optimum feedstock (1% by weight ash residue).

Optimum Marketable Products: Syngas to the gas distribution system (pipeline) or for direct industrial applications; upgrade to hydrogen for fuel cell use.

17. **Company Name:** Covanta Energy Corporation

Company Url: http://www.covantaenergy.com

Technology Name: Gasification

Type: Developer & Supplier

Technology: Gasification

First Name: Steven

Last Name: Weber

Title: Vice President, Business Development

Phone: (862) 345-5332

Fax: (862) 345-5000

Email: sweber@covantaenergy.com

Street Address: 445 South Street

City: Morristown

State: NJ

Zip: 07960

Capacity Range: 100 tpd to 1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other (various commercial and industrial wastes)

Company Specified Type: Gasification

Tech Description: Covanta's CLEERGAS® technology, which first gasifies the waste to produce syngas in one chamber and then combusts the syngas in a separate chamber, is an advancement of core Energy from Waste (EfW) processes and equipment that Covanta has been operating in its portfolio of facilities for the past 25 years. The CLEERGAS® process employs the following key elements: feed hopper and feed chute; refractory-lined, starved-air, gasification chamber with proprietary, internal hot gas recirculation system; inclined, reciprocating platform that provides multiple, independently controlled sections to control the movement of waste and the mixing of waste and controlled amounts of air along the platform; syngas combustor (waterwall chamber) and heat recovery steam generator; air supply system with individual flow measurement and control of the air supply to each zone of the process; post-gasification air pollution control system and associated ash and residue collection systems; advanced process control system; and turbine generator for electricity generation.

Tech Rights: The CLEERGAS® technology belongs to Covanta. Covanta has all the licenses, patents, and other approvals needed to use this technology and other

intellectual property that it intends to use for projects. The gasification platform installed at Covanta's Tulsa EfW facility was supplied by Sanfeng-Covanta, a Joint Venture between Covanta and Sanfeng Environmental of Chongquin, China. Covanta owns 40% of the JV company. As such, Covanta is the manufacturer of the technology proposed for projects.

Bus Structure: Covanta Energy Corporation (Covanta) is the owner and operator of large-scale EfW and renewable energy projects. Covanta is a wholly owned subsidiary of Covanta Holding Corporation (CHC), the parent company. CHC is incorporated in Delaware and listed on the New York Stock Exchange (NYSE:CVA). Financial results for all of the Covanta family of companies are filed as part of a consolidated statement under CHC. Covanta manages project implementation through a special purpose subsidiary formed for each project. Overall responsibility for the direction and management of the operation and maintenance of projects resides within Covanta through each special purpose subsidiary. The contractual obligations of each special purpose subsidiary are fully backed for the term of the agreement by CHC.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The facility can be visited to view the technology in operation; tours need to be arranged through Covanta.

Facility Location: Tulsa, Oklahoma (Walter B. Hall Resource Recovery Facility)

Technology: CLEERGAS® Gasification System (one) and Mass Burn EfW Units (two)

Energy Product: Primarily steam (sold to a neighboring refiner) but also electricity

Commercial/Demo: Commercial

Design Capacity: 350 tpd (110,000 tpy) for the CLEERGAS® System

Actual Capacity: 330-340 tpd for the CLEERGAS® System

Feedstock: Post-Recycled, Unprocessed MSW, green waste, commercial waste, and non-hazardous industrial waste

Owner: Covanta

Operator: Covanta

Size: 22 acres

Date Operational: August 2011 (for the CLEERGAS® System)

Still Operating: Yes

Optimum Design Capacity: 300 tpd (100,000 tpy) (one CLEERGAS® Gasification Unit, consisting of a feed hopper, feed chute, gasifier, furnace/boiler, dry recirculation scrubber, fabric filter baghouse, and associated ash and residue collection systems)

Optimum Feedstock: Unprocessed, Post-Recycled MSW along with other non-hazardous waste (e.g., food waste, commercial waste, industrial waste, and biosolids)

Optimum Area Required: 4 acres

Optimum Diversion Percentage: 75% (assumes non-hazardous ash requires landfill disposal)

Optimum Marketable Products: Electricity and/or steam; ferrous and non-ferrous metal

Optimum Additional Notes: Larger facility capacities can be achieved by operating multiple units in parallel (e.g., 2 units for 600 tpd; 3 units for 900 tpd, etc.)

18. **Company Name:** CR&R Incorporated

Company Url: http://www.crrwasteservices.com

Technology Name: DRANCO Dry Anaerobic Digestion

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Paul

Last Name: M. Relis

Title: Senior Vice President

Phone: 805.569.0914

Fax: N/A

Email: paulr@crrmail.com

Street Address: 11292 Western Avenue P.O. Box 125

City: Stanton

State: CA

Zip: 90680

Capacity Range: From 100 tpd to 500 tpd

Feedstock List: MSW (Organic Fraction after MRF Processing), Food Waste, Green Waste

Company Specified Type: DRANCO Dry Anaerobic Digestion

Tech Description: The DRANCO process is a one-phase continuous anaerobic digestion process. The incoming fresh waste is mixed with digestate before being introduced into the digester.

Tech Rights: The DRANCO technology is owned by OWS.

Bus Structure: CR&R is a private waste services and recycling company in Southern California. OWS is a privately held anaerobic digestion technology and engineering company, using its proprietary DRANCO technology. OWS is a vendor to CR&R.

Data Source: Company RFEI response to Los Angeles County (August 2011) | Company review of summary information (March 2012)

Additional Notes: The Reference Facilities are not owned by CR&R or OWS. The Reference Facilities use the OWS technology.

Facility Location: Terrassa, Spain

Technology: Anaerobic Digestion

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: 25,000 tpy

Actual Capacity: N/A

Feedstock: Biowaste

Owner: CESPA GR

Operator: CESPA GR

Size: N/A

Date Operational: December 2006

Still Operating: Yes

Facility Location: Busan, South Korea

Technology: Anaerobic Digestion

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: 73,000 tpd

Actual Capacity: N/A

Feedstock: Biowaste

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 2005

Still Operating: Yes

Optimum Design Capacity: 150 tpd to start; goal is 650 tpd

Optimum Feedstock: Organic Fraction of MSW after MRF Processing

Optimum Area Required: 3600 sq. ft. (<0.1 acre for the digester footprint)

Optimum Diversion Percentage: over 95% of source separated food waste and green waste, depending on feedstock composition and marketability of products.

Optimum Marketable Products: Renewable Natural Gas

19. **Company Name:** EcoCorp

Company Url: http://www.ecocorp.com

Technology Name: Dry Thermophilic Plug Flow Anaerobic Digestion

Type: Developer

Technology: Anaerobic Digestion

First Name: Dr. John G

Last Name: Ingersoll

Title: President and CEO

Phone: (703) 979-4999

Fax: N/A

Email: jgingersoll@ecocorp.com

Street Address: 1211 S. Eads Street, Suite 803

City: Arlington

State: VA

Zip: 22202

Capacity Range: <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other (manures, agricultural wastes, energy crops)

Company Specified Type: Anaerobic Digestion

Tech Description: Dry, thermophilic, plug flow anaerobic digestion process (operating at approximately 32% solids and 131°F). The technology is modular, comprised of a standardized digester design processing about 60 tpd at an average solids content of 32%. The technology is a two-stage process comprised of a short (1-3 days) aerobic hydrolysis process and a longer (16-21 days) anaerobic digestion process. Depending on the amount of available waste, multiple digesters can be operated in parallel (independently of each other). Pre-processing includes mechanical removal of contaminants and size reduction of solid components for fast degradation during digestion. Plastics, metals and other inorganics are separated for recycling, with the option to convert non-recyclable plastic into liquid and gaseous fuels. Digestate is post-processed into commercial grade fertilizers. Biogas is used to generate power and heat or is upgraded to pipeline quality natural gas with optional sequestration of carbon dioxide as an industrial gas.

Tech Rights: The AD component is licensed for the entire U.S. by OGIN Biogas Technology B.V. Post-processing of digestate into bio-fertilizer materials is

proprietary to EcoCorp. Processing of separated and not recycled plastics, if any, into liquid and gaseous fuels is proprietary to ENVION.

Bus Structure: EcoCorp is established as a corporation. Each project is constituted as a limited liability corporation owning and operating the project, with the LLC owned by the parent company.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: For the reference facility, the demonstrated throughput is with a wetter material (22% solids vs. 32% solids) and is at a higher level than the design throughput. This is achieved by reducing retention time to 16 days. The standardized plug flow digester offered by EcoCorp is larger in capacity and energy output than the units at Zeewolde (1.2 MW per digester). The reference facility can be visited to observe the technology in operation.

Facility Location: Zeewolde, Flevoland, the Netherlands

Technology: Dry, Thermophilic, Plug Flow Anaerobic Digester

Energy Product: Electricity (26,782 kWh/day; 2 power generation units at .715 MW each for total power capacity of 1.43 MW)

Commercial/Demo: Commercial

Design Capacity: 100 tpd (35,200 tpy) at 32% solids; 2 digester units

Actual Capacity: 107 tpd (38,820 tpy) at 22% solids

Feedstock: Food waste, grass, spoiled vegetables, crop residues, animal manure, FOG (fats, oil and grease)

Owner: Mr. Van de Knijff

Operator: Mr. Van de Knijff

Size: less than 1 acre

Date Operational: 2009

Still Operating: Yes

Optimum Design Capacity: Scalable in multiples of 20,000 tpy (50-60 tpd), which is the capacity of each standard digester unit

Optimum Feedstock: Organic components of MSW and/or agricultural wastes and energy crops

Optimum Area Required: Approximately 1 acre per processing unit

Optimum Diversion Percentage: Depends on feedstock composition and marketability of products; up to 100% for agricultural waste and energy crops

Optimum Marketable Products: Biogas with 60% methane content is typical, which can be converted into power and heat or upgraded to pipeline quality natural gas

Optimum Additional Notes: Other marketable products include solid phosphate fertilizer; liquid ammonium sulfate fertilizers; liquid potassium fertilizer, and optional sequestration of carbon dioxide from methane to be sold as an industrial gas

20. **Company Name:** EcoTech Fuels, LLC

Company Url: http://www.ecotechfuels.com

Technology Name: N/A

Type: Developer

Technology: Plasma Gasification

First Name: Linda-Rose

Last Name: Myers

Title: CEO/President

Phone: 310.413.1848

Fax: 310.413.1848

Email: LRMyers@vcfuels.com

Street Address: P.O. Box 341697

City: Los Angeles

State: CA

Zip: 90034

Capacity Range: From >500 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Agricultural Waste, Landfill Gas, Forest waste, including pine-beetle infested wood

Company Specified Type: N/A

Tech Description: This is a hybrid anaerobic digestion/gasification facility, where the agricultural wastes and wet food wastes are digested. The dry MSW (wood, paper, plastics, tires) are processed to remove recyclables, such as metals and glass, and shredded before being subjected to high temperature gasification. The tars and chars coming off the tires are further subjected to a plasma finish. The resulting syngas (primarily hydrogen and carbon monoxide) are reformed, compressed, run through synloop clean-up and then processed through a Fischer-Tropsch fixed bed reactor, using a proprietary catalyst and trade secret processes. Because this is a paraffinic synthetic diesel, the final process is hydrocracking to break up long-chain paraffins. The resulting fuel is a drop-in high cetane renewable diesel, Torqazine-D. This fuel can be used in any diesel engine with no modifications required. The gasification process also results in a vitreous slag by-product.

Tech Rights: EcoTech Fuels has an exclusive world-wide licensing agreement with engineering partners Plant Process Equipment, Inc. (PPE) for the conversion technology to produce renewable diesel fuel.

Bus Structure: EctoTech Fuels, LLC, a Delaware Corporation, is a woman-owned and managed limited liability company organized for the purpose of converting carbonaceous waste materials into advanced synfuels. Plant Process Equipment (PPE), based in Texas, is a privately held engineering, construction, and operating company specializing in projects in the chemical, petrochemical, petroleum refining, biofuel, and green energy industries. PPE has been in business since 1975.

Data Source: Company RFEI response to Los Angeles County (August 2011) | Company review of summary information (March 2012)

Facility Location: Cleborne, Texas (Smithfield Farms)

Technology: Waste to Synfuel

Energy Product: Biodiesel

Commercial/Demo: Commercial

Design Capacity: N/A

Actual Capacity: N/A

Feedstock: scrap animal fats and other biowaste

Owner: Smithfield Farms

Operator: N/A

Size: N/A

Date Operational: N/A

Still Operating: Yes

Facility Location: Utah

Technology: Waste to Synfuel

Energy Product: methanol

Commercial/Demo: Commercial

Design Capacity: N/A

Actual Capacity: N/A

Feedstock: N/A

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: N/A

Still Operating: N/A

Optimum Design Capacity: Stage I: 1000 tpd; Stage II: 2000 tpd; Stage III: 6000 tpd

Optimum Feedstock: MSW, Green Waste, biosolids, medical waste, agricultural waste, waste tires

Optimum Area Required: Stage I: 60 acres; Stage II: 120 acres; Stage 3: 360 acres

Optimum Diversion Percentage: 100% depending on feedstock composition and marketability of products

Optimum Marketable Products: Renewable drop-in renewable diesel (Torqazine-D®), waste heat recovery and electricity, vitreous slag

21. **Company Name:** Eisenmann

Company Url: http://www.eisenmann.us.com

Technology Name: EISENMANN High Solids Anaerobic Digestion System

Type: Supplier

Technology: Anaerobic Digestion

First Name: Thomas

Last Name: F. Gratz

Title: Regional Sales Manager Biogas Systems

Phone: (815) 477-8884

Fax: (815) 455-1018

Email: thomas.gratz@eisenmann.com

Street Address: 150 East Dartmoor Drive

City: Crystal Lake

State: IL

Zip: 60014

Capacity Range: <100 tpd to 500 tpd

Feedstock List: Food Waste, Green Waste, Other (organic fraction of MSW)

Company Specified Type: Anaerobic Digestion

Tech Description: The EISENMANN High Solids Anaerobic Digestion System is a proprietary two-stage, continuously mixed, horizontal plug flow technology, capable of processing organic feedstock up to 40% of total solids in the overall recipe. The main digester is heated and thermally insulated, with a top-mounted double-membrane gas holder. It is fitted with a horizontal agitator along its entire length. After the main digester, the substrate is passed to the post digester for a second stage digestion. The post digester is a heated, thermally insulated vertical stirred tank with a top-mounted double-membrane gas holder, which stores the biogas before use.

Tech Rights: EISENMANN is a design/build technology provider of its own, proprietary High Solids Anaerobic Digestion system, with more than 90 installations worldwide.

Bus Structure: EISENMANN Corporation with its offices based in Crystal Lake, IL, is a wholly owned subsidiary of EISENMANN Anlagenbau GmbH & Co. KG, Boeblingen, Germany.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: Eisenmann's anaerobic digestion technology is used in more than 90 biogas plants to date, ranging in processing size from 12 tons per day to over 80 tons per day. Both reference facilities listed can be visited to observe the technology in operation.

Facility Location: Liesberg, Switzerland

Technology: EISENMANN Highs Solids Anaerobic Digestion

Energy Product: 330 kW electric 340 kW thermal

Commercial/Demo: Commercial

Design Capacity: 13,000 tpy (one main digester at 1350 m3 capacity)

Actual Capacity: 13,000 tpy

Feedstock: yard waste, residential food waste, food processing waste, agricultural waste

Owner: Kelsag Biopower AG

Operator: Kelsag Biopower AG

Size: 3 acres

Date Operational: 2010

Still Operating: Yes

Facility Location: Perris, California

Technology: EISENMANN Highs Solids Anaerobic Digestion

Energy Product: Compressed Natural Gas for vehicle fleet use (2,300 diesel gallon equivalents per day)

Commercial/Demo: Commercial

Design Capacity: 76,000 tpy (four main digesters at 1350 m3 capacity each)

Actual Capacity: To be determined

Feedstock: Yard waste, organic fraction of MSW, food processing waste

Owner: CR&R Renewable Technologies, Inc.

Operator: CR&R Renewable Technologies, Inc.

Size: 3 acres

Date Operational: Anticipated Date of Operation: October 2014

Still Operating; Under Active Construction

Optimum Design Capacity: 4,000 tpy up to 100,000 tpy

Optimum Feedstock: N/A

Optimum Area Required: 1/2 to 3 acres

Optimum Diversion Percentage: N/A

Optimum Marketable Products: Electricity and thermal energy, or fuel (CNG, RNG)

22. **Company Name:** Energos and Urbaser

Company Url: http://www.energos.com

Technology Name: Energos Gasification Technology

Type: Supplier

Technology: Gasification

First Name: David

Last Name: Garcia de Herreros (Urbaser)

Title: N/A

Phone: 818.274.3034

Fax: 818.274.3033

Email: dgarciah@urbaser.com

Street Address: 21550 Oxnard Street, 3rd Floor

City: Woodland Hills

State: CA

Zip: 91367

Capacity Range: From <100 tpd to >1,500 tpd

Feedstock List: MSW

Company Specified Type: Energos Gasification Technology

Tech Description: The feedstock is pre-treated by shredding and removal of ferrous metal. The material passes through the gasification chamber. The gas then goes through the high temperature oxidation chamber; staged oxidation is facilitated by multiple injection of air and recycled flue gas. Flue gas exiting the high temperature oxidation chamber passes through the heat recovery steam generator, where electricity is generated.

Tech Rights: Energos holds the patent to the Energos Gasification Technology. If a contract is awarded, Energos will supply its gasification technology on an exclusive basis to Urbaser, including a license to operate and maintain the technology. Energos included a letter of support in the August 2011 response to the RFEI and an updated letter of support in August 2013.

Bus Structure: Urbaser is a Spanish company and provides the following (amongst other) services: waste management: collection, treatment, disposal of household, medical, industrial, hazardous, demolition and construction residues and used mineral oils. Energos is the supplier of the gasification technology. Energos, part of the ENER G group, specializes in Gasification technology is a leading supplier of small-scale energy from waste plants, which provides a local

solution for local waste problems. If a contract is awarded, Energos will supply its gasification technology on an exclusive basis to Urbaser. Energos included a letter of support in the response to the RFEI.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012), and Company confirmation of summary information (August 2013).

Facility Location: Forus Plant, Norway

Technology: Energos Gasification

Energy Product: Energy Production 86 GWh per year

Commercial/Demo: Commercial

Design Capacity: 38,000 tpy

Actual Capacity: N/A

Feedstock: Residual Municipal Solid Waste

Owner: Lyse Energi, IVAR IKS, Westco AKS

Operator: Lyse Energi

Size: Footprint 1200 m2

Date Operational: 2002

Still Operating: Yes

Facility Location: Sarpsborg, Norway

Technology: Energos Gasification

Energy Product: Steam Supply 249 GWh p.a.

Commercial/Demo: Commercial

Design Capacity: 78,000 tpy

Actual Capacity: 80,000 tpy

Feedstock: Municipal Solid Waste and Commercial Waste

Owner: Hafslund AS

Operator: Hafslund AS

Size: N/A

Date Operational: 2000

Still Operating: Yes

Optimum Design Capacity: 120 tpd

Optimum Feedstock: MSW

Optimum Area Required: 2.47 acres

Optimum Diversion Percentage: Approximately 85% depending on feedstock composition and marketability of products.

Optimum Marketable Products: Ferrous Metal, Electricity

23. **Company Name:** Envirepel Energy, Inc.

Company Url: http://www.envirepel.com

Technology Name: Envirepel Energy Biomass to Energy Process

Type: Developer & Supplier

Technology: Gasification

First Name: Anthony

Last Name: J. Arand

Title: CEO

Phone: (760) 644-7269

Fax: (760) 728-7388

Email: Tony@envirepel.com

Street Address: P.O. Box 698

City: Bonsall

State: CA

Zip: 92003

Capacity Range: From 100 tpd to >1,500 tpd

Feedstock List: MSW (Refuse derived fuel from MSW), Food Waste, Green Waste, Biosolids, Autofluff, Plastics

Company Specified Type: Envirepel Energy Biomass to Energy Process

Tech Description: The EEI proprietary biomass to energy process provides for a combined gasification and combustion process, producing a syngas without direct combustion of the feedstock. The system typically utilizes 3MW gross output units (approximately 70-80 tpd), with multiple units used to meet project needs. Waste is first pre-processed to achieve a more uniform feedstock of approximately 2 inches in size. The waste is fed to the gasification chamber, resulting in production of a syngas and an ash residue. The ash is collected for disposal or for potential beneficial use. The syngas is combusted to generate electricity.

Tech Rights: Envirepel Energy, Inc. (EEI) has developed a hybrid conversion techology combustion system, including a proprietary control algorithm for plant control systems that is used in conjunction with commercially available technology and components. EEI owns its technology outright and plans to license its technology to joint venture partners in Domestic and International markets.

Bus Structure: EEI is a private company with over 350 investors. The company was incorporated in CA in 2004, for the purpose of designing, developing, owning and operating waste-to-energy renewable energy facilities. Strategic partners

include Rainbow Disposal, an employee-owned material collection and processing company based in Huntington Beach, CA. EEI is actively seeking additional strategic partners for project development, permitting and financing in the USA and abroad.

Data Source: Company RFEI response to Los Angeles County (August 2011) | Company review of summary information (March 2012)

Facility Location: Santee, California

Technology: Hybrid conversion / combustion

Energy Product: Thermal, 0.5 MW, Electrical, 100 kW

Commercial/Demo: Demonstration

Design Capacity: 12 tpd

Actual Capacity: 12 tpd

Feedstock: wood waste, RDF, coal

Owner: Envirepel Energy, Inc.

Operator: Envirepel Energy, Inc.

Size: within a building

Date Operational: 2011

Still Operating: Yes

Facility Location: Santee, California

Technology: Hybrid conversion / combustion

Energy Product: Electrical, 2.8 MW

Commercial/Demo: Commercial

Design Capacity: 80 tpd

Actual Capacity: 60 tpd

Feedstock: wood waste

Owner: Kittyhawk Energy, LLC.

Operator: Envirepel Energy, Inc.

Size: N/A

Date Operational: 2012, 3rd Quarter

Still Operating: The facility is expected to begin operations in the 3rd quarter of 2012.

Optimum Design Capacity: Approximately 432 tpd to achieve 18 MW gross output

Optimum Feedstock: Refuse Derived Fuel (RDF) from MRF residue, biomass, biosolids

Optimum Area Required: approximately 2.5 acres (for the gasification system only integrated with an existing MRF; additional area would be required for a stand-alone facility).

Optimum Diversion Percentage: 100%, depending on feedstock composition and marketability of products

Optimum Marketable Products: electricity, biofuels (as an alternative to electricity), steam, ash (potential reuse as concrete filler)

24. **Company Name:** Environmental Energy Resources Ltd.

Company Url: http://www.eer-pgm.com

Technology Name: Plasma Gasification Melting (PGM) Technology

Type: Developer & Supplier

Technology: Plasma Gasification

First Name: Liran

Last Name: Dor

Title: CTO & Technical Director

Phone: +972-3-7511350

Fax: +972-3-7511354

Email: info@eer-pgm.com

Street Address: 21 HaMelacha St. P.O. Box 11457

City: Rosh Haayin 48091 Israel

State: N/A

Zip: N/A

Capacity Range: From 100 tpd to 1,000 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Refuse Derived Fuel (RDF), Tires, Automobile shredder residue (ASR), Dried sewage sludge (<40% moisture), Other organic solid residues (tank bot

Company Specified Type: Plasma Gasification Melting (PGM) Technology

Tech Description: EER offers its proprietary Plasma Gasification Melting (PGM) technology. PGM is a fixed-bed updraft-countercurrent plasma driven gasification system. Plasma torches are located at the lower end of the vessel. The waste is shredded prior to gasification; additional pre-processing, such as to recover recyclables, is not required, but can be incorporated as appropriate. Waste is introduced through the top of the PGM vessel and moves downward through the vessel by gravity. The gasification reactions occur in an oxygen-starved environment. Syngas exits near the top of the vessel, and is cooled, cleaned and used to generate energy. The melted inorganics exit the bottom of the vessel and form a solid, glassy slag upon cooling.

Tech Rights: EER is the developer and owner of the technology, having applied for and granted several patents which form the PGM Intellectual Property Portfolio. In addition, EER has developed a significant know-how for the operation of PGM plants. PGM is a Trademark of Environmental Energy Resources Ltd.

Bus Structure: EER, as the technology provider, and SNC-Lavalin, as the engineering procurement and construction company, can offer PGM gasification plants to clients. The business focus is providing the equipment and the construction of the plants.

Data Source: Company RFEI response to Los Angeles County (August 2011) Company review of summary information (March 2012)

Facility Location: Israel

Technology: Plasma Gasification Melting (PGM)

Energy Product: Syngas to fuel electricity

Commercial/Demo: Demonstration

Design Capacity: 12-20 tpd

Actual Capacity: N/A

Feedstock: MSW

Owner: EER

Operator: N/A

Size: N/A

Date Operational: 2007

Still Operating: Yes

Facility Location: Pluton facility, near Moscow, Russia

Technology: Plasma Gasification Melting (PGM)

Energy Product: Syngas to fuel electricity

Commercial/Demo: Commercial

Design Capacity: 6-10 tpd

Actual Capacity: N/A

Feedstock: low level radioactive waste

Owner: The plant was commissioned by EER and the Radon Institute.

Operator: N/A

Size: N/A

Date Operational: 2002

Still Operating: Yes

Optimum Design Capacity: < 500 tpd MSW to Syngas to Electricity using Integrated Gasification Combined Cycle >1000 tpd MSW to Syngas to Electricity using Integrated Gasification Com

Optimum Feedstock: MSW

Optimum Area Required: (10 acres) 17.5 acres

Optimum Diversion Percentage: depending on feedstock composition and marketability of products

Optimum Marketable Products: N/A

25. **Company Name:** Envision Waste Services, LLC

Company Url: http://www.minimrf.com

Technology Name: MiniMRF

Type: Supplier

Technology: Other

First Name: Steven

Last Name: M. Viny

Title: CEO

Phone: 216-831-1818

Fax: 216-831-1868

Email: sviny@envisionwaste.net

Street Address: 4451 Renaissance Parkway

City: Cleveland

State: OH

Zip: 44128

Capacity Range: From >500 tpd to >1,500 tpd

Feedstock List: MSW

Company Specified Type: MiniMRF

Tech Description: The miniMRF system is a mixed waste processing system suitable for use as a front-end separation system for conversion technologies. The system is designed to be modular in construction, with each standard unit having a processing capacity of 35 tons per hour of residential MSW. Each system would generally be operated two shifts per day with cleaning and maintenance performed on the third shift, allowing for up to 500 tpd capacity on a single system. Multiple lines can be arranged to accommodate larger facility capacities, as appropriate. The miniMRF system can also be used to process single stream recyclables or construction and demolition waste, with varied capacity as applicable. The miniMRF system consists of three separate modules with specific functions (base miniMRF system), and optional additional modules to meet project-specific needs (engineered fuel module, near infra-red (NIR) fiber module, NIR plastic module, and primary/secondary shredders for final product sizing of the fuel component). All of the modules of the miniMRF system are trailer mounted, providing for installation with no special foundation requirements. Each trailer-mounted module of the base system is approximately 45 feet long and 8 feet wide and can be arranged in a number of configurations. The modules are linked together by a central wireless control system, so they function as a single system. The system

is designed to first recover recyclables as commodities to the greatest extent possible, but also recovers a fine organic fraction for composting or digestion as well as an engineered fuel fraction suitable for gasification.

Tech Rights: The company owner, Steven M. Viny, has majority ownership of the MiniMRF technology.

Bus Structure: Envision Waste Services was formed in 2008 and is a single member LLC owned by Steven M. Viny.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: In addition to producing engineered fuel, the Seville, OH commercial reference facility recovers newspaper, cardboard, mixed fiber, ferrous metal, aluminum and other non-ferrous metal, wood, HDPE and PET plastic, glass, batteries, waste oil and electronics. Source separated yard waste is composted for beneficial use. Organic fines recovered from the sorting process are composted and used for landfill alternative daily cover. The Seville, OH facility can be visited to view the technology in operation. A third reference facility similar to the Seville, OH facility and using the miniMRF system began commercial operation in January 2012 in Clyde, OH. The facility is privately owned and operated (FSI Disposal). It processes unsorted MSW and single stream recyclables. This facility can be visited with advanced coordination with Envision Waste Services.

Facility Location: Seville, Ohio

Technology: Mixed Waste Processing (forerunner to the miniMRF system)

Energy Product: Engineered Fuel

Commercial/Demo: Commercial

Design Capacity: 350 tpd (91,000 tpy) (1 unit with a design capacity of 25 tph)

Actual Capacity: 500 tpd (130,000 tpy)

Feedstock: Residential and Commercial Mixed MSW

Owner: Medina County

Operator: Envision Waste Services, LLC

Size: 20 acres

Date Operational: June 1993

Still Operating: Yes

Facility Location: Montgomery County, Moraine, OH

Technology: MiniMRF System

Energy Product: Engineered Fuel

Commercial/Demo: Demonstration

Design Capacity: 350 tpd (100,000 tpy)

Actual Capacity: The system was operated for demonstration purposes; due to waste availability, it operated at less than total design capacity (e.g., approximately 26,500 tpy of post-curbside residential MSW in each of the three years the facility operated). However, it allowed for demonstration at the hourly design rate of 25 tph.

Feedstock: Post-curbside Residential MSW

Owner: Montgomery County Solid Waste District

Operator: Envision Waste Services LLC

Size: Approximately 10 acres

Date Operational: 2009-2011

Still Operating: No

Optimum Design Capacity: 1,000 tpd (300,000 tpy) using 2 miniMRF systems at 35 tph capacity each

Optimum Feedstock: Mixed residential MSW

Optimum Area Required: 15-20 acres (includes area for composting)

Optimum Diversion Percentage: Up to 70%, depending on what type of conversion technology this system is paired with and depending on the feedstock composition and the marketability of the products.

Optimum Marketable Products: Baled materials for recycling and fine materials for composting and use as landfill daily alternative cover

Optimum Additional Notes: Envision Waste Services also suggested a smaller project (500 tpd) using 1 miniMRF system with a 35 tph design capacity.

26. **Company Name:** Harvest Power, Inc.

Company Url: http://www.harvestpower.com

Technology Name: Two-stage batch High Solids Anaerobic Digestion (HSAD)

Type: Developer

Technology: Anaerobic Digestion

First Name: Linda

Last Name: Novick

Title: Project Manager

Phone: 510.847.0038

Fax: 559.435.1007

Email: lnovick@harvestpower.com

Street Address: 430 Main Street

City: San Francisco

State: CA

Zip: 94105-2006

Capacity Range: From <100 tpd to 500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Commingled Source Separated Organic Waste

Company Specified Type: Two-stage batch High Solids Anaerobic Digestion (HSAD)

Tech Description: The technology is Two-Stage, Batch, High Solids Anaerobic Digestion (HSAD). Batch HSAD utilizes "tunnel" style digesters where the incoming organic waste feedstock is loaded with a wheel loader and there is no mixing or pumping of the solids during digestion. The approach is highly tolerant of physical contamination (plastic, metal and glass). In 2-Stage Batch HSAD, high-strength organic acids extracted from the solids in the tunnel are carefully dosed to an attached high-rate anaerobic digester for the bulk of methanogenesis.

Tech Rights: Harvest Power holds the exclusive rights to 2-Stage Batch HSAD in North America via GICON, of Germany

Bus Structure: Harvest Power performs build, own and operate of organics recycling facilities including 2-stage High Solids Anaerobic Digestion (HSAD).

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012)

Facility Location: Richmond, British Columbia, Canada

Technology: High Solids Anaerobic Digestion (HSAD)

Energy Product: Electricity; biomethane; transportation fuel

Commercial/Demo: Commercial

Design Capacity: 30,000 tons per year

Actual Capacity: N/A

Feedstock: organic materials

Owner: Harvest Power through its subsidiary, Fraser Richmond Soil & Fibre, Ltd.

Operator: Harvest Power through its subsidiary, Fraser Richmond Soil & Fibre, Ltd.

Size: N/A

Date Operational: under construction; operations are expected to commence in summer or fall 2012

Still Operating: under construction; operations are expected to commence in summer or fall 2012

Facility Location: Cottbus II, Germany

Technology: High Solids Anaerobic Digestion (HSAD)

Energy Product: Electricity; biomethane; transportation fuel

Commercial/Demo: Commercial

Design Capacity: 8,800 tons per year

Actual Capacity: N/A

Feedstock: agricultural waste

Owner: Cottbus

Operator: GICON

Size: N/A

Date Operational: 2010

Still Operating: Yes

Optimum Design Capacity: The optimum capacity range is 100 tpd to 255 tpd.

Optimum Feedstock: commercial and residential source separated green and food waste

Optimum Area Required: The optimum range for required area is 8 acres to 18 acres.

Optimum Diversion Percentage: 100%, depending on feedstock composition and marketability of products.

Optimum Marketable Products: Electricity, Biomethane, Transportation Fuel, Soil and Organic Fertilizer Products

27. **Company Name:** Himark Biogas Inc.

Company Url: http://www.himarkbiogas.com

Technology Name: IMUS

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Shane

Last Name: Chrapko

Title: CEO

Phone: (780) 700-5110

Fax: N/A

Email: schrapko@himarkbiogas.com

Street Address: 6004 - 118 Street

City: Edmonton

State: Alberta, Canada

Zip: N/A

Capacity Range: <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other (any organic waste)

Company Specified Type: Anaerobic Digestion

Tech Description: The Integrated BioMass Utilization System (IMUS) is a unique AD system combining waste pre-treatment and the benefits of wet and dry digestion. IMUS feeds a large variety of feedstock through the High Solids Infeed System (HiSIS), which converts the feedstock into a pumpable liquid. The pre-treated feedstock is then pumped into primary digesters equipped with Clean Slate IMUS which continuously removes heavy inorganic particles that would otherwise build up and clog digesters. Primary digesters can be designed to operate in thermophilic or mesophilic temperature ranges. Primary digestate is transferred to secondary digesters when its viscosity is much reduced, meaning that the secondary digesters have a much lower energy load. Secondary digestate is passed through solid/liquid separation and fiber is removed for use as a soil amendment product. Liquids can be conveyed (optionally) to Tertiary digesters (minimal capital cost as mixing and heating requirement is much reduced) for an extended retention time. Liquids post-tertiary digestion can be upgraded for re-use or used in fertilization applications. IMUS produces polished (low H2S) biogas suitable for many uses.

Tech Rights: Himark has full rights to the IMUS and a number of other technologies. IMUS is protected by 8 patent families and a number of trade secrets.

Bus Structure: Himark BioGas Ltd is a corporation.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The reference facility also produces a fiber product marketed for agricultural use, home and garden use, and use as a soil amendment for reclamation and remediation sites. The facility has been upgraded a number of times since the date of operation, including a 4X increase in capacity in 2010. The facility can be visited to observe the technology in operation.

Facility Location: Hairy Hill, Alberta Canada

Technology: IMUS™

Energy Product: Electricity (2.5 MW using GE Jenbacher reciprocating engines) and biogas as boiler fuel in co-located ethanol facility

Commercial/Demo: Commercial

Design Capacity: 350 tpd (123,000 tpy) (one integrated facility)

Actual Capacity: 350 tpd (123,000 tpy)

Feedstock: Source separated organics (90%), open-pen feedlot manure (5%), and food processing (slaughter and packaging) waste (5%)

Owner: Growing Power Hairy Hill LP (GPHH)

Operator: GPHH

Size: 4 acres

Date Operational: February 2005

Still Operating: Yes

Optimum Design Capacity: 400 tpd (140,000 tpy) (one integrated plant)

Optimum Feedstock: MSW and source separated organics

Optimum Area Required: 4-8 acres

Optimum Diversion Percentage: >90% expected, with landfill disposal of up to 2% organics and up to 9% of the original MSW; actual diversion is dependent on feedstock composition and the marketability of products

Optimum Marketable Products: CNG; fiber

Optimum Additional Notes: Requires a MRF with autoclave for MSW pre-processing

28. **Company Name:** INEOS Bio USA LLC

Company Url: http://www.ineosbio.com

Technology Name: INEOS BioEnergy Process

Type: Developer

Technology: Other

First Name: Guy

Last Name: Barnocky

Title: Business Development Manager

Phone: (630) 857-7105

Fax: (630) 857-7328

Email: guy.barnocky@ineos.com

Street Address: 3030 Warrenville Road

City: Lisle

State: IL

Zip: 60532

Capacity Range: 100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids

Company Specified Type: INEOS BioEnergy Process

Tech Description: The INEOS Bio Process technology can be described through the following steps: Feed preparation and drying (including mechanical and biological (MBT) treatment when processing MSW); Gasification using a two-step (lower/upper chamber), oxygen-blown technology; Syngas heat recovery (to generate renewable power) and gas clean up; Fermentation (bioethanol production from syngas through patented biological process, occurring at low temperature and pressure over minutes rather than days); Filtration, distillation and dehydration (bioethanol recovery and purification); and renewable power generation (via recovery of heat from the hot syngas, and combusting the vent gas from the fermentation stage). In addition to the main steps described above, the plant includes ancillary systems such as the process sewer and chemical additives systems, culture storage, handling equipment and storage tanks.

Tech Rights: INEOS Bio was created following the acquisition of Bioengineering Resources Incorporated (BRI), who had developed and demonstrated at pilot scale a bioenergy technology to convert waste material to advanced biofuels. INEOS Bio assumed ownership of the BRI process technology, intellectual property, research and development laboratories and pilot plant. Since 2008, INEOS Bio

developed the INEOS BioEnergy process for converting waste material to advanced biofuels at commercial scale and owns or controls all of the technology rights.

Bus Structure: INEOS Bio is a bio-energy business within the INEOS Group, a major global chemical company. INEOS Bio was established in 2008 with the goals of commercializing a proprietary bio-energy technology and establishing an organization to license the technology to both wholly-owned and 3rd party projects. INEOS Bio utilizes the experience base of INEOS Technologies in its technology development and deployment, technology licensing, project management and development, and engineering. INEOS Bio employs approximately 145 people distributed between commercial, technical (R&D) and operational teams. The INEOS Group, headquartered in Rolle, Switzerland, is a specialty and petrochemicals company, operating 51 plants in 11 countries. The INEOS Group, formed in 1998, has grown to become one of the largest chemical companies in the world with annual aggregate sales of &43 billion. The INEOS Group employs approximately 15,000 employees and produces over 60 million tonnes of chemical products annually.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: Visits to the reference facilities can be arranged through INEOS Bio. After extensive due diligence, the USDOE selected the Vero Beach facility for funding under the 2009 ARRA/Integrated Biorefinery funding round, and the USDA selected the project for support with a loan guarantee. The project created over 400 jobs including local engineering, permitting and construction jobs, and now employs over 65 personnel on a full-time basis.

Facility Location: Vero Beach, Florida

Technology: INEOS BioEnergy Process

Energy Product: Fuel grade cellulosic bioethanol (8 million gallons per year) and electricity (6 MW) at design capacity

Commercial/Demo: Commercial

Design Capacity: 600 tpd (200,000 tpy) of green waste or 900 tpd (300,000 tpy of MSW); one unit design

Actual Capacity: To be determined

Feedstock: The plant is permitted to process 90% green waste consisting of landscape cuttings, tree trimmings and storm debris and 10% post-recycled MSW

Owner: INEOS New Planet Bioenergy LLC

Operator: INEOS New Planet Bioenergy LLC

Size: 9.5 acres

Date Operational: Expected to be commercially operational producing ethanol in the third quarter of 2013.

Still Operating: Yes

Facility Location: Fayetteville, AR

Technology: INEOS BioEnergy Process

Energy Product: N/A

Commercial/Demo: Pilot Plant for Demonstration Purposes

Design Capacity: N/A

Actual Capacity: N/A

Feedstock: N/A

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 2001

Still Operating: Yes

Optimum Design Capacity: Variable from 300 tpd to 3,600 tpd (100,000 tpy to 1,200,000 tpy)

Optimum Feedstock: Post-recycled MSW, green waste, wood waste, and other carbonaceous materials in varying percentages

Optimum Area Required: 10 acres for a small plant; 40 acres for a large plant

Optimum Diversion Percentage: Depends on the composition of the feedstock and the ability to market the products; for MSW, up to 80% diversion and for clean green waste, diversion can approach 100%

Optimum Marketable Products: Fuel-grade cellulosic bioethanol, power, and recovered recyclables from processing MSW

Optimum Additional Notes: The plant would consist of a minimum of two gasification facilities, one fermentation facility, one power generation facility and one ethanol distillation and dehydration facility. If processing green waste, it would require grinding and drying. If processing MSW, it would require a front-end MRF.

29. **Company Name:** Innovative Energy Solutions, Inc.

Company Url: http://www.ies-thermopac.com

Technology Name: Waste Hydrocarbon 2-Fuel (WHc2F) Technology

Type: Supplier

Technology: Other

First Name: Dr. Atul

Last Name: Kelkar

Title: CEO

Phone: 515.450.8997

Fax: 267.712.6999

Email: atul.kelkar@ies-thermopac.com

Street Address: 2716 SE 5th St., Suite 3

City: Ames

State: IA

Zip: 50010

Capacity Range: From <100 tpd to 500 tpd

Feedstock List: MSW, Waste hydrocarbons (plastics, tires, shingles, used oil, greases, etc.)

Company Specified Type: Waste Hydrocarbon 2-Fuel (WHc2F) Technology

Tech Description: The WHc2F process is primarily based on two processes: (1) thermo-catalytic cracking of heavier hydrocarbon / polymer molecules into monomers; and (2) catalytic re-bonding of monomer hydrocarbon molecules to liquid fuel products of desired range and quality. In the first step, feedstock is prepared by shredding and liquefying (either melting or dissolving in hot process oil). In the second step, the liquefied feedstock is heated to the catalytic cracking temperature of 350°C to 380°C. The feedstock is passed through a catalytic cracking reactor, where the proprietary process generates a narrow range of hydrocarbon monomers. In the third step, the monomers are reformed to diesel range hydrocarbons. In the fourth step, the hydrocarbons are distilled to separate the desired products.

Tech Rights: The intellectual property is entirely the property of IES.

Bus Structure: IES is an Iowa corporation.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012)

Facility Location: Biomass Energy Conversion (BECON) Facility, Nevada, Iowa

Technology: Waste Hydrocarbon 2-Fuel (WHc2F) Technology

Energy Product: diesel fuel

Commercial/Demo: Demonstration

Design Capacity: N/A

Actual Capacity: N/A

Feedstock: waste plastics, waste tires, shingles, oil sludge, waste oil

Owner: N/A

Operator: Iowa Energy Center and Iowa State University

Size: N/A

Date Operational: N/A

Still Operating: N/A

Optimum Design Capacity: 1) 150 tpd; 2) 10-15 tpd; 3) 2-5 tpd

Optimum Feedstock: Waste Hydrocarbons (plastics, used oil, tires, etc.)

Optimum Area Required: 1) 10 acres; 2) 2 acres; 3) Mobile (on flatbed truck)

Optimum Diversion Percentage: 100% depending on feedstock composition and marketability of products

Optimum Marketable Products: diesel, LP gas, carbon black

30. **Company Name:** International Environmental Solutions (IES)

Company Url: N/A

Technology Name: IES Advanced Pyrolytic System (APS)

Type: Developer & Supplier

Technology: Pyrolysis

First Name: William

Last Name: Reilly

Title: President

Phone: N/A

Fax: N/A

Email: wreilly99@aol.com

Street Address: N/A

City: N/A

State: N/A

Zip: N/A

Capacity Range: From <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Industrial Waste, Hazardous Waste, Agricultural Waste, Tires

Company Specified Type: IES Advanced Pyrolytic System (APS)

Tech Description: The IES technology consists of waste pre-processing systems, a pyrolytic gasifier for production of syngas, a thermal oxidizer for combustion of the syngas, waste heat recovery for operation of a steam turbine, and air pollution control technologies for the reduction of emissions from the combustion of the syngas. The system is a modular design, manufactured at 8-, 40- and 125-tpd capacities. Pre-processing equipment consists of a grinder (for size reductions to 2-inch minus) and a dryer (to achieve 20% feedstock moisture). The pyrolysis chamber is a retort vessel within a metal jacket. Rotating augers transport the fuel horizontally from the feed end of the retort to the opposite end, where char is collected. The gas path in the retort is concurrent with the solids flow. The pyrolysis takes place between 1,200 and 1,800°F. The syngas that is produced by the pyrolysis unit is piped to a thermal oxidizer for combustion and generation of electricity.

Tech Rights: IES has the rights to its proprietary pyrolysis technology called the Advanced Pyrolytic System (APS)

Bus Structure: IES is a privately-owned conversion technology company that was founded in June 2000 as a Nevada corporation. It is a full-service marketing, development, manufacturing, system integrator, and distribution entity serving the waste disposal market.

Data Source: Company participation in Los Angeles County Phase II Process, Company review of summary information (pending)

Additional Notes

Facility Location: Menifee (Romoland), California (Riverside County)

Technology: IES Advanced Pyrolytic System

Energy Product: Steam

Commercial/Demo: Demonstration

Design Capacity: 50 tpd

Actual Capacity: limited by operating permit to 35 tpd

Feedstock: MSW and other feedstocks

Owner: IES

Operator: IES

Size: 15,000 square foot building footprint on 8.5-acre property

Date Operational: 2004 - 2010

Still Operating: Equipment was relocated to Mecca, California in 2010 for commercial application to process tires and other feedstock; the operating permit is pending for the new installation.

Facility Location: Technikon Renewable Energy Test Center (RETC)

Technology: IES Advanced Pyrolytic System/Recirculated Fuel Gas

Energy Product: N/A

Commercial/Demo: Demonstration

Design Capacity: 8 tpd

Actual Capacity: N/A

Feedstock: MSW, medical waste, and other feedstock

Owner: IES

Operator: IES

Size: N/A

Date Operational: Facility received permit to construct in July 2010, which is valid through July 22, 2012; permit to operate has not yet been received, pending final installation.

Still Operating: N/A

Optimum Design Capacity: N/A

Optimum Feedstock: N/A

Optimum Area Required: N/A

Optimum Diversion Percentage: Approximately 80-95%, depending on feedstock composition and ability to market products.

Optimum Marketable Products Recyclables, Carbon Char (possible use in cement kilns or as landfill cover), Electricity

31. **Company Name:** Interstate Waste Technologies, Inc.

Company Url: http://www.iwtonline.com

Technology Name: Thermoselect High Temperature Gasification Technology

Type: Developer & Supplier

Technology: Gasification

First Name: Francis

Last Name: Campbell

Title: President

Phone: 610.793.0216, 484.288.9589

Fax: 610.793.1642

Email: frankc@iwtonline.com

Street Address: 401 Knolls Road

City: West Chester

State: PA

Zip: 19382

Capacity Range: From >500 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Biosolids, Medical Waste, Auto Shredder Residue, Tires, E-Waste, Commercial and Industrial Waste

Company Specified Type: Thermoselect High Temperature Gasification Technology

Tech Description: The core components of IWT's application of the Thermoselect technology include a feed chamber, gasification reactor, synthesis gas cleanup, water treatment, and electricity generation. The synthesis gas can also be used to manufacture alternative fuels such as ethanol and gasoline. Pre-processing is not required but can be incorporated to recover recyclables when economically viable to do so. Waste is fed to the high-temperature reactor where it is combined with limited amounts of pure oxygen and natural gas, at temperatures as high as 2,000C, forming a synthesis gas. The gas is cooled, cleaned, and used in a combustion turbine combined-cycle system to generate electricity. The process also generates a silica-based, sand-like aggregate and recovers metals, among other secondary products.

Tech Rights: Thermoselect, a Swiss Corporation, licenses the technology to IWT and provides the design and specifications required to procure the equipment. Thermoselect also assists with the installation, startup and testing of the

equipment, and will provide services to IWT as needed during design, construction, operation and maintenance of the project.

Bus Structure: IWT finances, designs, constructs and operates waste processing facilities. IWT uses the Thermoselect technology, a patented process incorporating high temperature gasification to recycle waste into energy and other products. IWT's development partner is Interstate Business Corporation (IBC), a housing and real estate development and ownership company.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 26, 2012)

Facility Location: Kurashiki, Japan

Technology: Thermoselect High Temperature Gasification System

Energy Product: Synthesis Gas export to steel works

Commercial/Demo: Commercial

Design Capacity: 612 tpd

Actual Capacity: 612 tpd

Feedstock: Combination of MSW, Industrial Waste and Incinerator Ash

Owner: Mizushima Eco Works

Operator: Mizushima Eco Works

Size: 10 acres

Date Operational: 2005

Still Operating: Yes

Facility Location: Chiba, Japan

Technology: Thermoselect High Temperature Gasification System

Energy Product: Gas Engine Power Generation; steel manufacturing process

Commercial/Demo: Commercial

Design Capacity: 330 tpd

Actual Capacity: 330 tpd

Feedstock: MSW and Industrial Waste

Owner: JRC (Japanese Recycling Corporation)

Operator: JRC (Japanese Recycling Corporation)

Size: 5 acres

Date Operational: 1999

Still Operating: Yes

Optimum Design Capacity: 1,770 tpd

Optimum Feedstock: MSW

Optimum Area Required: 20 to 25 acres (40% of site area used as buffer / green area)

Optimum Diversion Percentage: 100%, based on feedstock composition and marketability of products.

Optimum Marketable Products: Syngas to Electricity (GE Frame 6B Combustion Turbine), vitreous mineral granulate, iron-copper alloy, salt, sulfur, zinc-concentrate

32. **Company Name:** JFE Engineering Corporation

Company Url: http://www.jfe-eng.co.jp%2Fen

Technology Name: JFE High Temperature Gasification and Direct Melting Furnace

Type: Supplier

Technology: Gasification

First Name: Hideaki

Last Name: Sakuma

Title: N/A

Phone: +81-45-505-7535

Fax: +81-45-505-7456

Email: sakuma-hideaki@jfe-eng.co.jp

Street Address: 2-1, Suehiro-cho

City: Tsurumi-ku

State: Yokohama, Japan

Zip: N/A

Capacity Range: <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other (sewage sludge, automobile shredder residue, excavated waste from landfill, etc.)

Company Specified Type: JFE High Temperature Gasification and Direct Melting Furnace

Tech Description: The JFE Gasification and Direct Melting Furnace is a compact system, combining gasification and melting into a single furnace. Feedstock is fed into the top of the furnace along with small percentages of coke and limestone that facilitate and support the conversion process. Ash and inert materials are melted and discharged in a molten state at the bottom of the furnace. The molten material is sent to a water-granulation process; following granulation, the slag and metal are separated. Syngas is discharged at the top of the furnace into a secondary combustion chamber, followed by heat recovery and power generation. Flue gas resulting from the combustion of syngas is introduced to an air pollution control system, including a cyclone, activated carbon injection, and bag filter. Fly ash is collected and stabilized and typically requires landfill disposal. MSW does not require pre-processing, except for mixing (via crane) within the storage pit to homogenize characteristics prior to feeding the waste to the furnace. However, the JFE system can be paired with a MRF to remove recyclables and certain other

inerts that are not beneficially treated (e.g., gypsum board, rocks, soil and fines). The system is designed for zero process water discharge.

Tech Rights: JFE has the technology rights to the JFE High-Temperature Gasification and Direct Melting Furnace. JFE developed the technology by integrating its own technology of iron blast furnace for steel making and of fluidized bed for incineration plants.

Bus Structure: JFE is an engineering company that has constructed more than 150 waste treatment plants since 1968 and that also provides operation and maintenance services. JFE Engineering Company is headquartered in Japan, with a subsidiary in Long Beach, California. JFE Engineering Company is owned by JFE Group.

Data Source: Company RFEI response to Los Angeles County (December 2011)

Facility Location: Fukuyama Recycle Power Plant, Hiroshima prefecture, Japan

Technology: JFE High Temperature Gasifying and Direct Melting System

Energy Product: Power (rated at 20 MW)

Commercial/Demo: Commercial

Design Capacity: 314 tpd (one unit)

Actual Capacity: N/A

Feedstock: Pelletized RDF from MSW

Owner: Fukuyama Recycle Power Company

Operator: JFE Environmental Service Co. (a subsidiary of JFE Engineering Co.)

Size: Approximately 6.5 acres

Date Operational: February 2004

Still Operating: Yes

Facility Location: Clean Hill Homan WTE Plant, Fukuoka prefecture, Japan

Technology: JFE High Temperature Gasifying and Direct Melting System

Energy Product: Power (rated at approximately 5 MW)

Commercial/Demo: Commercial

Design Capacity: 250 tpd (two units at 125 tpd each)

Actual Capacity: N/A

Feedstock: MSW (including bulky waste and disaster waste)

Owner: Chikushino-Ogori-Motoyama Waste Disposal Facility Association

Operator: JFE Environmental Service Co. (a subsidiary of JFE Engineering Co.)

Size: N/A

Date Operational: March 2008

Still Operating: Yes

Optimum Design Capacity: 2,000 tpd, consisting of 4 lines at 500 tpd each (with flexibility for other capacities)

Optimum Feedstock: MSW

Optimum Area Required: Approximately 20 acres

Optimum Diversion Percentage: Up to approximately 96% diversion, depending on composition of feedstock and ability to market products; material requiring landfill disposal includes inerts that may be removed from the waste (e.g., gypsum board, rocks, soil, fines) and stabilized fly ash.

Optimum Marketable Products: Power (66 MW), slag (for use as asphalt aggregate, fill, or to make concrete blocks), metal

Optimum Additional Notes: A 500 tpd line would represent a 1.6 scale-up factor against JFE's largest reference plant (Fukuyama, Japan, at 314 tpd), but only a 5% increase in thermal input (this is because the Fukuyama plant processes RDF, which normally has a higher calorific value than MSW)

33. **Company Name:** Lystek International, Inc.

Company Url: http://www.lystek.com

Technology Name: Lystek Process

Type: Developer & Supplier

Technology: Other

First Name: Ward

Last Name: Janssens

Title: Executive Vice President

Phone: (226) 444-0186 ext. 301

Fax: (888) 501-7429

Email: wjanssens@lystek.com

Street Address: 1425 Bishop Street North, Unit 16

City: Cambridge

State: ON

Zip: Canada

Capacity Range: <100 tpd to 1,000 tpd

Feedstock List: Biosolids, Other (Digestate from Food Waste Anaerobic Digestion)

Company Specified Type: Lystek Process

Tech Description: Lystek's patented technology is a thermal hydrolysis technology with a small footprint (approximately 1,000 sq. ft. for processing equipment). Due to the equipment's small size, it is often practical to install the Lystek processing equipment at a wastewater treatment plant rather than build a separate regional facility, and it can be easily integrated with an anaerobic digester at a wastewater treatment plant. Lystek's technology processes biosolids and digestate to produce a marketable fertilizer product. The modular process includes: high speed shearing; steam addition, to raise the temperature to 170 degrees Fahrenheit; and alkali addition. The semi continuous batch process is executed in small reactors. The process takes 45 minutes. After the material has been processed in the reactors, some of the high solids product (at about 15% solids) can be fed into anaerobic digesters, which can facilitate material breakdown and enhance biogas yield production for existing biosolids digesters. Some of the product can be (if applicable) re-fed into the beginning of the process at the wastewater treatment facility to enhance the BNR process, and the balance of the product can be stored either at the facility or offsite for future sales for use at farms, mine/quarry rehabilitation or silviculture.

Tech Rights: Lystek developed, patented and owns the complete rights to the Lystek Process, including four U.S. patents and all future enhancements.

Bus Structure: Lystek International Inc of Cambridge Ontario Canada is a biosolids management company. It is a subsidiary of R.W. Tomlinson of Ottawa. Tomlinson is a 60-year-old, privately owned business headquartered in Ottawa, ON, that provides environmental and construction services to the governmental (municipal & provincial) and institutional sectors. Tomlinson currently operates the Springhill landfill and the Peterborough landfill as well as their Construction and Demolition (C$D) Recycling Facility. Tomlinson's revenues are well into the nine-figure range, and they are routinely awarded projects in the eight-figure range. Tomlinson is staffed with a workforce of over 850 professionals in a wide range of disciplines such as engineers, technologists, technicians, highly skilled trades, accounting, business development, marketing and administrative support. Lystek has a long working relationship with the environmental permitting and design firm Conestoga Rovers and Associates (CRA), which has eight offices in California.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The Lystek Process has been in successful operation in Canada for over six years and has five installations. In addition to the 9 m3 reactor (60,000 tpy), Lystek has a smaller 5 m3 reactor (34,000 tpy) that has been in operation at the City of Guelph for over five years. The Lystek process creates a fertilizer, not energy. However, it can be used to enhance the production of biogas when used in combination with an anaerobic digester. Lystek worked with Conestoga Rovers and Associates (CRA) for the environmental permitting and design of the Southgate reference facility, which is the largest of all their installations. The reference facility can be visited to observe the technology in operation. Typical operating hours are 6am to 5pm Monday to Friday, and 8am to 12 noon on Saturday (if required).

Facility Location: Southgate Township, Ontario Canada

Technology: Lystek Low Temperature Thermal Alkaline Hydrolysis Process

Energy Product: Creates a fertilizer, not energy

Commercial/Demo: Commercial

Design Capacity: 550 tpd (165,000 tpy) (two 9 m3 reactors currently installed, but permitted for a total of four)

Actual Capacity: 400 tpd (120,000 tpy)

Feedstock: Municipal wastewater biosolids, digestate from anaerobic digesters, screened septic waste and other clean organic waste

Owner: Lystek International, Inc.

Operator: Lystek International, Inc.

Size: 10 acres, of which 6.5 acres are for product storage

Date Operational: December 2012

Still Operating: Yes

Optimum Design Capacity: 335 tpd (100,000 tpy) using three 9 m3 Lystek Reactors (two operating and one on standby at any given time)

Optimum Feedstock: Municipal wastewater biosolids, digestate from anaerobic digesters, screened septic waste and other clean organic waste

Optimum Area Required: If located on-site at a WWTP with existing anaerobic digesters and assuming off-site storage of product, would need approximately 0.1 acres. If developed as an off-site regional facility without anaerobic digestion but inclusive of product storage, would need approximately 5 acres.

Optimum Diversion Percentage: Can achieve 100% diversion, subject to feedstock composition and marketability of the fertilizer product.

Optimum Marketable Products: Fertilizer; biogas if co-located with anaerobic digestion

Optimum Additional Notes: Lystek is currently getting about $14 per ton for the Lystek fertilizer product, and they expect that value will grow to above $25 per ton within the next three years.

34. **Company Name:** MaxWest Environmental Systems, Inc.

Company Url: http://www.maxwestenergy.com

Technology Name: MaxWest Gasification System

Type: Developer & Supplier

Technology: Gasification

First Name: Kelly

Last Name: Sarber

Title: Vice President, Project Development, Western Region

Phone: 760.613.5994, 760.942.8400

Fax: N/A

Email: kellysarber@hotmail.com

Street Address: 642 Margarita Avenue

City: Coronado

State: CA

Zip: 92118

Capacity Range: From 100 tpd to 500 tpd

Feedstock List: Biosolids

Company Specified Type: MaxWest Gasification System

Tech Description: The proprietary Max West biogasification system consists of five primary components: materials handling; drying; gasification; thermal oxidation; and energy recovery. Dewatered biosolids are dried using a screw type dryer. Waste heat from the thermal oxidizer is used to dewater the incoming biosolids. The dried biosolids are fed into the gasification unit. In the biogasification unit, the biosolids are converted into syngas and inert ash. The syngas enters the thermal oxidizer, which is a multi-chamber reactor, where it is combusted with a controlled amount of oxygen. The waste heat from the oxidizer is transferred to an energy recovery system, which is used to dry the sludge in the sludge dryer.

Tech Rights: Max West owns the technology.

Bus Structure: Partnership with CPH Engineers, Inc.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Sanford, FL

Technology: Biosolids Gasification

Energy Product: Waste heat is used to dry the biosolids fed to the gasifier.

Commercial/Demo: Commercial

Design Capacity: 80 wet tons per day

Actual Capacity: 80 wet tons per day

Feedstock: biosolids

Owner: MaxWest

Operator: MaxWest

Size: less than one acre

Date Operational: September 2009

Still Operating: Yes

Optimum Design Capacity: The optimum capacity ranges from 108 wet tpd to 324 wet tpd.

Optimum Feedstock: biosolids

Optimum Area Required: less than one acre

Optimum Diversion Percentage: Depends on the beneficial reuse of the residuals.

Optimum Marketable Products: Waste heat is used to dry the biosolids fed to the gasifier.

Optimum Additional Notes: If the incoming biosolids material is greater than 25% solids, there is the ability to create net green energy on site. This energy could be heat that is used to heat digesters at a wastewater treatment plant, or used for central heating, or possibly used for Rankine cycle electricity generation (depending on efficiencies and dryness of the feedstock). If the facility is co-located with a facility with excess high temperature flue gas being flared (such as an oil refinery, cement kiln, or other manufacturer with excess high temperature flue gas), then the flared gas could be redirected to dry the biosolids, and the energy from the gasifier could be used to provide green energy on site (for example, steam). This would result in a currently operating facility being able to reduce their emissions profile.

35. **Company Name:** Mustang Renewable Power Ventures, LLC

Company Url: http://www.bekon.eu

Technology Name: BEKON Dry Fermentation Process

Type: Developer

Technology: Anaerobic Digestion

First Name: John

Last Name: Dewey

Title: CEO

Phone: 805.259.9499

Fax: 805.392.8113

Email: John@deweygroup.com

Street Address: 750 Pismo Street

City: San Luis Obispo

State: CA

Zip: 93401

Capacity Range: From >500 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Halogenated Waste, Tires

Company Specified Type: BEKON Dry Fermentation Process

Tech Description: The processing consists of a Materials Recovery Facility (MRF) in series with parallel processing of the organic and inorganic fractions of MSW using Anaerobic Digestion and Gasification, respectively. The MRF equipment is from Van Dyk Baler/Bollengraaf. The Anaerobic Digestion technology has been developed by BEKON. The Gasification technology is owned by Waste to Energy Canada.

Tech Rights: N/A

Bus Structure: Partnership with Van Dyk Baler/Bollegraf (VDBB), BEKON Energy Technologies (BEKON), and Waste-to-Energy Canada (WTEC)

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Borgstedt, Germany

Technology: BEKON Dry Anaerobic Digestion

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: 18,250 metric tpy

Actual Capacity: N/A

Feedstock: source separated household and yard wastes

Owner: AWRmbH and BEKON

Operator: AWRmbH

Size: N/A

Date Operational: November 2008

Still Operating: Yes

Facility Location: Erfurt Schwerborn, Germany

Technology: BEKON Dry Anaerobic Digestion

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: 40,000 metric tpy

Actual Capacity: N/A

Feedstock: source separated green and food waste

Owner: B&R Bioverwertung GmbH

Operator: B&R Bioverwertung GmbH

Size: N/A

Date Operational: November 2008

Still Operating: Yes

Optimum Design Capacity: 450 - 1,600 tpd

Optimum Feedstock: Mixed MSW, food waste (SSO or comingled with mixed MSW), green waste (SSO or comingled with mixed MSW), medical waste, other as specified above, biosolids

Optimum Area Required: approximately 7 acres for 600 tpd mixed MSW, approximately 10 acres for 800-1200 tpd mixed MSW, approximately 14 acres for 1200-1800 tpd mixed MSW

Optimum Diversion Percentage: 85%-90%, depending on feedstock composition and marketability of products

Optimum Marketable Products: Biogas and Syngas to Electricity, Compost, Recyclables

36. **Company Name:** NRG Energy, Inc.

Company Url: http://www.nrgenergy.com

Technology Name: Various

Type: Developer

Technology: Plasma Gasification

First Name: Robert

Last Name: Henry

Title: Senior Vice President, Business Operations

Phone: 609.524.4660

Fax: 609.524.4941

Email: bob.henry@nrgenergy.com

Street Address: 211 Carnegie Center

City: Princeton

State: NJ

Zip: 08540

Capacity Range: From <100 tpd to 1,500 tpd

Feedstock List: MSW, Industrial Waste, Construction and Demolition Wood, Wood Pallets, urban tree trimmings, scrap tires, agricultural waste, waste plastic, wastewater sludge

Company Specified Type: Various

Tech Description: Distributed cool plasma gasification technology, consisting of modular, scalable, and portable waste to electricity skids; Large scale plasma gasification system; and large scale biomass gasification system. Feedstock is inspected, sorted and sized to that degree appropriate to the feedstock, technology and application on a project specific basis. To the extent possible valuable materials (ferrous and non-ferrous metals, glass, plastics, etc.) are sorted, preserved or recovered. Feedstock enters the reactor vessel, typically at or near the top of the reactor, where it encounters extreme heat in a substoichiometric environment. The feedstock dissociates into smaller simpler molecular and elemental forms, especially CO and H2 forming synthesis gas. The synthesis gas is then cooled, cleaned and used to generate electric power or make liquid fuels.

Tech Rights: NRG would acquire project specific license agreements from AlterNRG, Westinghouse Plasma Corp, adaptiveARC, ICM, and other technology providers.

Bus Structure: NRG is a Fortune 500 company headquartered in Princeton, NJ. NRG owns and operates a diverse power generation portfolio (fossil fuel, wind, solar) providing more than 24,000 megawatts of generation capacity and including more than 2,150 megawatts of generation in the Western Region.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Utashinai, Japan

Technology: WPC Plasma Gasification

Energy Product: 8 MW of electricity (gross)

Commercial/Demo: Commercial

Design Capacity: 220 tpd MSW, or approx. 170 tpd of MSW w/auto shredder residue

Actual Capacity: N/A

Feedstock: MSW and auto shredder residue

Owner: Hitachi Metals

Operator: Hitachi Metals

Size: N/A

Date Operational: 2003

Still Operating: Yes

Facility Location: Mexico City

Technology: AdaptiveARC

Energy Product: Electricity

Commercial/Demo: Commercial

Design Capacity: 25 tpd

Actual Capacity: N/A

Feedstock: N/A

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 2011

Still Operating: Yes

Optimum Design Capacity: As little as 25 tpd (per module) for distributed gasification, and up to 1,500 tpd for central gasification project, in each case with feedstock processing to recover recyclables.

Optimum Feedstock: MSW

Optimum Area Required: As small as 0.5 acres, and as large as 10 acres.

Optimum Diversion Percentage: Estimated to be 95% or greater, depending on feedstock composition and marketability of products/residue.

Optimum Marketable Products: Syngas for thermal energy (steam), Syngas for thermal energy via STG, Syngas for electric energy via CT or generator engine, CHP, Elemental Sulfur (from syngas cleaning)

Optimum Additional Notes: Ideally, NRG would integrate the client's existing infrastructure (e.g., boiler, STG, HRSG, transfer station, tipping floor) to lower capital costs.

37. **Company Name:** Organic Waste Systems, Inc.

Company Url: http://www.ows.be

Technology Name: DRANCO

Type: Supplier

Technology: Anaerobic Digestion

First Name: Norma

Last Name: McDonald

Title: North American Sales Manager

Phone: (513) 535-6760

Fax: (513) 233-3395

Email: norma.mcdonald@ows.be

Street Address: 7155 Five Mile Road

City: Cincinnati

State: OH

Zip: 45230

Capacity Range: From <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Other (Manures)

Company Specified Type: DRANCO

Tech Description: Technology Description: DRANCO is a dry, continuous anaerobic digestion technology especially suited for the treatment of organics from municipal solid waste, especially combinations of food waste mixed with soiled paper products and green waste. The waste is minimally pretreated and fed into upright, silo-style, vertical plug-flow digesters. The waste moves down through the digester by gravity, with a retention time in the digester of 18-21 days. The patented system has no internal mixers or other internal moving parts, eliminating the need to open or periodically empty the digester. By maintaining a solids content in the digester of 22-40%, sedimentation and floating layers are avoided. Biogas production is maximized by high ratio external mixing of digestate with fresh feedstock (within a closed chamber) and operation at thermophilic temperatures (up to 131°F). OWS also offers the post-digestion SORDISEP® process, in which digestate from anaerobic digestion of organics coming from mixed waste is refined in a closed-loop, wet separation process to remove heavy inerts and light plastic fragments to produce high quality compost.

Tech Rights: DRANCO technology is protected with both US and international process and design patents, and OWS remains the owner of all rights to DRANCO technology.

Bus Structure: OWS is a privately held firm headquartered in Ghent, Belgium with US offices since 1992 in Ohio. OWS employs more than 70 people, more than half of which are engineers. OWS has had the same ownership and has been in continuous operation since its establishment in 1988.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: OWS has 25 commercial scale relevant reference facilities in operation and four more in construction and planning. Of these, ten are treating the mechanically separated organic fraction of municipal solid waste. The oldest (Bassum, Germany) has operated since 1997 and has a capacity of 14,850 tons per year. The largest (Wijster, the Netherlands) has operated since 2012 and has a capacity of 62,700 tons per year. For the two reference facilities detailed above, OWS provided engineering and construction of the DRANCO anaerobic digestion plant. The facilities can be visited to view the technology in operation, with advance coordination with the facility owners.

Facility Location: Leszno, Poland

Technology: DRANCO Anaerobic Digestion

Energy Product: Electricity (0.5 MW, using IC Reciprocating Engines)

Commercial/Demo: Commercial

Design Capacity: 177 tpd MSW (55,000 tpy) with a digestion capacity of 93 tpd (28,700 tpy) (one digester)

Actual Capacity: 177 tpd MSW (55,000 tpy) with a digestion capacity of 93 tpd (28,700 tpy) (one digester)

Feedstock: Mixed waste is received and processed to remove recyclables and contaminants. The separated organic fraction, about 52% by weight, is digested.

Owner: Hydrobudowa 9

Operator: Hydrobudowa 9

Size: Approximately 5 acres

Date Operational: 2010

Still Operating: Yes

Facility Location: Hille, Germany

Technology: DRANCO Anaerobic Digestion

Energy Product: Electricity (460 kW, using IC Reciprocating Engine) and 1.6 MMBtu/hr waste heat for wood drying

Commercial/Demo: Commercial

Design Capacity: 355 tpd MSW (88,000 tpy) with a digestion capacity of 135 tpd (41,900 tpy) (one digester)

Actual Capacity: 355 tpd MSW (88,000 tpy) with a digestion capacity of 171 tpd (52,920 tpy) (one digester)

Feedstock: The separated organic fraction from mechanical pretreatment of MSW

Owner: Public Private Partnership between the District of Minden-Lubbecke and the waste treatment company Tonsmeier of Porta Westfalica

Operator: Waste Disposal Centre GVoA mbH 7 Co. KG

Size: About 5 acres for the mechanical biological treatment area

Date Operational: June 2005

Still Operating: Yes

Optimum Design Capacity: 90,000 tpy plant receiving MSW with 45,000 tpy going to digestion; optimum capacities range from 37,500 tpy to 200,000 tpy (115 tpd to 645 tpd)

Optimum Feedstock: The DRANCO digester can accommodate a wide range of feedstocks without modification, in some cases as a single feedstock or as a combination of feedstocks: organic fraction from MSW (up to 100% of feedstock); source-separated food waste (up to 100%); source-separated green and yard waste (up to 95%); fats, oils and grease (FOG) (up to 25%); soiled papers in source separated organic waste (up to 50%); biosolids (up to 30%).

Optimum Area Required: 7 acres

Optimum Diversion Percentage: 55% (assumes inerts comingled with MSW are separated and require landfill disposal); actual diversion depends on composition of feedstock and marketability products (compost)

Optimum Marketable Products: Combined heat and power (approximately 1150 kW/hr of electricity and 4.6 MMBtu/hr heating value; or, 242 MCF/day of pipeline quality biomethane; or, compressed biomethane, approximately 1,860 gallons of diesel equivalent per day. Also produces compost.

Optimum Additional Notes: Site and project-specific factors will determine the ultimate economic viability of projects of any size. The lower end of the MSW input capacity shown above reflects the typical availability of smaller scale yet commercial equipment. The high end reflects assumed practical limits for waste aggregation and compost disposition. Neither end of the range represents a strict technical limitation of mechanical biological treatment technology using DRANCO. Digester sizes range from 3,300 tpy to 65,000 tpy for a single digester. Multiple digesters of the same or different sizes can be combined to meet project-specific requirements.

38. **Company Name:** Orgaworld International (Wet AD)

Company Url: http://www.orgaworld.nl

Technology Name: Wet Anaerobic Digestion

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Paul

Last Name: Oostelbos

Title: Director International Business Management

Phone: (519) 670-5970

Fax: +31 621 523 559

Email: p.oostelbos@orgaworld.nl

Street Address: PO Box 5076

City: 5201 GB 's-Hertogenbosch

State: Netherlands

Zip: N/A

Capacity Range: From 100 tpd to > 1,500 tpd

Feedstock List: Food Waste (including packaging material / excluding packaging material), Biosolids

Company Specified Type: Wet Anaerobic Digestion

Tech Description: Depending on how the food waste is collected, food waste is pre-processed by de-packing. The food waste is then treated by mesophilic wet anaerobic digesting process with biogas recovery, electricity and heat recovery. The digestate is treated through decanting followed by composting. Water is treated through a combination of aerobic water treatment (membrane technology) and anaerobic treatment with sulphur removal.

Tech Rights: Orgaworld designs, builds, (co)-owns and operates all of its facilities/technologies. Orgaworld owns, holds the appropriate agreements to market, develop, warranty, operate and maintain the technology for long term periods with Los Angeles County, California. Orgaworld owns and operates waste processing facilities in the Netherlands, UK, and Canada.

Bus Structure: Orgaworld is a 100% subsidiary of Shanks Group, Plc. Shanks is a European waste management company. With over 4,000 employees, Shanks has operations in Belgium, Canada, the Netherlands and the United Kingdom. The Group provides a range of recycling, energy recovery solutions and technologies to customers both in the public and private sectors. Orgaworld designs, builds, co-

owns and operates MBT facilities (including wet anaerobic digestion and waste stabilization) to process MSW and builds and operates wet and dry tunnel anaerobic digestion facilities, in-vessel tunnel composting, in-vessel aerated floor and open windrow composting facilities in order to treat source separated organics. Orgaworld and Shanks Group are further an integrated waste processing company rather than just an equipment supplier, and so design, own and operate their waste processing facilities. Further, Orgaworld and Shanks Group are directly responsible for sales and marketing of the products resulting from these facilities in the Netherlands, UK, and North America.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012), and Company submittal of updated RFEI response (August 2013)

Additional Notes: Reference facilities can be visited with at least one-week advance notices. The Greenmills Facility is a synergetic operation with the Simadan Group, which is one of Europe's largest used cooking oil collection companies. Simadan Group operates a biodiesel plant; it delivers wastewater and glycerin to Orgaworld and uses steam produced from the digestion process. The Greenmills AD facility is also connected to a Cargill juice plant by means of a 1.2-mile pipeline, which transfers sugar rich wastewater from Cargill to the AD plant for processing.

Facility Location: Greenmills Facility, Amsterdam, the Netherlands

Technology: Wet Anaerobic Digestion and ESGB Anaerobic Wastewater Reactor

Energy Product: 5.6 MWe and 5.6 MWth (3 combined heat and power systems)

Commercial/Demo: Commercial

Design Capacity: 400 tpd (120,000 tpy) (3 digester tanks)

Actual Capacity: 450 tpd (120,000 tpy)

Feedstock: food waste (from supermarkets, processing, grease, fats, and glycerin sludges) and industrial wastewater

Owner: Orgaworld Nederland BV

Operator: Orgaworld Nederland BV

Size: 3.7 acres

Date Operational: 2010

Still Operating: Yes

Facility Location: Cumbernauld, United Kingdom

Technology: Wet Anaerobic Digestion

Energy Product: 2.4 MWe (2 combined heat and power systems)

Commercial/Demo: Commercial

Design Capacity: 250 tpd (66,000 tpy) (2 digester tanks)

Actual Capacity: 250 tpd (66,000 tpy)

Feedstock: Supermarket food waste, food manufacturing and processing waste, grease, glycerin sludges, and fat

Owner: Energen Biogas Ltd (a joint venture with Shanks Waste Management Limited, a wholly owned subsidiary of Shanks Group Plc.)

Operator: Energen Biogas Ltd

Size: 4.87 acres

Date Operational: 2011

Still Operating: Yes

Optimum Design Capacity: 450-700 tpd (150,000-200,000 tpy) (2 or 3 digesters)

Optimum Feedstock: Source-separated organics, industrial/commercial/institutional waste, and/or biosolids (individually or in any combination)

Optimum Area Required: 10-20 acres

Optimum Diversion Percentage: Up to 100%, depending on feedstock composition and marketability of products (including the ability to re-use the light and heavy residue fractions removed during pre-processing).

Optimum Marketable Products: Biogas will be used to generate electricity and heat or can be upgraded for use in compressed natural gas vehicles or for use in industrial boilers or similar applications, or further refined to pipeline quality. Digestate can be composted and marketed as a fertilizer product. Packaging material removed from food waste (e.g., from supermarkets) may be used as refuse derived fuel for cement kilns, industrial boilers, and electricity generators, or otherwise would require disposal; heavy materials (stones, grit) removed during pre-processing may be reusable as landfill daily cover or otherwise would require disposal.

39. **Company Name:** Orgaworld International BV (Dry AD BIOCEL)

Company Url: http://www.orgaworld.nl

Technology Name: BIOCEL Dry Anaerobic Digestion

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Paul

Last Name: Oostelbos

Title: Director International Business Management

Phone: (519) 670-5970

Fax: +31 621 523 559

Email: p.oostelbos@orgaworld.nl

Street Address: 5076, 5201 GB 's-Hertogenbosch, the Netherlands

City: 5201 GB 's-Hertogenbosch

State: Netherlands

Zip: N/A

Capacity Range: From 100 tpd to 1,000 tpd

Feedstock List: Food Waste, Green Waste, Biosolids

Company Specified Type: BIOCEL Dry Anaerobic Digestion

Tech Description: The BIOCEL Dry Anaerobic Digestion process is a mesophilic batch process. The BIOCEL process is a world-class dry anaerobic tunnel digestion facility combined with tunnel composting. At the Biocel facility in Lelystad, The Netherlands, waste processing (contaminants included) occurs through use of anaerobic tunnels, followed by aerobic composting. After composting the material is screened to separate the contaminants from compost. Water is treated through an aerobic water treatment system (membrane).

Tech Rights: Orgaworld designs, builds, (co)-owns and operates all of its facilities/technologies. Orgaworld owns, holds the appropriate agreements to market, develop, warranty, operate and maintain the technology for long term periods with Los Angeles County, California. Orgaworld owns and operates waste processing facilities in the Netherlands, UK and Canada.

Bus Structure: Orgaworld is a 100% subsidiary of Shanks Group, Plc. Shanks is a European waste management company. With over 4,000 employees, Shanks has operations in Belgium, Canada, the Netherlands and the United Kingdom. The Group provides a range of recycling, energy recovery solutions and technologies to customers both in the public and private sectors. Orgaworld designs, builds, co-

owns and operates MBT facilities (including wet anaerobic digestion and waste stabilization) to process MSW and builds and operates wet and dry tunnel anaerobic digestion facilities, in-vessel tunnel composting, in-vessel aerated floor and open windrow composting facilities in order to treat source separated organics. Orgaworld and Shanks Group are further an integrated waste processing company rather than just an equipment supplier, and so design, own and operate their waste processing facilities. Further, Orgaworld and Shanks Group are directly responsible for sales and marketing of the products resulting from these facilities in the Netherlands, UK, and North America.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012), and Company submittal of updated RFEI response (August 2013)

Facility Location: Lelystad, the Netherlands

Technology: BIOCEL Dry Anaerobic Digestion

Energy Product: biogas, electricity

Commercial/Demo: Commercial

Design Capacity: 200 tpd

Actual Capacity: 180 tpd

Feedstock: food waste and Source Separated Organics

Owner: Orgaworld

Operator: Orgaworld

Size: 5 acres

Date Operational: 1999

Still Operating: Yes

Optimum Design Capacity: 380 tpd - 575 tpd

Optimum Feedstock: Food Waste, Green Waste, Biosolids

Optimum Area Required: 12-20 acres

Optimum Diversion Percentage: >90%, depending on feedstock composition and marketability of products.

Optimum Marketable Products: biogas, electricity, compost / fertilizers

40. **Company Name:** Orgaworld International BV (MBT OMRIN)

Company Url: http://www.orgaworld.nl

Technology Name: MBT-OMRIN

Type: Developer & Supplier

Technology: Other

First Name: Paul

Last Name: Oostelbos

Title: Director International Business Development

Phone: (519) 670-5970

Fax: +31 621 523 559

Email: p.oostelbos@orgaworld.nl

Street Address: PO Box 5076

City: 5201 GB 's-Hertogenbosch

State: Netherlands

Zip: N/A

Capacity Range: From >100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Biosolids, Other (Industrial, Commercial and Institutional Waste)

Company Specified Type: MBT-OMRIN

Tech Description: The OMRIN technology is able to separate MSW, including post-recycled municipal solid waste. The process consists of three distinct units that operate in series to separate the incoming material streams and to create the most valuable, re-saleable products. The units consist of a dry material recovery facility (MRF), a wet MRF, and an anaerobic digester. The incoming MSW is collected in bunkers and then fed into the dry MRF via a hopper to a combination of drum sieves, air sifting, and ferrous, nonferrous separators. These screen the material into an organics fraction, high calorific material (RDF), papers, plastics, ferrous and nonferrous material. The mixed plastics consequently are further processed into various product streams for sale to markets and the other recyclable materials are baled for sale. The organic fraction is fed to the wet MRF, which consists of a washing unit that separates the organics from contaminants and inert materials. The organic fraction (mixed with water) is then fed into the digesters for processing and the production of biogas. The inert material recovered from the organic fraction generally consists of stones and grit and these are sold to processors who re-use them as aggregates for concrete and asphalt. Wash water from the wet MRF is re-used in the system and then is added to the

anaerobic digester for processing. When excess water is accumulated it is processed through an aerobic membrane system. The digester produces fine and coarse digestate products that are dewatered and then composted with leaf and yard or green materials using windrows. The anaerobic digester produces methane gas which is collected and converted into electricity and heat, or it can be upgraded to compressed natural gas (CNG).

Tech Rights: Orgaworld proposes the use of OMRIN processing technology. The OMRIN technology has been implemented in a full commercial plant at SBI Friesland in the Netherland for over 10 years. The OMRIN facility is government owned; however, the facility was designed, built and further developed by OMRIN, who owns the technology used at the Facility. OMRIN entered into a partnership agreement with Orgaworld which entitles Orgaworld to use the OMRIN technology outside of the Netherlands. OMRIN is a partner of Orgaworld and will be fully involved in the design, construction and commissioning of new facilities.

Bus Structure: Orgaworld is a 100% subsidiary of Shanks Group, Plc. Shanks is a European waste management company. With over 4,000 employees, Shanks has operations in Belgium, Canada, the Netherlands and the United Kingdom. The Group provides a range of recycling, energy recovery solutions and technologies to customers both in the public and private sectors. Orgaworld designs, builds, co-owns and operates MBT facilities (including wet anaerobic digestion and waste stabilization) to process MSW and builds and operates wet and dry tunnel anaerobic digestion facilities, in-vessel tunnel composting, in-vessel aerated floor and open windrow composting facilities in order to treat source separated organics. Orgaworld and Shanks Group are further an integrated waste processing company rather than just an equipment supplier, and so design, own and operate their waste processing facilities. Further, Orgaworld and Shanks Group are directly responsible for sales and marketing of the products resulting from these facilities in the Netherlands, UK, and North America.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012), and Company submittal of updated RFEI response (August 2013)

Additional Notes: The reference facilities can be visited with one-week advance notice.

Facility Location: SBI OMRIN Facility, Friesland, the Netherlands

Technology: Mechanical Biological Treatment (MBT-OMRIN); dry MRF, wet MRF and wet Anaerobic Digestion

Energy Product: Electricity (5.8 MW) using 5 combined heat and power generators, and 108,000 tpy secondary derived fuels (sent to cement kilns and power plants for off-site power generation)

Commercial/Demo: Commercial

Design Capacity: 700 tpd (250,000 tpy) MSW; 600 tpd (135,000 tpy) AD

Actual Capacity: 700 tpd (240,000 tpy) MSW; 600 tpd (125,000 tpy) AD

Feedstock: MSW, green waste, organic waste, and industrial/commercial/institutional waste

Owner: Governmental Owned

Operator: OMRIN

Size: 11 acres

Date Operational: 2002

Still Operating: Yes

Facility Location: Cumbria County, United Kingdom

Technology: Mechanical Biological Treatment

Energy Product: Secondary derived fuels sent to cement kilns for off-site power generation

Commercial/Demo: Commercial

Design Capacity: 275 tpd (83,000 tpy)

Actual Capacity: 275 tpd (83,000 tpy)

Feedstock: Residual Household Waste (MSW)

Owner: Shanks Cumbria Ltd (a wholly owned subsidiary of Shanks Group, Plc)

Operator: Shanks Cumbria Ltd

Size: 8 acres

Date Operational: 2011

Still Operating: Yes

Optimum Design Capacity: 550-1000 tpd (200,000-300,000 tpy); can be built with multiple lines, but economy of scale with installation of a single line

Optimum Feedstock: MSW as the sole feedstock or in combination with source separated organics, green waste, and industrial/commercial/institutional waste as available.

Optimum Area Required: 10-20 acres

Optimum Diversion Percentage: Up to 100%, depending on feedstock composition and marketability of products (including the ability to market/reuse the RDF and inert fractions recovered from the waste)

Optimum Marketable Products: Recyclable materials (ferrous/non-ferrous metal and plastics), two RDF products (for use by cement manufacturers or local power generators), inerts (sand, grit, glass for use as an aggregate replacement or as

landfill daily cover material), biogas (converted to electricity and heat or upgrade for vehicles or in place of pipeline gas), and two digestate products.

Optimum Additional Notes: The proposed OMRIN process would consist of three processing units - a dry material recovery facility, a wet material recovery facility, and a wet anaerobic digestion facility, with the dry and wet MRFs operated at a slightly higher processing rate than the AD to ensure a continuous supply of organic feedstock to the digesters.

41. **Company Name:** Plasco Energy Group

Company Url: http://www.plascoenergygroup.com

Technology Name: Plasco Conversion System

Type: Developer & Supplier

Technology: Plasma Gasification

First Name: Steve

Last Name: Simmons

Title: Vice President, Project Development

Phone: 613.591.9438

Fax: 613.591.9442

Email: ssimmons@plascoenergygroup.com

Street Address: 1000 Innovation Drive, Suite 400

City: Ottawa

State: ON, Canada

Zip: N/A

Capacity Range: From 100 tpd to 1,000 tpd

Feedstock List: MSW, Food Waste, Green Waste, Agricultural Waste, Woody Biomass

Company Specified Type: Plasco Conversion System

Tech Description: The Plasco Conversion System has a modular design, with each module capable of processing up to 147 tpd of waste. Each module contains a three-part conversion unit (Conversion Chamber, Refinement Chamber and Carbon Recovery Vessel), a heat recovery system, and a gas quality control suite. Pre-processed waste (material separation and size reduction) is fed into the Conversion Chamber, where the feedstock is gasified. Solid residue from the Conversion Chamber discharges by gravity to the Carbon Recovery Vessel, where plasma is used to further gasify the carbon-based material and to create a molten slag from the remaining inert material. The raw syngas from the first two chambers flows into the Refining Chamber, which uses plasma to refine the syngas. The refined syngas is then cooled and cleaned and used to generate electricity. In addition to energy, the process yields other co-products including vitrified slag, reclaimed-quality water, and recovered metals.

Tech Rights: Plasco is the sole owner of the Plasco Plasma Arc Gasification Technology, which was invented, developed and patented by Plasco and its predecessor companies (RCL Plasma and Resorption Canada Limited).

Bus Structure: Plasco is an innovative energy technology company incorporated in the Province of Ontario, Canada. Plasco builds, owns and operates Plasco Conversion System facilities using its proprietary technology. Plasco would establish a special-purpose company for future projects, incorporated in the State of the project location.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Additional Notes: Plasco is also developing a 300 tpd commercial facility in Ottawa, Ontario, Canada. Operations are anticipated to commence in Q4 2013. Additionally, in January 2011, Plasco was selected to develop a 3-module facility at the Johnson Canyon Landfill in Salinas Valley, California. Permitting is underway.

Facility Location: Plasco Trail Road, Ottawa, Canada

Technology: Plasco Plasma Arc Gasification

Energy Product: N/A

Commercial/Demo: Commercial-Scale Demonstration Facility

Design Capacity: 110 tpd

Actual Capacity: permitted for 94 tpd

Feedstock: post-recycled MSW

Owner: Plasco Energy Group, Inc.

Operator: Plasco Energy Group, Inc.

Size: 3 acres

Date Operational: 2008

Still Operating: Yes

Optimum Design Capacity: 3 modules (441 tpd) to 5 modules (735 tpd)

Optimum Feedstock: post-recycled MSW

Optimum Area Required: 6-8 acres (3 module facility), excluding landscaping/buffer, 10-12 acres (5 module facility), excluding landscaping/buffer

Optimum Diversion Percentage: Approximately 95% depending on feedstock composition and marketability of products

Optimum Marketable Products: Syngas to Electricity (approx. net 17 MW for 3-module plant), Vitrified Slag, Recovered Metals, Reclaimed Water

42. **Company Name:** PowerHouse Energy LLC

Company Url: http://www.powerhouseenergy.net

Technology Name: Pyromex AG

Type: Developer & Supplier

Technology: Gasification

First Name: Kevin

Last Name: Butler

Title: VP Technology Development

Phone: (435) 830-2793

Fax: (435) 884-0105

Email: kbutler@powerhouseenergy.net

Street Address: 198 East Durfee

City: Grantsville

State: Utah

Zip: 84029

Capacity Range: <100 tpd to 500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other (Tires, Plastic and other feedstock with high calorific value)

Company Specified Type: Gasification

Tech Description: The Pyromex AG process is an ultra-high temperature gasification process, designed to operate on a continuous (not batch) basis. It consists of a modular, compact construction available in two standard sizes - approximately 5 tons per day, and approximately 25 tons per day. Standard waste pre-treatment equipment is used to sort, size and condition the waste material to be gasified. The prepared feedstock is introduced into one end of a slowly turning, horizontal reactor through a two-stage tank system using an auger (to ensure an oxygen free environment inside the reactor). Conversion takes place at temperatures generally ranging from 1100°C to 1400°C. The reactor uses electric rods as an indirect heating source. Syngas is collected and cleaned using a two-step scrubber system (quench/acid scrubber), for subsequent energy use. Residual ash is collected and marketed for commercial application (e.g., to cement and asphalt industries). Approximately 17% of produced syngas is used to power the Pyromex system.

Tech Rights: PowerHouse Energy LLC currently has a license agreement directly with Pyromex AG on an exclusive and non-exclusive basis.

Bus Structure: PowerHouse Energy is a manufacturer, vendor and developer of equipment and projects, with most of its work currently outside of the United States. PowerHouse Energy will Joint Venture with strategic partners or be the vendor to projects, as applicable. Services include long term service and maintenance, engineering services and construction.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The Eitting, Germany Pyromex reference facility typically operates 8am to 5pm Monday to Friday. As of August 2013, it had operated for a total of 4,380 hours and had processed 5,110 tons of feedstock. There are plans to expand the facility with the addition of another 25-tpd reactor and two G.E. Jenbacher 412 engines (for up to 3 MW of electricity to the grid). The facility can be visited, subject to Pyromex availability and advanced scheduling.

Facility Location: Eitting Germany

Technology: Pyromex UHT Gasifier

Energy Product: Electricity, biofuels (both demonstrated)

Commercial/Demo: Demonstration

Design Capacity: 25 tpd (8,250 tpy) (one 25-tpd unit)

Actual Capacity: 25 tpd (2,555 tpy)

Feedstock: Various feedstock demonstrated: MSW/RDF, wood waste, plastics, biosolids, tires, medical waste, chicken litter, green waste, dairy waste, petroleum sludge, sugar cane residue, all types of food waste

Owner: Pyromex AG

Operator: Pyromex AG

Size: 1-2 acres

Date Operational: June 2011

Still Operating: Yes

Optimum Design Capacity: 25-200 tpd (8,250-66,000 tpy) using up to eight 25-tpd Pyromex UHT gasification reactors; pre-processing using Vecoplan MRF/RDF equipment; post-processing using VUM two-step gas scrubber (quench/acid scrubber)

Optimum Feedstock: MSW/RDF, with an optimum feedstock of 100% plastics and paper (fluff) RDF after separating received MSW

Optimum Area Required: 5 acres, unless co-located with an existing transfer station to make use of existing infrastructure (2 acres)

Optimum Diversion Percentage: Up to 90% of prepared feedstock, in the situation that ash cannot be marketed for commercial application.

Optimum Marketable Products: Electricity, residual ash (to be marketed to a cement or asphalt company)

43. **Company Name:** Princeton Environmental Group

Company Url: http://www.princetonenvironmental.com

Technology Name: GB Solid Waste Dry Distillation Process (Gasification)

Type: Developer & Supplier

Technology: Gasification

First Name: Peter

Last Name: Tien

Title: President

Phone: 718.767.7271

Fax: 718.767.7287

Email: Peter.Tien@princetonenvironmental.com

Street Address: 14-58 154th Street

City: Whitestone

State: NY

Zip: 11357

Capacity Range: From <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Paper, Glass, Metal, Electronics, Plastics, Forest & Yard Waste, Lumber, Concrete, Bricks & Soil, Household Hazardous, Ash, Tires

Company Specified Type: GB Solid Waste Dry Distillation Process (Gasification)

Tech Description: Kinsei GB gasification is a heat conversion process with controlled oxygen converting bio masses from solid forms to gaseous forms with temperature and pressure controls. This heat conversion process engineering consists of four (4) stages of operaxztion; biomass gasification, ash reduction, flue gas oxidization, and flue gas filtration.

Tech Rights: Princeton is the exclusive license holder in North America for technology developed by Kinsei Sangyo Company of Takasaki, Japan.

Bus Structure: Princeton Environmental Group is a New York corporation.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Eisei Center, Okayama Prefecture, Japan

Technology: Gasification

Energy Product: Hot Water

Commercial/Demo: Commercial

Design Capacity: 40 tpd

Actual Capacity: 40 tpd

Feedstock: industrial waste, including medical waste

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 2003

Still Operating: Yes

Facility Location: Seiban Kankyo, Hyogo Prefecture, Japan

Technology: Gasification

Energy Product: Hot Air, Hot Water

Commercial/Demo: Commercial

Design Capacity: 30 tpd

Actual Capacity: 30 tpd

Feedstock: Industrial Waste (solid and liquid)

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 2005

Still Operating: Yes

Optimum Design Capacity: 250 tpd (Scale-ability: 2,500 tpd)

Optimum Feedstock: MSW (paper, plastics, glass, food waste, metal waste, textiles, carpet, household hazardous waste), special waste, medical and hospital waste, green waste, forest and yard waste, electronics, some C&D

Optimum Area Required: 4 acres (for equipment, storage, and logistics)

Optimum Diversion Percentage: Up to 97% depending on feedstock composition and marketability of products

Optimum Marketable Products: Syngas to Electricity

Optimum Additional Notes: The response to the RFEI included a note as follows: NOTE: This proposed facility is a comprehensive waste recovery and waste to

energy plant capable of working with feed stock directly from the tail end of the waste collection truck.

44. **Company Name:** Pyrogenesis Canada

Company Url: http://www.pyrogenesis.com

Technology Name: Plasma Resource Recovery System (PRRS)

Type: Supplier

Technology: Plasma Gasification

First Name: Tom

Last Name: Whitton

Title: Business Development Leader

Phone: +1 514-937-0002 x 280

Fax: +1 514-937-5757

Email: twhitton@pyrogenesis.com

Street Address: 1744 William Street, Suite 200

City: Montreal

State: Quebec, Canada

Zip: N/A

Capacity Range: From <100 tpd to 500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste

Company Specified Type: Plasma Resource Recovery System (PRRS)

Tech Description: The incoming feedstock is processed by removal of large unsuitable items and by shredding to the appropriate size. The prepared feedstock is fed into the plasma reactor by means of an enclosed screw feeder system. Within the plasma reactor, the feedstock is separated into an organic fraction (raw synthesis gas) and an inorganic fraction (molten metal and molten inert slag). The inorganic fraction flows to the bottom of the reactor, where it is removed. The metals are recycled, and the inert slag is removed from the reactor. The inert slag can either be formed into a solid ingot or formed into granules by water quenching. The raw synthesis gas is sent through a secondary gasification chamber, fired by a plasma torch. This step converts the complex molecules in the raw syngas into a syngas consisting of carbon monoxide and hydrogen. The syngas is used in a gas engine to generate electricity.

Tech Rights: Pyrogenesis Canada is the owner of the Plasma Resource Recovery System (PRRS) technology, maintaining patent rights to the technology in the USA. PCI also possess a license from the US government to commercialize a sub-section of the process.

Bus Structure: PyroGenesis Canada Inc (PCI) is a Canadian company based in Montreal. PCI stock trades under the symbol PYR on the TSX Venture Exchange. PCI is involved in the design, development, manufacture and commercialization of plasma waste to energy systems. PyroGenesis Canada's technologies have been developed over 15 years with an estimated investment of over $40 million dollars. PCI has a long-standing relationship with the US Navy along with a system in operation at a US Air Force base.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Hurlburt Field, Florida

Technology: Plasma Gasification

Energy Product: Electricity

Commercial/Demo: Demonstration

Design Capacity: 10.5 tonnes per day

Actual Capacity: 10.5 tonnes per day

Feedstock: MSW, industrial waste, medical waste

Owner: US Air Force Special Operations Command (AFSOC)

Operator: AFSOC (subcontracted to Pyrogenesis)

Size: 30,000 sq. ft. (0.7 acres)

Date Operational: December 2011

Still Operating: Yes

Optimum Design Capacity: 75 tpd

Optimum Feedstock: MSW, Food Waste, Green Waste

Optimum Area Required: "Bolt-on" to existing site = 1 acre Greenfield Site = 1.5 acres

Optimum Diversion Percentage: Near to 100% depending on waste composition and marketability of products

Optimum Marketable Products: Syngas to Electricity, metals, inert slag, waste heat

Optimum Additional Notes: The response to the RFEI states that the conceptual optimum project generates 1.1 MW of excess electricity when the gas engine is supplemented with additional electricity generation using a heat recovery system (Organic Rankine Cycle).

45. **Company Name:** ReCycled Refuse (RCR) International, Ltd.

Company Url: http://www.rcrinternational.com

Technology Name: RCR STAG Recursive Recycling System (Steam Treatment and Gasification)

Type: Developer & Supplier

Technology: Other

First Name: Paul

Last Name: McGuire

Title: Director

Phone: 520.850.3240

Fax: 440.866.6627

Email: Paul.McGuire@rcrinternational.com

Street Address: 2221 Suffron Hills Court

City: Henderson

State: NV

Zip: 89044

Capacity Range: From 100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Other

Company Specified Type: RCR STAG Recursive Recycling System (Steam Treatment and Gasification)

Tech Description: The RCR STAG System is a batch (90-minute) autoclave process that uses high-temperature, pressurized steam to sanitize and size-reduce unsorted MSW. Except for removal of oversized, bulky items, no pre-processing is required ahead of the STAG autoclave. After the sterilization process, the material is typically reduced in volume by up to approximately 85%. The condensate from the process is collected, clarified, filtered, and treated with reverse osmosis to remove pollutants, generating some water treatment residue requiring disposal. After sterilization, recyclable materials are removed and sorted (ferrous metals, non-ferrous metals, plastics, and glass). The remaining cellulosic fiber biomass enters a microwave to remove hydrocarbons and condense 70% as #4 heating oil and 30% non-condensable gases for electric generation followed by a carbon conversion system using steam reforming to convert carbon into hydrogen and carbon monoxide which can be used for liquid fuels or fuel cells. RCR also has a tire recycling process using the microwave to depolymerize the

tires into oil, carbon black steel and electricity. For C&D RCR has developed a micronize to reduced C&D into a powder for recycling with cement.

Tech Rights: RCR through a former subsidiary is the developer of the patented STAG steam (autoclave) process. RCR pairs the STAG system with commercially available mechanical processing/recycling systems and thermal conversion systems to form the RCR STAG Recursive Recycling System.

Bus Structure: RCR International is a Limited Liability Company founded in 1988 in Jersey, the U.K. Channel Islands. It is an environmental engineering company specializing in providing customers with recycling and reuse solutions. RCR Group, led by RCR International, includes several divisions and wholly owned subsidiaries operating in various industries including energy, engineering and technology development.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012)

Additional Notes: The South Wales plant was decommissioned in 2005 in order to design a capacity expansion from 80,000 tpy to 300,000 tpy. As of the date of the RFEI response, the expansion plans are ongoing under the guidance of the facility's ownership group.

Facility Location: Sheffield, England (sited at a transfer station, adjacent to an incinerator)

Technology: STAG Autoclave System

Energy Product: The cellulosic fiber was combusted in the City's existing incinerator adjacent to the facility.

Commercial/Demo: Demonstration

Design Capacity: N/A

Actual Capacity: N/A

Feedstock: MSW

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 1996-2000

Still Operating: No

Facility Location: Tythegston, South Wales

Technology: STAG Autoclave System

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: 80,000 metric tons per year

Actual Capacity: N/A

Feedstock: MSW

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 2000-2005

Still Operating: No

Optimum Design Capacity: MSW: 1500 tpd; Tires: 52.4, 80 tpd

Optimum Feedstock: MSW, Tires

Optimum Area Required: Minimum of 5-8 acres for STAG Recursive Recycling Plant; Approximately 20-30 acres for STAG biorefinery plant

Optimum Diversion Percentage: Approximately 98%, depending on waste composition and marketability of products

Optimum Marketable Products: Recyclables (Ferrous Metals; Non-Ferrous Metals; Glass; Plastic), Electricity (from gas produced), Steam, Heating Oil, Liquid Fuels

Optimum Additional Notes: For tires as a feedstock, larger units with multiple lines can also be manufactured.

46. **Company Name:** Renewable Energy Management, Inc. (REM) with ENTECH

Company Url: http://www.rem-energysolutions.com

Technology Name: ENTECH-WtGas-RES System

Type: Developer & Supplier

Technology: Gasification

First Name: Doug

Last Name: Starr

Title: Executive Vice President

Phone: 905.839.4766

Fax: 412.202.7965

Email: doug.starr@rem-energysolutions.com

Street Address: 1101 Kingston Rd., Suite 270

City: Pickering

State: Ontario

Zip: L1V

Capacity Range: From <100 tpd to 1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Industrial. Commercial and Institutional Waste, Pharmaceutical Waste, Quarantine Waste, Textile Waste

Company Specified Type: ENTECH-WtGas-RES System

Tech Description: The ENTECH-WtGas-RES System is a low temperature gasification process that operates within an oxygen deprived environment subjecting waste to temperatures of approximately 500 to 850°C up to 24 hours. Feedstock is pre-processed by removing recyclable materials, as applicable. The prepared feedstock is introduced into the first phase or Primary Cell of the system, which produces a syngas. The syngas is collected and transferred to the Thermal Reactor or Secondary Cell where it is fired at temperatures of 1,400°C or higher for the production of thermal energy. High temperatures are transferred to a heat recovery boiler for the production of high temperature/high pressure steam, which is used to drive a steam turbine for electrical generation or alternatively generates thermal energy for distribution and process utilization.

Tech Rights: ENTECH Renewable Energy Solutions (ENTECH) owns the Intellectual rights of the ENTECH-WtGas-RES System. Renewable Energy Management (REM) controls the Intellectual Property (IP) License of ENTECH for Canada, the United States and the Caribbean Territories.

Bus Structure: ENTECH is a privately owned Australian engineering company which offers the ENTECH-WtGas-RES System. REM is a project development company headquartered in Pickering, Ontario. The companies have formed the joint venture ENTECH REM. The business model for project development is Build, Own, Operate (BOO) working with strategic partners where applicable, as well as with the local community.

Data Source: Company participation in Los Angeles County Phase II Process, Company review of summary information (April 2012), and Company review and update of summary information (August 2013)

Additional Notes: REM cites over 150 facilities placed into commercial operation over the past 20 years surpassing a total of 16,000,000 operational hours and processing over 7,000,000 tons of waste. ENTECH REM's first project in Canada is under development. The project will be located in Ontario within the Municipality of Port Hope - Wesleyville (east of Toronto). The first-stage plan is to build a waste processing facility that can handle 200,000 tonnes per year, with future expansion up to 600,000 tonnes per year. The project will recycle metal, plastic, paper and glass; recover water for internal use; and initially generate approximately 15 MW of electricity for sale. The facility will produce an ash residue that is intended to be sold as aggregate or for other uses. The project is currently completing a required environmental screening review and working on a power purchase agreement.

Facility Location: Genting, Malaysia

Technology: ENTECH-WtGas-RESTM System

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: N/A

Actual Capacity: 22,254 tpy

Feedstock: MSW

Owner: Genting Corporation

Operator: Genting Corporation

Size: N/A

Date Operational: 1998

Still Operating: Yes

Facility Location: Bydgoszcz, Poland

Technology: ENTECH-WtGas-RESTM System

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: N/A

Actual Capacity: 996 tpy

Feedstock: Clinical and Hospital Waste

Owner: Centre for Oncology

Operator: Centre for Oncology

Size: N/A

Date Operational: 2005

Still Operating: Yes

Optimum Design Capacity: Design capacity takes into consideration the current volume of waste that is being generated as well as the forecasted growth plans for that jurisdiction.

Optimum Feedstock: Focus on MSW and Industrial/Commercial/Institutional Waste, but the system can process other types of waste streams.

Optimum Area Required: N/A

Optimum Diversion Percentage: Up to 100%, depending on feedstock composition and marketability of products.

Optimum Marketable Products: Recyclables, Electricity, Ash

Optimum Additional Notes: The system is modular in design and can be customized to meet the needs of the market for the short, medium and long term. REM believes that the most economically and environmentally sustainable solutions are achieved when waste processing facilities are placed close to where the majority of the waste is produced. This reduces transportation costs, fuel consumption and the carbon footprint associated with current collection and disposal methods.

47. **Company Name:** Resource Energy Development, Inc.

Company Url: http://www.resourceenergydevelopment.com

Technology Name: Concord Blue Tower Reformer Technology

Type: Developer & Supplier

Technology: Pyrolysis

First Name: David

Last Name: W. Muller

Title: Executive Vice President

Phone: 949.466.8274

Fax: 877.212.6664

Email: dmuller@resourceenergydevelopment.com

Street Address: 1077 E. Pacific Coast Highway, Suite 151

City: Seal Beach

State: CA

Zip: 90740

Capacity Range: From <100 tpd to 1,000 tpd

Feedstock List: MSW, Food Waste, Green Waste / Biomass, Biosolids, Medical Waste, Sewage Treatment Sludge, Virtually all organic materials

Company Specified Type: Concord Blue Tower Reformer Technology

Tech Description: The feedstock is shredded and dried following pre-processing which includes the removal of inert materials. The feedstock is introduced into the reactor vessel and the vessel is sealed. The interior of the vessel is heated to 550°C in the absence of oxygen, so no combustion/incineration takes place. The feedstock then goes through a gasification stage and the resultant gas is piped to a Reformer stage to remove any impurities. In the Reformer stage, steam cleanses the gases produced in the gasification process at a temperature of 950°C. The gas is cracked into a high-quality syngas, consisting of 50%-70% hydrogen and the balance made up of methane and smaller amounts of other combustible gases, plus negligible amounts of inert gases. The syngas is then released from the reformer for use as fuel to produce clean energy. The char material flows to the bottom of the reactor to the char/heat-carrier separator. The char is either moved from the thermal decomposition vessel and gasified in a second decomposition stage to produce additional syngas or collected for use as a soil recombinant to reconstitute the soil.

Tech Rights: Resource Energy Development (RED), Inc. is a licensed agent for Concord Blue Engineering, GmbH, Duesseldorf, Germany. RED has the rights to develop, market and operate the technology anywhere in the world there is a need. Concord Blue Engineering, GmbH, is the patent holder and manufacturer of the Concord Blue Reformer and RED and its customers are fully protected by these patent rights.

Bus Structure: RED is a licensed and authorized agent of Concord Blue Engineering, GmbH of Dusseldorf, Germany. The Company develops, owns, and operates the systems designed and engineered by Concord Blue.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Pune, India

Technology: Concord Blue System

Energy Product: Electricity

Commercial/Demo: Commercial

Design Capacity: 700 dry tons per day

Actual Capacity: 700 dry tons per day

Feedstock: MSW

Owner: Concord Blue Technology Ltd., Mumbai, India

Operator: Concord Blue Technology Ltd., Mumbai, India

Size: 2 acres

Date Operational: March 2012

Still Operating: Yes

Facility Location: Mahad, India

Technology: Concord Blue System

Energy Product: Electricity

Commercial/Demo: Commercial

Design Capacity: 75 dry tons per day

Actual Capacity: 75 dry tons per day

Feedstock: Pharmaceutical Hazardous Waste

Owner: Concord Blue Technology Ltd., Mumbai, India

Operator: Concord Blue Technology Ltd., Mumbai, India

Size: 1.5 acres

Date Operational: June 2011

Still Operating: Yes

Optimum Design Capacity: 800 to 1,000 tpd, Larger facilities if required

Optimum Feedstock: MSW, Biomass (green waste), food waste, virtually any organic waste

Optimum Area Required: 2 to 3 acres

Optimum Diversion Percentage: Over 90% depending on feedstock composition and marketability of products

Optimum Marketable Products: Syngas to Electricity

48. **Company Name:** Ros Roca Envirotec

Company Url: http://www.rosrocaenvirotec.com

Technology Name: Mechanical Biological Treatment of MSW and Anaerobic Digestion of Food Waste and other organic feedstocks

Type: Supplier

Technology: Other

First Name: Ian

Last Name: Handley

Title: Vice President USA Market

Phone: 941.201.9463

Fax: N/A

Email: ihandley@rosroca.com

Street Address: 1348 Fruitville Road, Suite 203

City: Sarasota

State: FL

Zip: 34236

Capacity Range: From 100 tpd to 1,000 tpd

Feedstock List: MSW, Food Waste, Other industrial and agricultural feedstocks such as manures and whey

Company Specified Type: Mechanical Biological Treatment of MSW and Anaerobic Digestion of Food Waste and other organic feedstocks

Tech Description: For the Mechanical Biological Treatment process, the mixed MSW is sorted to separate out the organic fraction from the recyclables (plastics, papers, metal). The recyclables are sent to a recycling plant. The residual is sent to a landfill. The organic fraction is anaerobically digested to produce biogas. For the Anaerobic Digestion process, the incoming material is pre-processed to open bags and to crush the material. The material is moved by screw conveyor to a mixing tank, where water is added to result in a slurry that is 10% solids. Inorganic contaminants are separated by sedimentation and wet screening. The slurry then passes through a drum screen, and to a buffer tank. The slurry is then heated and fed to the anaerobic digester, which is operated as a mesophilic digester. The AD process produces biogas and digestate. The digestate is dewatered and composted. Both liquid and solid fertilizer can also be produced by the use of Nutrient Recovery Technology which recovers nitrogen, phosphate and other nutrients which have commercial value.

Tech Rights: The technology is wholly owned by Ros Roca Envirotech.

Bus Structure: Ros Roca Envirotec is part of the Ros Roca Environment Group, which is jointly owned by the Ros Roca family and Deyna, which is a subsidiary of the Bank of Majorca.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Vienna Project - Simmering

Technology: Anaerobic Digestion

Energy Product: Biogas

Commercial/Demo: Commercial

Design Capacity: 34,000 tons per year

Actual Capacity: 17,000 tons per year

Feedstock: commercial food waste

Owner: City of Vienna

Operator: Magistratsabteilung MA 48

Size: 2.5 acres

Date Operational: 2007

Still Operating: Yes

Facility Location: MBT Facility: EcoPark 3 FCC Barcelona

Technology: Mechanical Biological Treatment

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: 260,000 tons per year

Actual Capacity: 260,000 tons per year

Feedstock: MSW

Owner: FCC

Operator: FCC

Size: 3 acres

Date Operational: 2006

Still Operating: Yes

Optimum Design Capacity: 1) AD: 60,000 to 80,000 tons per year, 2) MBT: 250,000 to 300,000 tons per year

Optimum Feedstock: 1) AD: food waste and industrial food processing waste, 2) MBT: MSW

Optimum Area Required: 1) AD: 2.5 acres, 2) MBT: 3.5 acres

Optimum Diversion Percentage: 65% to 85% depending on feedstock composition and marketability of products

Optimum Marketable Products: Biogas, Compost, Recyclables

Optimum Additional Notes: The diversion percentage also depends on the specification of the MBT pre-processing.

49. **Company Name:** Sierra Energy

Company Url: http://www.sierraenergycorp.com

Technology Name: FastOx Gasification

Type: Supplier

Technology: Gasification

First Name: Michael

Last Name: Hart

Title: CEO and President

Phone: (530) 759-9827 ext. 504

Fax: (530) 759-9872

Email: mhart@sierraenergycorp.com

Street Address: 221 1st Street

City: Davis

State: CA

Zip: 95616

Capacity Range: <100 tpd to >1,500 tpd

Feedstock List: MSW, Green Waste, Medical Waste, Other (Construction and Demolition Waste, Used Tires, Auto Shredder Residue)

Company Specified Type: FastOx Gasification

Tech Description: FastOx leverages the centuries-old blast furnace, as a scalable means to convert a wide range of waste streams into renewable energy. The gasifier can be scaled from 5 tpd to over 1,000 tpd in a single unit. Waste is fed into the top of the gasifier. Oxygen and steam are injected into the bottom of the gasifier. As waste descends inside the gasifier, it is broken down at the molecular level and recovered as the following products: syngas, which is used to create pure hydrogen and/or electricity, or refined into diesel or ethanol; inert stone/slag, created from the melting of glass and other inorganic materials in the waste feedstock, which is marketed for cement and other construction materials; and metals, which are recovered as a recycled, alloyed metal and sold for reuse.

Tech Rights: Sierra Energy is the owner and holds the rights and patents to the FastOx gasification technology without any restrictions.

Bus Structure: Sierra Energy specializes in the FastOx gasification technology, which it plans to license to projects all over the world. Sierra Railroad is the parent company of Sierra Energy.

Data Source: Company RFEI response to Los Angeles County (August 2013)

Additional Notes: The FastOx demonstration facility was located at the Renewable Energy Test Center at the McClellan Business Park, which is a location for a variety of technologies to demonstrate and develop. The FastOx demonstration facility was operated for the purpose of validating heat and mass balance models and therefore intermediary syngas fuel was generated (and flared) for the design of future systems producing renewable diesel substitute, hydrogen and electricity, with hydrogen expected to be the most economical. On July 1, 2013, the demonstration facility was closed to move the gasifier to an expanded commercial application at US Garrison Fort Hunter Liggett in Monterey County. The project is currently in the contracting, permitting and design phase; construction is expected to be completed in 2014.

Facility Location: Renewable Energy Test Center, McClellan, California

Technology: FastOx Gasifier

Energy Product: Syngas Fuel

Commercial/Demo: Demonstration

Design Capacity: 2 tpd (one unit)

Actual Capacity: 2-12 tpd

Feedstock: Synthetic MSW, tires, petcoke, biomass/woodchips, agricultural wastes, sterilized medical waste

Owner: Technikon LLC and Sierra Energy

Operator: Sierra Energy

Size: Approximately 0.5 acres

Date Operational: September 2009 - July 2013

Still Operating: No

Optimum Design Capacity: 50 tpd (14,600 tpy) (single gasifier)

Optimum Feedstock: non-recyclable commercial demolition debris

Optimum Area Required: 1 acre minimum; 3 acres preferred

Optimum Diversion Percentage: Goal to achieve 100% diversion; actual diversion rate would depend on composition and feedstock and marketability of products

Optimum Marketable Products: Electricity via hydrogen fuel cell; inert slag and metals

Optimum Additional Notes: This optimum project is identified as an opportunity for immediate project application of the FastOx gasification technology, with low-

risk scale-up. As the technology is proven commercially in the region, Sierra Energy expects larger-scale projects will follow.

50. **Company Name:** Strategic Management Group w/entec biogas USA

Company Url: http://www.entec-biogas.com

Technology Name: Anaerobic Digestion

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Kelly

Last Name: Sarber

Title: President

Phone: 760.613.8400

Fax: N/A

Email: kellysarber@hotmail.com

Street Address: 642 Margarita Avenue

City: Coronado

State: CA

Zip: 92118

Capacity Range: From <100 tpd to 500 tpd

Feedstock List: MSW, Food Waste, Biosolids

Company Specified Type: Anaerobic Digestion

Tech Description: The incoming material (food waste) is pumped into a tank, where it is mixed and heated to the mesophilic range. The heated material is then pumped to the anaerobic digester. The biogas is cleaned and may be used for electricity generation, natural gas supplement, or CNG. The digestate is dewatered and moved off site; the digestate may be composted or used as a soil additive. The dewatering liquid is stored and recycled back to the process if additional moisture is required.

Tech Rights: N/A

Bus Structure: entec biogas USA is the Venture Name for the partnership of Reynolds, Inc. and entec biogas GmbH. In general, Reynolds will act as the contract entity and provide construction services, while entec acts as the provider of technical knowledge, engineering oversight, and assistance in commissioning. The parent company of Reynolds, Inc. is Layne Christensen Company.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Benet, France

Technology: Anaerobic Digestion

Energy Product: biogas, electricity, heat

Commercial/Demo: Commercial

Design Capacity: 110 tpd

Actual Capacity: 70 tpd

Feedstock: food residues

Owner: SIFDDA Centre, Usine de Benet

Operator: SIFDDA Centre, Usine de Benet

Size: N/A

Date Operational: June 2010

Still Operating: Yes

Facility Location: Malchin, Germany

Technology: Anaerobic Digestion

Energy Product: N/A

Commercial/Demo: Commercial

Design Capacity: 140 tpd

Actual Capacity: 140 tpd

Feedstock: food residues

Owner: SARIA Refood GmbH

Operator: SARIA Refood GmbH

Size: N/A

Date Operational: 2008

Still Operating: Yes

Optimum Design Capacity: 125 to 275 tpd

Optimum Feedstock: source separated organic waste

Optimum Area Required: 2-4 acres

Optimum Diversion Percentage: 85% to 100%, depending on feedstock composition and marketability of products

Optimum Marketable Products: biogas, electricity, CNG, digestate

51. **Company Name:** Taylor Biomass Energy, LLC

Company Url: http://www.taylorbiomassenergy.com

Technology Name: Taylor Biomass Gasification Process

Type: Developer

Technology: Gasification

First Name: James

Last Name: W. Taylor, Jr.

Title: President & CEO

Phone: 845.457.4021 Ext 401

Fax: 845.457.1917

Email: jim.taylor@taylorbiomassenergy.com

Street Address: 336 Neelytown Road

City: Montgomery

State: NY

Zip: 12549

Capacity Range: From 100 tpd to 1,000 tpd

Feedstock List: MSW, Food Waste, Green Waste, Construction & Demolition Debris

Company Specified Type: Taylor Biomass Gasification Process

Tech Description: The Taylor Biomass Energy Biomass Fueled Power Generation Facility consists of three basic components: 1) A solid waste processing system that recovers recyclables and produces a processed gasification fuel from MSW, green waste, food waste, and other residual materials; 2) The Taylor Biomass Gasification Process; and 3) an integrated combined cycle power generation process. Within the gasification process, a circulating sand material is used to heat the incoming feedstock; no air or oxygen is added. The resulting syngas is conditioned internal to the gasification process in a unique gas conditioning reactor and further cleaned of particulate then used to generate final energy products (e.g., electricity). Solid residue in the form of char (unconverted materials) and the sand material are conveyed to a combustion reactor, where the char is combusted, and the sand material is reheated. The sand is conveyed back to the gasifier and the ash residue is collected for disposal

Tech Rights: Taylor Biomass Energy, LLC (TBE) is the patent holder of its Taylor Biomass Gasification Process (Patent application number 60/728,989).

Bus Structure: Taylor Biomass Energy would create a special purpose entity company as a Limited Liability Corporation (LLC) to build, own, and operate a facility. Taylor Biomass Energy's affiliate, Taylor Recycling Facility, LLC provides management and oversight of the waste sorting, separation and biomass fuel preparation functions. Taylor Recycling Facility, LLC has been in business since 1995 as a waste sorting and separation facility.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 23, 2012)

Additional Notes: Indirectly heated gasification technology, upon which the Taylor process is based, was previously piloted at Battelle in Columbus, OH at a capacity of 10 dry tons per day of biomass input on various feedstock including RDF and switchgrass. The Battelle technology was subsequently demonstrated at the McNeil generating station in Burlington, VT. The Taylor gas conditioning step was tested at pilot scale at the National Renewable Energy Laboratory in Golden, Colorado.

Facility Location: Montgomery, New York

Technology: Biomass Gasification

Energy Product: biogas, electricity

Commercial/Demo: Commercial

Design Capacity: 450 tpd of C&D waste, 500 tpd of MSW, 100 TPD of raw waste wood

Actual Capacity: N/A

Feedstock: MSW, C&D and Wood Waste

Owner: Taylor Biomass Energy

Operator: Taylor Biomass Energy

Size: 20 acres

Date Operational: currently under construction; expected completion 2013

Still Operating: currently under construction; expected completion 2013

Optimum Design Capacity: 1,000 tpd (raw input to facility); 340 tpd (dry basis to gasification, after pre-processing)

Optimum Feedstock: MSW and Green Waste

Optimum Area Required: Approximately 10 acres for baseline plant (additional acreage, as needed, for buffer and green zones)

Optimum Diversion Percentage: Approximately 80% depending on feedstock composition and marketability of products

Optimum Marketable Products: Recovered Recyclables (approx. 26% by weight incoming MSW), Syngas to electricity (approx. 20 MW net for export), Heat

52. **Company Name:** Technip USA, Inc.

Company Url: http://www.technip.com

Technology Name: Westinghouse Plasma Gasification Technology

Type: Supplier

Technology: Plasma Gasification

First Name: Poornima

Last Name: Sharma

Title: Vice President Process / Technology & Engineering

Phone: 909.447.3600

Fax: 909.447.3704

Email: psharma@technip.com

Street Address: 555 West Arrow Highway

City: Claremont

State: CA

Zip: 91711

Capacity Range: From <100 tpd to 1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste

Company Specified Type: Westinghouse Plasma Gasification Technology

Tech Description: The Westinghouse Plasma gasification technology was originally developed for foundry (metal-melting) applications in the 1980's, and subsequently was further developed for waste management applications. The Alter NRG Plasma Gasification System includes waste handling equipment, plasma gasification, followed by Technip's gas cooling and clean-up, and syngas management options. The plasma gasification reactor is a refractory-lined vessel, with plasma torches located around the periphery near the bottom of the reactor. Limited pre-treatment of feedstock is required but could include segregation and sorting of recyclables (typically metals and glass), shredding, and/or crushing as appropriate. Waste is fed into the reactor near or at the top; it begins to gasify as it falls onto a bed of coke heated by the plasma torches, where gasification is completed. Syngas exits the top of the reactor for clean-up and conversion to energy products. Inorganic materials that cannot be gasified are melted and flow out the bottom of the reactor as molten slag. The technology is scalable and modular.

Tech Rights: Alter NRG wholly owns the Westinghouse Plasma gasification technology. In October 2010, Technip USA entered into a collaboration agreement

with Alter NRG to market the Westinghouse Plasma Technology and provide design, engineering, and procurement services as well as overall performance guarantees, in conjunction with Alter NRG, to support project financing for plasma facilities. Technip USA has a corresponding agreement with BioGold Fuels Corporation to construct all of its Alternative Energy Centers.

Bus Structure: Technip Group provides services in the engineering and construction market. The Group is headquartered in France, with over 23,000 employees worldwide. It is a publc company listed on Euronext Paris (EURONEXT: FR0000131708). Technip USA has engineering centers in Claremont, CA and Houston, TX. The California office provides engineering, procurement and project execution with over 300 employees.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Utashinai, Japan

Technology: Plasma Gasification

Energy Product: Electricity

Commercial/Demo: Commercial

Design Capacity: 220 tpd MSW, 160 tpd MSW combined with auto shredder residue

Actual Capacity: N/A

Feedstock: MSW and auto shredder residue

Owner: Hitachi Metals

Operator: Hitachi Metals

Size: N/A

Date Operational: 2003

Still Operating: Yes

Facility Location: Nagpur, India

Technology: Plasma Gasification

Energy Product: Electricity (1.6 MW net to grid)

Commercial/Demo: Commercial

Design Capacity: 72 tonnes per day

Actual Capacity: N/A

Feedstock: Hazardous Waste and Industrial Waste

Owner: SMS Envocare, Ltd

Operator: SMS Envocare, Ltd

Size: N/A

Date Operational: 2010

Still Operating: Yes

Optimum Design Capacity: 1) 500-1,100 tpd MSW to Electricity via Combined Cycle; 2) 100 tpd MSW to Electricity via Rankine Cycle; 3) 150 tpd MSW to Electricity via Gas Engines

Optimum Feedstock: Municipal Solid Waste, Industrial / Medical Waste

Optimum Area Required: approximately 7 acres for 1,100 tpd MSW combined cycle project

Optimum Diversion Percentage: Approximately 91%, based on feedstock composition and assuming the slag is marketed for beneficial use. The diversion percentage can be increased to approximately 95% by shredding bulky items, recovering the metal, and processing the remaining components in the gasifier. The diversion percentage can be increased up to approximately 97% by re-processing (i.e., gasifying) some of the wastewater residues that are generated from the syngas cleanup process.

Optimum Marketable Products: Electricity (approx. 39 MW for 1,100 tpd MSW via combined cycle), Optional: Ethanol, Slag, Sulfur compounds (depends on syngas cleanup technology used)

53. **Company Name:** Terrabon and Waste Management of California

Company Url: http://www.terrabon.com

Technology Name: MixAlco

Type: Developer

Technology: Other

First Name: Gary

Last Name: Garverick

Title: Project Development Program Manager

Phone: 281.803.5960 ext. 122

Fax: 281.803.5972

Email: GGarverick@Terrabon.com

Street Address: 20329 State Highway 249, Suite 350

City: Houston

State: TX

Zip: 77070

Capacity Range: From >500 tpd to 1,000 tpd

Feedstock List: MSW, Food Waste, Green Waste

Company Specified Type: MixAlco

Tech Description: The MixAlco technology converts biomass into gasoline, diesel, and jet fuel. The technology includes the production of an organic salt bearing fermentation broth which is further processed to eliminate water, and the conversion of the resulting salts into ketones, which are distilled into fuels. The fermentation process is a biological process, carboxylic fermentation; it also produces a residue (undigested material) that requires landfill disposal or that could potentially be used as landfill daily cover or compost. The process which converts the ketones into biofuels is a conventional chemical process.

Tech Rights: Terrabon has exclusively licensed the MixAlco technology from Texas A&M University for over 15 years. This exclusive, world-wide license allows Terrabon to fully sublicense the technology on an exclusive or non-exclusive basis. This license gives Terrabon the right to market, develop, warrant and maintain the MixAlco technology. Terrabon also has the right to add to this license any discoveries, inventions and improvements to the MixAlco technology that the University may develop.

Bus Structure: The response to the RFEI was submitted jointly by Waste Management of California and Terrabon USA. Waste Management of California

is a subsidiary of Waste Management, Inc. and is the owner of Lancaster Landfill and Recycling Center in Lancaster, CA. Terrabon and its affiliates are technology development companies. Terrabon was founded in 1995 to fund biofuel research from Texas A&M University.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 27, 2012)

Facility Location: Bryan, Texas

Technology: MixAlco

Energy Product: gasoline, diesel, jet fuel

Commercial/Demo: Demonstration

Design Capacity: 5 dry tons per day of biomass

Actual Capacity: 2 dry tons per day

Feedstock: MSW, food, contaminated paper, green waste, sorghum

Owner: Terrabon Research Company, LLC

Operator: Terrabon Research Company, LLC

Size: N/A

Date Operational: July 2009

Still Operating: Yes

Facility Location: Commercial Facility (confidential)

Technology: MixAlco

Energy Product: gasoline (5.2 million gallons per year)

Commercial/Demo: Commercial

Design Capacity: 240 dry tons per day

Actual Capacity: under development; will be operational Q3, 2014

Feedstock: MSW, food waste, contaminated paper, green waste

Owner: TerraFuels, LLC

Operator: TerraFuels, LLC

Size: 10 acres

Date Operational: under development; will be operational Q3, 2014

Still Operating: under development; will be operational Q3, 2014

Optimum Design Capacity: 800 wet tons per day (240 dry tons per day)

Optimum Feedstock: Food Waste

Optimum Area Required: 10 acres (minimum), 25 acres (preferred; additional buffer and expansion capability)

Optimum Diversion Percentage: N/A

Optimum Marketable Products: Gasoline or Jet Fuel (approx. 5.2 million gallons per year)

54. **Company Name:** Urbaser

Company Url: http://www.urbaser.com

Technology Name: Valorga Dry Anaerobic Digestion Technology

Type: Supplier

Technology: Anaerobic Digestion

First Name: David

Last Name: Garcia de Herreros

Title: N/A

Phone: 818.274.3034

Fax: 818.274.3033

Email: dgarciah@urbaser.com

Street Address: 21550 Oxnard Street, 3rd Floor

City: Woodland Hills

State: CA

Zip: 91367

Capacity Range: From <100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Glycerin, Crop Waste

Company Specified Type: Valorga Dry Anaerobic Digestion Technology

Tech Description: The feedstock is pre-treated by diluting by adding water to achieve a dry solids content of 31% to 33%. The feedstock is mixed and heated by steam injection to raise the temperature of the material. A small amount of digested material is mixed with the feedstock to inoculate it with microorganisms. The prepared feedstock is introduced into the digester by means of a piston pump. The contents of the digester move through the digester as a plug flow. The digester contents are mixed by the injection of high-pressure biogas. A vertical inner wall within the digester prevents short-circuiting of the material within the digester. The biogas is removed from the digester, cleaned and compressed and sent to gas engines for electricity production. Digested material is removed by gravity and dewatered, and the digestate is composted.

Tech Rights: The Valorga AD Technology is an exclusive design from Valorga International, a subsidiary of Urbaser.

Bus Structure: Valorga International is a subsidiary of Urbaser.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Additional Notes: The capacity for the La Paloma facility is for the total MSW throughput to the facility. The capacity for the digesters, which receive post-processed organic fraction of MSW, is not specified.

Facility Location: La Paloma Facility, Madrid, Spain

Technology: Valorga Dry Anaerobic Digestion

Energy Product: Biogas

Commercial/Demo: Commercial

Design Capacity: 700 mtpd

Actual Capacity: 600 mtpd

Feedstock: post-processed organic fraction of MSW

Owner: Madrid City Council

Operator: Joint Venture of Urbaser, Vertresa, Sufi

Size: N/A

Date Operational: 2007

Still Operating: Yes

Facility Location: Saragossa, Spain

Technology: Valorga Dry Anaerobic Digestion

Energy Product: Biogas

Commercial/Demo: Commercial

Design Capacity: 95,000 tpy for the Valorga digesters

Actual Capacity: N/A

Feedstock: MSW and packaging waste

Owner: Saragossa City Council

Operator: UTE EBRO: Joint Venture between TECMED and VERTRESA (both are owned by Urbaser)

Size: N/A

Date Operational: 2007

Still Operating: Yes

Optimum Design Capacity: 90 tpd (one digester module)

Optimum Feedstock: food waste and green waste

Optimum Area Required: estimated 6 acres (it can be modified)

Optimum Diversion Percentage: Approximately 85% depending on feedstock composition and marketability of products.

Optimum Marketable Products: Biogas, Electricity, Compost

55. **Company Name:** Waste to Energy, LLC, in partnership with BioEnergy Development, LLC, BioEnergy Design, LLC and New Water Technology, LLC

Company Url: http://www.bioenergydesign.com

Technology Name: BED2 Conversion Technologies Biorefinery, Power, Power Storage and Leachate Purification

Type: Developer & Supplier

Technology: Pyrolysis

First Name: Greg

Last Name: Shipley

Title: CEO

Phone: 805.239.8714

Fax: 805.239.0517

Email: gregshipley@bioenergydesign.com

Street Address: 4004 Stags Leap Way

City: Paso Robles

State: CA

Zip: 93446

Capacity Range: From > 100 tpd to >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste, Agricultural Waste, Construction and Demolition Waste, Forest Waste

Company Specified Type: BED2 Conversion Technologies Biorefinery, Power, Power Storage and Leachate Purification

Tech Description: Pyrolysis pre-treatment, plasma arc polishing of syngas, liquid chemical, long-term storage of power and New Water Technology leachate purification.

Tech Rights: We control and/or have exclusive licensing rights for an entire suite of technologies: biological, biochemical and thermochemical for CT's and biorefinery plants. We also control and have exclusive licensing rights for the suite of water purification technologies.

Bus Structure: The team is a vertically integrated, CT solution with strategic partnerships. BED (BioEnergy Development, LLC) is the R&D arm that develops and owns Intellectual Property and develops the equipment to be used. BED2 (BioEnergy Design, LLC) is the engineering, procurement and construction arm that has exclusive licensing rights to all of the IP's/Proprietary Equipment and Processes. WTE (Waste to Energy, LLC) is the market development arm used for

municipal bids and company-owned or in partnerships with private feedstock sources. NWT (New Water Technology, LLC) is the water purification arm, that specializes in recycling water from process waste, leachate from landfills and oil production water. This structure allows us to either own/operate or contract for a turnkey operation owned/operated by the entity that controls the feedstock. All vertically integrated firms are under the same ownership.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (April 2012), and Company submittal of updated RFEI response (August 2013).

Additional Notes: Although the Oregon reference facility is a commercial facility, it is also used for demonstration purposes (e.g., to test new feedstock and for continued development). The Oregon facility can be visited to observe it in operation, subject to advance scheduling and with coordination to run any specific feedstock and/or conduct any specific testing (e.g., emissions, mass balance, energy balance, etc.).

Facility Location: Prineville, Oregon

Technology: Pyrolysis

Energy Product: Power at 2.66 MW (generated by thermal oxidizer to waste heat boiler to steam generator)

Commercial/Demo: Commercial and Demonstration

Design Capacity: 1 unit at 48 tpd (17,520 tpy)

Actual Capacity: 48 tpd (16,800 tpy)

Feedstock: Woodchips and carbon regeneration

Owner: ITC

Operator: R&R

Size: 1 acre

Date Operational: March 2013

Still Operating: Yes

Optimum Design Capacity: Phase I: 150 tpd; Phase II: 350 tpd; Phase III: 750 tpd; Phase IV: 1,000 - 4,000+ tpd

Optimum Feedstock: MSW, wood chips, green waste, C&D, agricultural waste and process waste, all carbon-based/post-cracked materials (plastics/rubber), leachate and process water.

Optimum Area Required: 3 acres under roof for every 4,000 tpd of feedstock (Phase IV); up to 50 acres for GHG mitigation through algae bioreactor.

Optimum Diversion Percentage: Depends on feedstock and marketability of products; 100% for pure woodchips and 90% for post-MRF MSW.

Optimum Marketable Products: Power, fuel, steam, biochar, chemicals (depending on feedstock)

Optimum Additional Notes: The optimum project would have phased development, with each phase increasing the scale of operation. The eventual goal is to have skid-mounted units to process in increments of 4,000 tpd.

56. **Company Name:** WSI Management, LLC

Company Url: http://www.wsimgt.com

Technology Name: WET Systems Technology

Type: Developer & Supplier

Technology: Other

First Name: John

Last Name: F. Horn

Title: Sr. Vice President, Engineering & Construction

Phone: 813.707.0778 Mobile: 863.512.2709

Fax: 813.849.0870

Email: jhorn@wsimgt.com

Street Address: P.O. Box 3749

City: Plant City

State: FL

Zip: 33563

Capacity Range: >1,500 tpd

Feedstock List: MSW, Food Waste, Green Waste, Biosolids, Medical Waste

Company Specified Type: WET Systems Technology

Tech Description: The WET System technology consists of a low pressure, low temperature process that uses an autoclave to cut, clean, and sterilize the MSW and other materials brought to the facility. After treating the waste with steam in an autoclave, the material is dried and processed through a trommel, to separate the cellulose materials from the other materials. Recyclables are then recovered, including metals, plastics and glass, as appropriate, and the remaining inert fraction (brick, stone, dirt, broken glass, etc.) is separated for potential use as landfill daily cover or fill, or for disposal. The cellulosic stream and, if not recovered for recycling, the plastics stream, are ground up and blended to produce a controlled RDF fuel, which is compressed into a cube and stored. These prepared fuel cubes are then processed in a pyrolysis unit or gasifier (not part of the patented WET System).

Tech Rights: WSI owns the patent and all licensing rights to the WET Systems technology. WSI has licensing agreements in several parts of the world including parts of the United States. At this time, WSI has not entered into any license agreements covering California, so this area would be retained by WSI as a corporate project and not be licensed to a third party at this time.

Bus Structure: WSI Management, LLC (WSI) is organized under the Laws of the State of Florida. It has been incorporated since 2001 with a subsequent name change from WET Systems, Inc. to its current name. WSI would typically approach a project from the perspective of providing the funding for engineering, construction, startup and operation of a facility. It would normally look to the municipality to provide a site, guaranteed tonnage, and assistance in obtaining a power purchase agreement and interconnection. WSI through negotiations would consider undertaking long term operating agreements.

Data Source: Company RFEI response to Los Angeles County (August 2011)

Additional Notes: A demonstration facility is under development in Hudson County, New Jersey, with MSW as a feedstock.

Facility Location: Washington Parish, Louisiana

Technology: WET Systems technology

Energy Product: N/A

Commercial/Demo: Demonstration

Design Capacity: 125 tpd

Actual Capacity: N/A

Feedstock: MSW

Owner: N/A

Operator: N/A

Size: N/A

Date Operational: 1993-1994

Still Operating: No

Optimum Design Capacity: 2,000 to 2,400 tpd

Optimum Feedstock: MSW, Food Waste, Green Waste, Bio-Solids (de-watered sludge)

Optimum Area Required: 12 to 15 acres (additional acreage preferred for increased buffer/green zone)

Optimum Diversion Percentage: Approximately 90%, depending on waste composition and ability to market products, and depending on technology used to generate electricity with fuel cubes

Optimum Marketable Products: Ferrous Metals, Non-Ferrous Metals, Potentially Other Recyclables (Plastic, Glass), Fuel Cubes from Cellulosic Materials, Electricity if WET System paired with Power Plant

57. **Company Name:** Zero Waste Energy

Company Url: http://www.zwenergy.com

Technology Name: Kompoferm Dry Anaerobic Digestion

Type: Developer & Supplier

Technology: Anaerobic Digestion

First Name: Dirk

Last Name: Dudgeon

Title: Vice President, Business Development

Phone: 925.279.0603

Fax: 925.385.0495

Email: Dirk@zwenergy.com

Street Address: 3470 Mt. Diablo Blvd., Suite A215

City: Lafayette

State: CA

Zip: 94549

Capacity Range: From <100 tpd to 500 tpd

Feedstock List: MSW, Food Waste, Green Waste

Company Specified Type: Kompoferm Dry Anaerobic Digestion

Tech Description: The Kompoferm Dry Anerobic Digestion Technology is a batch process. The feedstock is loaded into the digester and the air-tight door is sealed. First, fresh air is pumped into the digester through the in-floor aeration system, the microbiological activity self-heats the material to the appropriate temperature. This step lasts for approximately 24 hours. Next, the fresh air supply is shut off, thus creating anaerobic conditions. The organic waste is sprayed with percolate liquid which contains the mesophilic anaerobic organisms. The percolate liquid inoculates the organic material in the digester, is collected in the drains beneath the digester floor, and flows to a percolate storage tank, where the percolate liquid is heated and recirculated back to the digester. The digestion produces biogas, which is collected and stored. The batch digestion process lasts for about twenty-one days. After the digestion period, the liquid percolate sprinkling is stopped, and fresh air is pumped into the digester. When the digester has been safely ventilated, the digested material is removed for further composting.

Tech Rights: Kompoferm, a trademarked patented brand of German based Eggersmann Anlangenbau Corporation, is the exclusive anaerobic digestion technology provider to Zero Waste Energy. Zero Waste Energy is the exclusive

North American licensee of Eggersmann Anlangenbau (EAB) and the Kompoferm dry anaerobic digestion technology, marketed under the product names Kompoferm Plus, Kompoferm Plus AD + IVC and SmartFerm.

Bus Structure: ZWE and Kompoferm are directly involved in the design, construction and start-up phases of all Zero Waste Energy projects in North America. Under the long-term license agreement, EAB provides operating knowledge, technology enhancements and improvements for ZWE projects. Under a related Technical Services Agreement, EAB provides technical and engineering support as needed and guarantees all design work. Each project that is designed and built using the Kompoferm technology is specifically identified under the license and sub-licensed for such ongoing support. ZWE and EAB provide turnkey facility development services.

Data Source: Company RFEI response to Los Angeles County (August 2011), Company review of summary information (March 2012)

Facility Location: Nieheim, Germany

Technology: Kompoferm Dry Anaerobic Digestion

Energy Product: Electricity

Commercial/Demo: Commercial Facility and R&D Site

Design Capacity: 327 tpd; of which 2/3 is bypass volumes. 92 tpd to digester.

Actual Capacity: 327 tpd; of which 2/3 is bypass volumes. 92 tpd to digester.

Feedstock: source separated organics (brown bag waste)

Owner: Eggersmann

Operator: Eggersmann

Size: N/A

Date Operational: January 2007

Still Operating: Yes

Facility Location: San Jose, California (under development)

Technology: Kompoferm Dry Anaerobic Digestion

Energy Product: Electricity

Commercial/Demo: Commercial

Design Capacity: 315 tpd

Actual Capacity: under development; expected to commence operations in April 2013

Feedstock: Source Separated Food Waste and Green Waste

Owner: Zero Waste Energy Development (ZWED)

Operator: Zero Waste Energy Development (ZWED)

Size: N/A

Date Operational: under development; expected to commence operations in April 2013

Still Operating: under development; expected to commence operations in April 2013

Optimum Design Capacity: 40,000 tpy (140 tpd based on 5.5 days per week)

Optimum Feedstock: Approximately 60-70% green waste and 30-40% residential and commercial food waste

Optimum Area Required: 3 to 5 acres

Optimum Diversion Percentage: >80% depending on feedstock composition and marketability of products

Optimum Marketable Products: Biogas, Electricity, Compost