2015 CASA/CWEA Biosolids and Renewable Energy Seminar

Public-Private Partnerships for Mechanical/Biological Treatment (Wet Digestion) of Black-Bin Organics
A Lower Cost Alternative to Source Separation

- Renewable Electricity
- Renewable Natural Gas
- Renewable Transportation Fuel - CNG
- Landfill Diversion of Organics/Metal/Plastics
- Class A Liquid Fertilizers
- GHG / Carbon Destruction
Designed, built, owned and operated more clean onsite gas to energy plants than any independent power producer in the US.

- Executing Electric and Natural Gas Grid Interconnections
- Natural Gas Engines, Solar PV, MicroTurbines, Microgrids
- Highly Reliable ‘Cleaner Than Grid’ Power Located At Host Customer Site
- Power Plant Fleet Sale to ArcLight/John Hancock Insurance
- All Systems Installed Under Public Private Partnership (P3) Arrangements
RealEnergy P3 Developments

State of California Public Utilities Commission, San Francisco

California State Office Building, Oakland, CA

GE/Arden Beverly Hills, CA

KOR, Marina Del Rey, CA

Marriott Hotel Walton/SCS Advisors, Fremont, CA

Viceroy Hotel Santa Monica, CA
RealEnergy P3 Developments

Ensemble, Long Beach, CA

GE/Arden, San Diego, CA

RREEF, Carlsbad, CA

CommonWealth Partners
San Diego, CA

GE/Arden
Beverly Hills, CA

GE/Arden, Long Beach, CA
RealEnergy P3 Developments

- Tishman Speyer
  San Francisco, CA

- Bechtel
  San Francisco, CA

- Transwestern
  So. California and New Jersey

- Trammell Crow
  Torrance, CA
Real Energy is developing biogas resources, using organic waste to make renewable natural gas.

- Cheaper, Cleaner, Domestic and Abundant Fuel
- Constant, Safe, Reliable, Renewable, Baseload
- Proven with 6000+ Plants Operating in Europe

- Lowest Carbon Fuel
  - 80-150% Lower Carbon than Conventional Fuels
  - 50-100% Lower Carbon than Electric Vehicles
  - Lower than Cellulosic Ethanol

- Carbon Destruction / Renewable Fuel Credits
- Landfill Diversion
- Renewable Cooling/Heat/Power Serving Microgrids
- Local Jobs

- Sustainable and Organic Fertilizers
- Energy Security and Hedging
- A Better Environment

RealEnergy Projects:
Civic Center, SF
Lend Lease, SF
Marriott, Fremont
Elihu Harris Building, SF
What’s Changing

- **2000 – 2005** Over $1B invested in blue/brown/green bins, treatment, transfer stations and infrastructure to achieve a 50% landfill diversion

- **2016 – 2020** Over $2B will be invested to achieve new 2014 CalRecycle regulations that mandate further recycling to achieve a 75% landfill diversion

- German experience comes from their ‘landfill directive’ that began phasing out landfilling for plastics, metals and organics 14 years ago

- RealEnergy brings proven European process technologies - pre-permitted to operate in California landfills - recovering valuable materials swiftly and precisely
Organics Policy and Environmental Drivers

75% Landfill Diversion By 2020

- 49% of black bin trash is organic and will become methane gas
- 14% of black bin trash is recyclable plastic and metal
- 34% = the RealEnergy diversion goal – 84% total municipal diversion
- Get the organics/plastics/metals out of the black bin first, then use the RDF.
- New permit pathways (Programmatic EIR, CalRecycle/Water Board exemptions)

10% Lower Carbon Fuel Standard (LCFS)

- Requires oil companies to reduce carbon intensity of fuels 10% by 2020
- Over 100 firms have traded over $100M of carbon at up to $85/ton of GHG
- RealEnergy has oil company LCFS buyers.

Finalized Biomethane Pipeline Injection Standards

Organics Recycling Requirements under AB1826 and AB1594

CalRecycle Exclusion to POTW’s in Compliance with the SWRCB

1 Assembly Bill 341 Signed by Governor - [link]
2 California 2008 Statewide Waste Characterization Study - [link]
4 Air Resource Board Negative Carbon Fuel Pathways - [link]
5 Biomethane Rulemaking Process ot the California Public Utility Commission - [link]
We design, permit, supply, build, own & operate gas to energy plants

- Designed as envisioned by waste/energy regulatory agencies
- Privately financed, for-profit facilities, funding the technology
- Delivering infrastructure & stable financial returns to pension/insurance funds

Economic sustainability for host sites with public private partnerships

- No up front capital/risk requirements w/land lease – great for smaller agencies
- Contributing the permit and the land for a share of all revenue – shared upside
- Reducing energy costs and off-the-grid with renewable energy and Tesla storage
- Leveraged funding options including tax benefits and grants management
- Strategic planning through intensive, inclusive team design charrettes
- Eliminate management of Algae & Class B Biosolids (Class A Liquid Fertilizer)

Sustainability…

Economic
Environmental
Social
Energy
Food
Agriculture

RealEnergy Biogas Design Charrette Napa Valley – Clos Pegase Winery
RealEnergy will build an Organics Transfer Station

- At your transfer station or landfill (min. 1,000 tons/day MSW)
- 33% diversion from mixed ‘black bin’ MSW, to create biogas, to meet AB 939, 341, 1594 and 1826 requirements

RealEnergy will build a Regional Biogas Plant

- At your POTW or Industrial Site (min. 300 tons/day organics)
- For your Source Separated & Organic Transfer Station organics
- To fuel 200 trucks with Renewable CNG and fertilize 10,000 acres with Class A Liquid Fertilizer

Negotiated* Site Leases (P3 vs RFP)

- Sharing of Skills, Assets, Risks & Rewards for Public Good
- Focus on Life Cycle Cost/Benefit vs Lowest Capital Cost
- Option for Host/Landlord to Maintain
- Option for Host/Landlord to purchase after tax subsidies realized

* Under California Code – P3, sole source or lowest cost provider
Proven Wet Mechanical/Biologic Treatment (MBT)

- 244 installations processing municipal solid waste (MSW) today in Europe
- Measurable diversion – over 30% diversion credits

**Input:**
- 1000 tons/day of MSW

**Output:**
- 480 tons per day refuse derived fuel
- 300 tons/day of organics
  - 7000 diesel gallon equivalent CNG/day (200 trucks)
  - 6000 gallons 3-0-0 Class A liquid organic fertilizer (10,000 acres)
- 40 tons/day metals
- 180 tons per day refuse
Proven Organic Separation Technologies

At the Transfer Station or Landfill –

Shredding
    Mechanical Sorting
    Optical Sorting
    Organic Cleaning …

At the Biogas Plant or POTW –

Organic Cake Pulping
    Source Separated Organics (SSO) Depackaging and Pulping
    Organics Pressing
    Lights/Heavies Removals
    Wet Anaerobic Digestion
    Biogas Pipeline Injection
    Class A Fertilizer
Proven Organics Sorting Technologies

The Landfill Recovery
Five Step Process;

1) Mobile Tipping

2) Mobile Shredding
Proven Sorting Technologies

3) Mobile Mechanical Sorting

4) Mobile Optical X-Ray Sorting
High Performance Mixed Waste Processing
Proven Anaerobic Digestion Technology

Organic Pressing

Concrete Pumping Technology
Proven Anaerobic Digestion Technologies

- Design Experience
  - 17 Years
- Operating Experience
  - 14 Years
- Countries Served
  - 8 Countries
- Plant Uptime
  - 98%

Lights Skimmer

Heavies Scraper
Proven Liquid Fertilizer Production

RealLiquid Organic Fertilizer - Class A liquid fertilizer for drip

- Sustainable/Consistent Urea (Synthetic Nitrogen) Alternative
- Minimum 5% plant available nitrogen
- Fertilizer Applied Through Efficient Drip Irrigation Can Reduce N Applied by 50%
- Sold at the Price of Plant-Available Urea, but Includes N/P/K, Organics and Acids
- Utilizing cell lysis and/or pasteurization for pathogen kill
- Lowered water consumption
Napa Sanitation District

Enhanced Resource Recovery for the Community

- Municipal solid waste diversion from landfills
- Biosolids and algae conversion to Class A Fertilizer and local soil fertility
- County compliance with organic diversion laws AB341, 1594 & 1896
- County greenhouse gas baseline to below zero
- Delivering infrastructure & stable financial returns to pension/insurance funds

Economic Sustainability with P3 at the POTW

- No up front capital/risk requirements w/land lease – great for smaller agencies
- Contributing the permit and the land for a share of all revenue – shared upside
- Reducing energy costs and off-the-grid with renewable energy and Tesla storage
- Leveraged funding options including tax benefits and grants management
- Strategic planning through intensive, inclusive team design charrettes
- Eliminate management of Algae & Class B Biosolids (Class A Liquid Fertilizer)
Site Lease at Napa Sanitation District

Proposed Transaction Overview

Location: Napa Sanitation District
Project Size: 80,000 TPY Organics
Feedstock: Separated Organics from 275,000 TPY of MSW

Project Cost: $40M
Debt: $30M Tax Exempt Bonds
Equity: $10M

Revenues: $6M Tipping Fees
$4M CNG Fuel & Electricity
$4M Liquid Fertilizer
Site Lease - Southern California Industrial Site

Proposed Transaction Overview

Location: Confidential
Project Size: 240,000 TPY Organics
Feedstock: Separated Organics from 825,000 TPY of MSW

Project Cost: $120M
Debt: $90M Tax Exempt Bonds
Equity: $30M

Revenues: $18M Tipping Fees
$12M CNG Fuel & Electricity
$12M Liquid Fertilizer
California agencies came together to stimulate biogas development with streamlined permitting.

- CalRecycle
- Regional Water Quality Control Board

RealEnergy nominated design features from Biogas Wien as sustainable design.

Result:
Two completed California Programmatic Environmental Impact Reports from our multi-year Technical Advisory Groups (TAG’s) activities
Regional Biogas Plant Site Lease Terms

1. 20 year service term with landfill or POTW owner

2. Minimum 4 acre site, inside the facility permit area, on natural soil

3. RealEnergy pays all development and operating costs

4. Rent: 2% of all revenue

5. Minimum Flow of Organic Waste: 80,000 TPY - 300TPD Organic Transfer Station and Source Separated Organics (maximum 20% contaminants)

6. Option to Purchase – Biogas Plant and renewable CNG transportation fuel

7. Host will take up to 20 AC-FT/y of recycled water

6. Any host controlled biogas, and rights of way to RealEnergy;
   - will be contributed at no cost
   - at no infrastructure cost to host
   - biogas will be replaced with natural gas at no cost to host
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BioEnergy Developments ~ Primary Onsite Power ~ Microgrids ~ Carbon Negative