PROJECT SUMMARY

- Heartland Biogas has secured a contract with California-based Sacramento Municipal Utility District (SMUD) for the sale of 7,000 Decatherms per day of renewable natural biogas.

- The current project consists of Phase I - sale of 4,700 Decatherms of biogas per day. Phase II will proceed after securing of all local and State permits - total sale of 7,000 Decatherms per day.

- Development of Phase I will result in the construction and operation of the largest organic waste Anaerobic Digester (AD) project in North America; Construction and operation of Phase II will result in the largest AD project in the world.
MAIN PROJECT COMPONENTS

- Substrate and manure off-loading and storage area
  - Manure Pit w/dilution and mixing ability
  - Substrate Tanks (two) w/mixing ability
  - Dosing Tanks for proper mixing of manure and substrate before injecting into digesters

- 6 bio-reactors of 1.7 million gallons each
  - Main area where methane (renewable natural gas) is produced
  - Raw gas from active bio-reactors is produced

- Biogas upgrading system converts raw digester gas to pipeline quality gas
  - With natural biological Sulfur Scrubber
  - With DeOxo Unit for preparation of pipeline injection

- Solids separation system
  - State of the art Centrisis Centrifuge-2 units
  - Produces high value landscape solids material

- Covered Anaerobic Lagoon for finishing gas production
  - 8.2 million gallons

- liquid digestate (soil amendment) holding ponds
  - South Lagoon – 28.3 million gallons
  - North Lagoon – 14.5 million gallons
PROJECT STATUS:
CONSTRUCTION STATUS

All permits and approvals have been obtained for construction.

Construction Schedule:
• Limited Notice to Proceed: Issued July 1, 2013
• Final Notice to Proceed: Issued August 16, 2013
• Biogas Production: March 19, 2014 (covered lagoon)

Construction Status
• Project RNG Injection into CIG from CAL is occurring daily
• All storage ponds and covered lagoons have been completed
• Completing construction of ring walls for Tanks 1-6
• Substrate tank and dosing tank foundations have been completed
• Biogas Upgrading Systems delivered to site
• Separation building construction and systems installation initiated
COVERED ANAEROBIC LAGOON

Background includes Greelane Kanuka BUS, flare and South Lagoon
NORTH LAGOON UNDER CONSTRUCTION

Construction includes 60 mil HDPE, Geo-netting and 2nd 60 mil HDPE
CONSTRUCTION OF NORTH LAGOON

North Lagoon 14 MG
CONSTRUCTION OF TANKS 5 AND 6

Includes excavation of manure pit
FEEDSTOCK AND WATER USAGE

- Dairy Cow Manure
  - Source: Shelton Dairy and M&J Dairy
  - Volume: 114,000 gallons per day at 15% solids—does not include parlor water

- Substrate (all organic)
  - Source: Denver metro food waste, grease trap waste, meat packaging plant and other organic waste including DAF and organic sludge, off-spec food, low solids (liquid) food waste
  - Volume: 200,000 gallons per day at approximately 23% solids

- Dilution Water
  - Recycle effluent: 165,000 gallons per day
  - Fresh water use: 50,000 gallons per day

- Manure and water is pumped into manure pits for mixing and dilution

- Substrate is pumped into substrate tanks where dilution, chopping and mixing can occur as necessary

- Manure and Substrate are mixed together as appropriate for digestion in dosing tanks which feed to the 6 AD tanks (bio-reactors)
BIOGAS PRODUCTION AND BYPRODUCT USAGE

Biogas Production-Phase 1
• 4,800 SCFM of raw biogas produced per day
  • Biogas Upgrading System converts gas to pipeline quality gas which, after compression is injected into the Colorado Interstate Gas (CIG) pipeline.

Solids Production and Usage
• 450+ cubic yards Phase 1, 700+ cubic yards Phase 2 produced per day
  • To be finished through further composting on site
  • Marketed by a third party for high end soil amendment

Liquids Production and Usage
• 217,000 gallons per day
  • Stored in lagoons for up to 6 month storage
  • Marketed and used as a high N soil amendment for crop growth in region
PROJECT REGION

Town of La Salle
M&J Farm
Shelton Farm
Site
ENVIROMENTAL BENEFITS

E-Benefits
• Prevents methane emissions from landfilling waste and lagoon storage of manure
• Displaces fossil fuel use from electricity generation
• Displaces fossil fuel used from fertilizer application (digestate and solids are used for soil amendment)
• GHG offsets: 64,000 CO2E additionally, 624,000 CO2E captured as methane in digesters

Beneficial Byproducts
• Produces a valuable solids by-product
• Produces a valuable liquid digestate used for fertilizer/irrigation
• Reduces runoff problems from stockpiling wastes (manure).
• Reduces odors, Reduces pathogens

Energy Production
• The renewable natural biogas will produce roughly 42 MW’s of power (Phase 2)

Other
• Recycles N and P to soils in region of digester
• Digestate introduces healthy microbes to soils which improve soil quality and plant growth
• Reduces organic content of waste – results in reduction of solids and COD strength in byproduct (we have found by 80%)
PROJECT DEVELOPMENT CHALLENGES

- Project Financing

  - The Project Finance Capital markets continue to be concerned with,
    - Credit quality of feedstock providers
    - Large project design/construction experience
    - Large Project Operations and Maintenance experience
    - Performance guarantees and performance LD’s
    - Limited reference plant performance metrics
PROJECT DEVELOPMENT CHALLENGES

- **Project Construction**
  - Customized design/engineering solutions required for
    - Bio-reactors-tank design-tank geometry
    - Substrate receiving and pumping
    - Manure receiving and pumping
    - Biogas Upgrading System
    - Gas compression and pipeline compliance requirements
    - Liquid Digestate storage requirements
    - Regional weather factors affecting pumping of material, tank heating design, storage of material, efficient off-loading, etc
  
  - Limited large AD Project design and construction experience
  - Project performance guarantees based on RNG production
PROJECT DEVELOPMENT CHALLENGES

- Management of Liquid Digestate (LD)
  - The Heartland Biogas Project will produce over 200,000 GPD of Liquid Digestate. Management of this material is critical to Project viability.
    - Large AD Projects located in dry climate environments can implement programs to manage LD more effectively than wet climate environments
    - High N and P levels can limit field/crop application periods
    - High TDS can also affect land application
    - High ratio digesters require critical predictive modeling capabilities based on the defined substrate feedstocks.
    - Large AD Projects are always located in ag intensive regions that normally have legacy N and P problems and highly sensitive receptor metrics
    - LD Product labeling can have significant beneficial impact on subsequent use, application and value proposition.
    - Passive solutions -product management-storage-storage-storage
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