Prospects for Anaerobic Digestion in the U.S.

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Presented at the WTERT Bi-Annual Meeting
October 6, 2016
GBB  Quality – Value – Ethics – Results

• Established in 1980
• Solid Waste Management and Technology Consultants
• Helping Clients Turn Problems into Opportunities
GBB’s Waste Consulting Services

• Economic, technical and environmental reviews
• Procurements
• Due diligence third-party reviews
• Waste characterization and sourcing
• Process planning and conceptual designs
• Independent feasibility consultant
Outline

1. Anaerobic Digestion in the U.S.
2. Economics and Funding
3. Trends & Drivers
4. Prospects of AD in the U.S.
ANAEROBIC DIGESTION (AD) IN THE U.S.
Total number: 38
Stand Alone AD plants processing food waste: 18
Facilities and Market Leaders

- Privately financed, owned and operated
- Commercial food waste
- Organics from MSW
- Mixed with yard waste
• Established in 2006 in Cleveland, OH
• Initially European technology
• Integrated Anaerobic Digestion System (iADs)-patent pending technology developed at Ohio State University
• Over $150M in Executed Projects
  – 14 Operational Digesters (OH, NY, MA, ME)
  – Capacity to annually manage 700,000 tons of organic waste
• Municipal, Industrial & Agricultural Ads
• Mature US Supply Chain
US company based in Lafayette, CA

Dry Anaerobic Digestion licensee for:
- KompoFERM
- SmartFERM

Plants:
- Monterey Regional Waste Management District, Marina, CA
- Zero Waste Energy Development Co., San Jose, CA
- Blue Line Transfer/SSF Scavengers, South San Francisco, CA
- 3 plants under construction and development

South San Francisco, CA
San Jose, CA
by Hitachi Zosen INOVA

- One of the world leaders in AD
- Dry anaerobic digestion
- 75 plants around the world
- Plant under construction in San Luis Obispo County, CA
- 400 years of accumulated operating experience

Doha, Qatar

Kompogas® Digester

Botarell, Spain
Projects Under Development & Construction

Total: 26
Under Development: 16
Under Construction: 10

Yellow - Under development
Green - Under construction
Prince William County, VA

- Through RFP procured a build, finance, own, operate contract with Freestate Farms
- 80,000 tpy of organics facility includes:
  - Wet Anaerobic digestion
  - Aerated composting of digestate and yard waste
  - On-site greenhouses for growing organic food
  - Sale of high grade compost
- Start construction fall 2016, operational 2018
CR&R – Perris, CA

**EISENMANN**

- 500 tons per day of food and yard waste
- Expandable to 1,000 tpd
- Under construction, start up late 2016
- Methane to fuel waste collection trucks
Food Waste Management Regulations and Legislations

• State Level
  – California
  – Connecticut:
  – Massachusetts
  – Minnesota
  – Rhode Island:
  – Vermont

• Local Level
  – Austin, Texas
  – New York City, New York
  – San Francisco, California
  – Seattle, Washington
  – Washington, DC
ECONOMICS AND FUNDING
System Economics

• Tipping fees at operating plants:
  – $40-$100/ton
  – Cleaner the feedstock lower the tipping fee

• Capital expenses
  – Different for different types of AD
  – $300-$500 per installed annual ton of capacity

• Operating Expenses
  – 2-3% of the Capital Expenses per ton processed
Revenue Sources

- Electricity/ biogas sale
- Digestate/ fertilizer sale
- RINs
  - $0.90-$1.80/”gallon” (77,000 BTUs) for biogas>vehicle fuel
  - Types for biogas: D3 cellulosic advanced and D5 advanced
- Low Carbon Fuel Standard (LCFS), CA
  - Metric Tons of Carbon Dioxide equivalent (MTCO2e) avoided
  - $85-$100 per credit
- RECs (eligibility depends of the state)
  - $20/MWh – PJM value
- Production Tax Credit-
  - Section 45: Open/closed-loop Biomass (electricity)
    - 1.15 cents/kWh (x2 for closed loop)
Capital Funding

• Investment Tax Credit-
  – Section 45: Open/closed-loop Biomass (electricity)
    • 30% of qualifying property (capital costs)
  – H.R.5489 — Agriculture Environmental Stewardship Act of 2016 (non-electricity)
    • 30% ITC
  – Loan Guaranteed
  – Private investment sources
TRENDS & DRIVERS
Trends

• Growing interest in managing organic waste separately
• Higher recycling and diversion goals
• From private initiatives only to the public sector
• More world leading technology developers/vendors
• Legislative support
• Financial support
• Co-digestion at wastewater treatment plants
AD Project Drivers

• Tipping Fees
• Landfill Capacity
• Waste Stream
  – Quality and Quantity
  – Collection Method
• Marketability of Commodities
  – Biogas Use
  – Compost market
  – Fuel replacement economics
• Regulations
• Community and Political Influences
• Competitive Landscape
Circular Economy

Source: Ellen MacArthur Foundation
PROSPECTS OF AD IN THE U.S.
Significant Attention

• Biogas Opportunities Roadmap
  – By USDA, US-EPA, USDE- August 2014
  – Part of the White House Climate Action Plan- Strategy to Reduce Methane Emissions

• U.S. EPA Sustainable Materials Management Program Strategic Plan (2017-2022)
  – Develop infrastructure (composting and AD plants)
  – Promote opportunities across the entire food life cycle to reduce wasted food from landfills
  – Improve and standardize measurement of wasted food

• ReFED- Rethink Food Waste
  – A Roadmap to reduce U.S. food waste by 20%
  – Assessed Technical and Economic Impact of 27 Solutions
Significant Funding Opportunities

Amazon

Apple

Stern Brothers & Co.

Google green

Microsoft

STIFEL
Opinion of Future Trends

• Stand alone AD facilities
• AD facilities as part of Mechanical Biological Treatment Facilities or together with composting, MRF’s or WTE facilities
• As projects like Prince William County become reality the public sector will feel more comfortable and willing to accept more risk
• More experienced AD project developers
In Summary

• Bright future for the AD in the U.S:
  – AD technology is proven (moderate to low risk)
  – Vendors are known and experienced
  – Existing legislative support
  – Funding Sources available

• Business case is the key

• It is a game changer without significant system changes and fees increase
2-Days of high-value sessions providing actionable solutions and new insights into challenges faces by industry professionals

Optional half-day pre-conference workshop
“From Concept to Reality - Waste Conversion Project Implementation”

www.rewconference.com
Questions and comments?

Thank you!

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