Overview

- Pre-Project Considerations
- Landfill Biogas Recovery Modeling
- Landfill Biogas Collection System Design and Operation
- Energy Project Design and Operation
- Project Analyses
- Finding Project Developers
- Summary
Pre-Project Considerations

• Understand Project Scope
  - What is the Potential for Landfill Biogas Recovery?
  - What Type of Project Could be Developed?
  - Conduct Preliminary Technical and Economic Evaluations
  - Determine the Financial Roles of the Landfill Owner and Project Developer

• What is a Realistic Project Schedule?
• Understand Procurement Requirements
Landfill Biogas Recovery Potential

- Observation and Analysis of Landfill Operations
- Collection of Accurate Data
- Use of Landfill Biogas Modeling
  - Selection of Appropriate Model and Inputs Based on Landfill Characteristics
  - Close Scrutiny of Model Results via Comparison with Results from other Landfills (if possible)

- Development of Multi-Year Biogas Recovery Estimates
Biogas Recovery Modeling

- Biogas Recovery Estimates are Used for:
  - Developing System Design and Sizing Requirements
  - Evaluating Project Feasibility and Economics

- Modeling can be Challenging
  - May Result in a Large Source of Error in Evaluating Project System Requirements and Project Feasibility
  - Many Models Based on U.S. Waste Profiles
  - Unrealistic Biogas Recovery Projections can lead to Investment in Uneconomical Projects (or neglecting opportunities)
  - Average International LFG Project Performance = 49% (actual recovery / modeled recovery)
Biogas Collection System Design and Operation

- Required for Both Emission Reduction and Energy Generation Projects
- Consider Economics of Collection System Design
  - Maximize Biogas Recovery per Well
    - Wells in Deeper Areas
    - Wells in Areas of New Waste
  - Utilization of High-Density Polyethylene (HDPE) in Low-Pressure/Vacuum Applications
  - Anticipate Future Landfill Expansions
  - Evaluate Different Types of Collection System Designs
    - Individual Lateral per Well
    - Header System with Shorter Laterals to Wells
Collection System with Headers and Laterals
Energy Project Design and Operation

- Evaluate Project Options
  - Electricity, Direct-Use, Combined Heat/Power

- May be Limited by Location
  - No Industry near Landfill

- Evaluate Risks For Each Option
  - Carbon and Energy Market Stability
  - Accuracy of Project Assumptions and Costs

- Consider Phased Approach
  - Phase 1. Flaring (emission credits)
  - Phase 2. Energy Generation After Establishing Biogas Recovery
Project Financial Components

- Costs (capital and operating)
  - Biogas Collection, Treatment, and Flaring Systems
  - Monitoring Systems
  - Energy Generation Equipment
  - Debt Service
  - Taxes
  - Administrative

- Revenues
  - Emission Credits
  - Energy Sales
  - Green Tariffs/Certificates
  - Grants/Incentives
  - Low-Interest Loans
Project Evaluation

- Costs and Revenues Should be Calculated and Compared on a Year-by-Year Basis over the Expected Life of the Project
- Develop Financial Model for all Reasonable Project Options
- Compare Results to Determine Best Project Option
  - Annual Cash Flows
  - Net Present Value
  - Debt Coverage
  - Rate of Return
Finding Project Developers for Biogas Projects

- Consider Competitive Bidding Process
  - To Evaluate Multiple Offers

- Develop Tender
  - Project Overview
  - Information on Landfill
  - Available Reports and Analyses
  - Scope of Project
  - Anticipated Ownership Structure
  - Technical Requirements
  - Schedule Requirements
  - Qualifications of Bidder
  - Submittal Instructions/Administrative Requirements
  - Evaluation Criteria
Summary

- Evaluate Pre-Project Considerations
- Prepare Biogas Recovery Modeling With Care
- Develop Project Scenarios Based on Estimated Landfill Biogas Recovery and Utilization Options
- Conduct Preliminary Project Analyses
- Recognize the Importance of the Tender Process
For More Information…

www.globalmethane.org

- Tom Frankiewicz - U.S. EPA
  - frankiewicz.thomas@epa.gov
  - +1 202.343.9232

- Chad Leatherwood, P.E. – SCS Engineers
  - cleatherwood@scsengineers.com
  - +1 828.285.8951