

## 10. Group Discussion (English)



**Screening For Project Potential**

- Identify the goals of the project
- Screen the project for energy recovery potential
- Use modeling to estimate the landfill gas generation potential; based on the results:
  - Select the appropriate technology(s)
  - Identify the design criteria
  - Monitoring, operations and maintenance

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**Box D-1 Is a Project Right for Your Landfill?**

A. Is your landfill a municipal solid waste landfill?  
If not, you may encounter some additional issues in project development due to the presence of hazardous or non-hazardous waste in the landfill. Stop and consult an energy recovery expert.

B. Add your score for the next 3 questions:

Score	Points
200	100
100	50
50	25
< 50	10

1. How much waste is in your landfill?  
Yes = 0

2. Is your 10 acre at least 40 feet deep?  
Yes = 0

3. Is your landfill currently open? If yes, answer 200. If no, answer 500.  
(a) How much waste will be received in the next 10 years?  
For each 100,000 tons, score 5 points.  
(b) If closed < 1 year, enter 0.  
If closed 1 year, multiply score per acre above by 6, and add that amount back to the total.  
Total your answers to questions 1-3: \_\_\_\_\_

C. If your score is:  
 < 500: Your landfill is a good candidate for energy recovery (go to section D).  
 500-1000: Your landfill may be a good candidate for energy recovery, particularly if a factory or other energy user will invest in fuel derived at a nearby facility. Is the value of the landfill gas to Section D.  
 > 1000: Your landfill may not be a good candidate for conventional energy recovery systems. However, you may want to consider on-site or alternative uses for the landfill gas.

D. If your landfill is a good candidate, answer the following questions:  
 1. Are you now collecting gas at your landfill (other than from perimeter walls), or do you plan to do so soon for regulatory or other reasons? If yes, your landfill may be an excellent candidate for energy recovery.  
 2. (a) Is annual landfill gas less than or equal to 20,000 cu m per year?  
 (b) Is non-combustible and non-flammable waste more than 10% of the municipal waste or is it a large portion of that waste?  
 If yes to questions 2(a) or 2(b), your annual landfill gas production may be lower than otherwise expected. Your landfill may still be a strong candidate, but you may want to lower your estimated gas volume slightly during project design and evaluation.

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**Estimate LFG Quantity**

**Method A: Simple Approximation**

- Annual Landfill Gas Generation (cf) = 0.10 cf/lb x 2000 lb/ton x Waste-In-Place (tons)
- Example: A landfill with one million tons of waste in place:
  - Annual LFG (cf) = 1,000,000 tons x 0.10 cf/lb x 2000 lb/ton = 200,000,000 cf/y or ~550,000 cf/day
  - Note: Need to account for the uncertainty associated with this estimate. Use +/- 50%. Therefore, the annual LFG quantity is in a range of 275,000 to 825,000 cfd for this example.

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**Estimate LFG Quantity**

**Method B: First Order Decay Model**

$$LFG = 2 L_0 R (e^{-kc} - e^{-kt})$$

- LFG = Total amount of landfill gas generated in current year (cf)
- $L_0$  = Total methane generation potential of the waste (cf/lb)
- R = Average annual waste acceptance rate during active life (lb)
- k = Rate of methane generation (1/year)
- t = Time since landfill opened (years)
- c = Time since landfill closure (years)

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**Estimate LFG Quantity**

Default values for Method B

- k = rate factor yr<sup>-1</sup>
  - Dry 0.02; AP42 0.04; NSPS Wet 0.05; Bioreactor up to 0.70
- Lo = methane yield per unit of mass
  - 100 cu m/kg = 1.6 cu ft/lb
  - 170 cu m/kg = 2.6 cu ft/lb

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 **Estimate LFG Quantity**

Example for Method B

Landfill has been open for 25 years; still accepting waste; and average annual waste acceptance rate of 40,000 tons

- The first order decay model would yield a rough estimate of 310 million cubic feet of landfill gas per year, or about 850,000 cfd (using the NSPS k and L0 values).
- Note: Need to account for the uncertainty associated with this estimate. Use +/- 50%. Therefore, the annual LFG quantity is in a range of 425,000 to 1.3 million cfd for this example.

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 **Suggested Model Modifications for Chinese Landfills**


**Method A: Simple Approximation**  
Annual Landfill Gas Generation (cf) = 0.10 cf/lb x 2000 lb/ton x Waste-In-Place (tons)  
Use 0.02 for landfills in arid environments <25" rain/year  
Use 0.08 for landfills in wet environments >25" rain/year

Example: a landfill with one million tons of waste in place in a dry environment:

Annual LFG (cf) = 1,000,000 tons x 0.02 cf/lb x 2000 lb/ton = 40,000,000 cf/yr or ~110,000 cf/day or 76 SCFM

- Need to account for the uncertainty associated with this estimate. Use +/- 50%. Therefore, the annual LFG quantity is in a range of 55,000 to 165,000 cfd for this example.
- This modification is based on limited data from several Chinese landfills. More data is needed to improve modeling accuracy.

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 **Estimate LFG Quantity**

Default values for Method B

- k = rate factor yr<sup>-1</sup>
  - Chinese LF 0.03
  - No data was evaluated for wet landfills
- Lo = methane yield per unit of mass
  - Estimate based on other Chinese LF's
    - 64 cu m/kg = 1.0 cu ft/lb High Range
    - 0.7 cu ft/lb Low Range

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