Operating gas engines at landfill sites in new LFGTE countries

Drivers – Barriers
Commercial and Technical Success Factors

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GE Energy Jenbacher gas engines

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LFG to Energy - Future regions

30 countries with >10 MW mid term potential

Western Europe
FRA, ITA, ESP, GBR ...
450

(South)/ Eastern Europe/ RUS 550

USA, CAN
1,150

Near/Middle East
300

Latin America
600

South Africa
40

Total mid term potential in MW_{el} = ~4,000

China + Southeast Asia 650

South Korea
20

Australia
40

Rest of World 200

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Drivers & Barriers in new countries

Drivers
- Some well managed landfills (mostly in the capital/ bigger cities)
- First reference plants
- High share of biodegradables
- Incentives
  - Attractive/ supported feed in tariff
  - Utilities obliged to by renewable energy
- Carbon Trading (CDM, JI a.o.)
- Technology partners and financing schemes available

Barriers
- Landfill design and management not suitable for LFGTE
- Low feed-in tariffs (in case of coal-based energy supply e.g.)
- Changing political situation, municipalities own gas rights
- No regulations on environmental protection imposed
- Lengthy process of project preparation
  - Gas suction system not optimized
  - CDM, JI Bureaucracy
- Pilot projects relatively risky, practical financing at risk

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The amount and composition of the produced gas depends on a variety of factors ...

- **Landfill size**
  total size of the landfill

- **Waste composition**
  organic portion in MSW, VOSCs

- **Time**
  opening and closure of landfill

- **Water level**
  amount of leachate in the landfill body

- **Climate**
  temperature, wind, air pressure etc.

- **Emplacement**
  landfill structure, design, compression
Project margin LFGTE: Gas collection & flaring/utilization **NOT** mandatory

*all figures stated in US$ cent per kWh\textsubscript{el} and calculated for 60,000 operating hours (=7.5 years) of J320
Success factors for profitable LFGTE projects

• Try to reach project size >> 1MWel
• Thorough assessment of landfill condition and gas quality (gas curve, VOSCs, other impurities, leachate ...)
• Long-term planning of entire project
• Professional and flexible gas capturing system
• Strive for stable Power Purchase Agreement
• Further revenues from heating (CHP) or other

• Broad range of robust, light-weight containerized engines with high power density
• Engine, which can run full load with low LHV and varying gas qualities
• Ensure long-term service structure and contracts
Maximum exploitation of LFG energy value

Combustion limit LHV:

CH₄:CO₂ min. 1:1 ✓
CH₄/N₂ min. 28/72 ✓

- Special ignition system ...
- Spark plugs
- Piston heads
- Combustion chamber geometry

- LEANOX control system
- Fast Reaction of Gas Mixer
- Turbo charger bypass system
- Pre-defined operation modes

>> Installed capacity and engines operation always in line with varying gas volume and heating value
Life-cycle management is key

- For project operator LFGTE is not core business
- Maintaining the gas collection system is already a big challenge
- Site conditions and gas quality more challenging than in NG operation

>> Engine and auxiliary equipment needs to be synchronized and managed throughout life-cycle
LFGTE development in Turkey

History
After poor start with dumpsites in Bursa/Kemerburgaz Istanbul >> very successful reference site at Mamak LF, Ankara
From 2006 – 2010 orders for >50 units with total >70MW capacity: Istanbul LF, Gaziantep, Denizli, Adana, Sincan
planned: Bolu, Kayser, Samsun LF a.o.

Total LFGTE Capacity of Turkey ~150 MW

Success factors
• Some well managed landfills
• LFGTE lead by privatized companies
• Professional feasibility studies and other technical support
• Financially sound investors
• Distributor well trained in LFGTE
• Well connected distributor (municipality general contractor, consultants, financiers)
• Standardized engine type
• Flexible, well LFG proofed engines
• Applied local scope where useful
• High service capacity in Turkey
• Kyoto protocol ratification 2009 (CDM!)
LFGTE business in >30 countries worldwide

Installed base: total >1,400 units ~1,400 MWel

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Recent project Highlights in young LFGTE countries (not including 2010 orders from UKR, CHI, PHI ...)

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Where do you find information?

>> GE Jenbacher intranet - Webportal

https://information.jenbacher.com