Methane to Markets

Korea's Landfill Gas Experience: Lessons Learned and Opportunities for M2M

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Climate Technology Partnership
Overview

Objectives

- Transform markets so new landfill projects continually develop, and GHG reduction and other benefits are realized on a large scale
- Influence the international community's design of technology cooperation programs

Key activities

- Identify potential landfill projects
- Encourage partnerships between Korean & developed country companies to jointly pursue projects in Korea

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Landfill Gas (LFG) in South Korea

- Waste sector in Korea accounted for 38% of country's 2001 methane emissions
- Korea's rapid economic growth depends heavily on fossil fuels, 97% of which were imported in 2003
- Municipal solid waste is increasingly being viewed as a potential resource in South Korea
- 238 landfill sites in operation - many of which are small
- LFG projects in South Korea have the two-fold effect of addressing environmental issues as well as providing a domestic fuel source

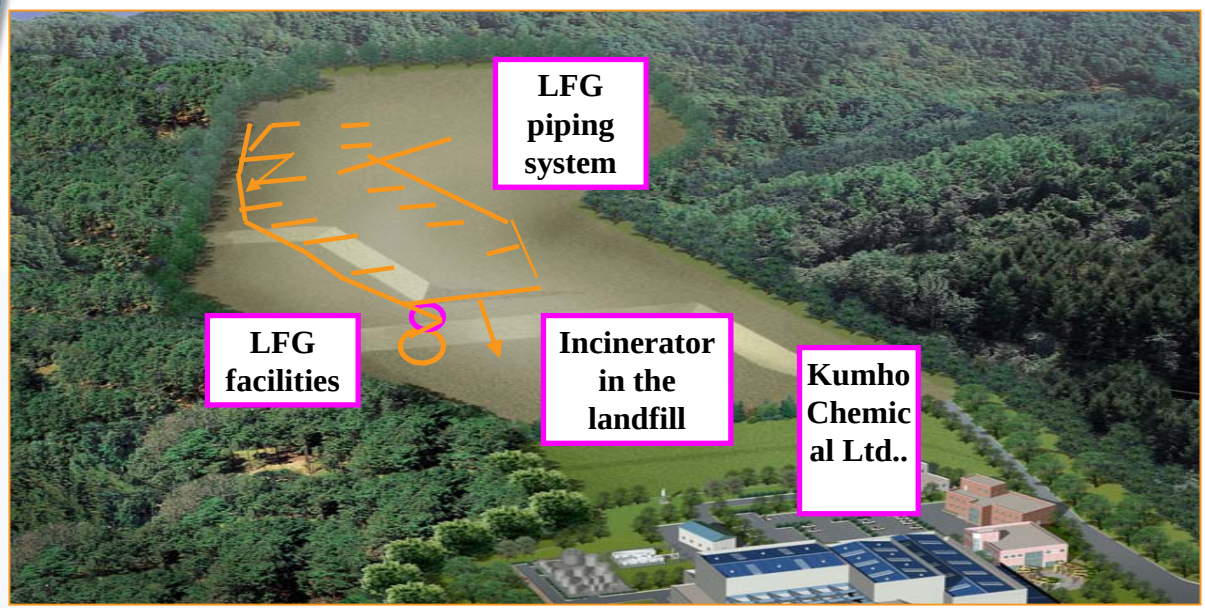
CTP Korea LFG Activity – Case Studies

Ulsan Landfill, City of Ulsan –

Pilot Project with direct use of recovered methane

SK Corporation selected by Ulsan to construct the facility and partnered with Danish consulting company that assisted with feasibility study & design

- Market value of methane gas supplied to the boiler estimated at US$3.4 million while construction and operating costs were US$3.9 million. Out years will raise value of methane gas to show profit.



- Emission reductions for the project were estimated at 84,000 metric tons per year with LFG production at 33 Nm3/hr
- The landfill has a total capacity of 4,255,000 cubic meters of volume. It had 2,297,000 cubic meters in place in 1999. It is expected to be closed in 2004

CTP Korea LFG Activity – Case Studies

- Megalo Landfill, Cheong ju province –

Feasibility Study *sponsored by US EPA Landfill Methane Outreach Partnership (LMOP) and Korean Energy Management Company (KEMCO)*

- Created a model for LFG project implementation that could be replicated for subsequent projects
- Consideration of emission reduction credits (ERCs) through the clean development mechanism (CDM)
- Opened in 1994, life expectancy: Dec. 2000, Capacity: 1.52 million tons (1.46 million tons in place by 1999)

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Best Practices as applied to Ulsan and Cheong ju

Best Practices	CTP Korea *LFG*	Ulsan	Cheong ju
Government assistance in publicizing potential projects	MOCIE designated KEMCO as the country 'champion' of LFG projects	Ulsan City officials were approached by KEMCO in regards to LFG projects – these interactions created the foundation for pursuing the project	KEMCO approached City of Cheong ju about doing a landfill gas project after identifying the city's landfills as prime candidates for LFG work
Government assistance with new developers and providing forum for trainings and building awareness	LFG workshops in Korea and funding for Korean representative to attend international conferences	SK Corp formed a relationship with consultant in Denmark after attending a conference in Korea in which both companies participated	KEMCO and EPA LMOP funded feasibility study
Revision of regulatory framework/ requirements	Overhaul of solid waste disposal and landfill management laws	Awareness increasing among landfill operators of environmental harms due to increased regulation	Vents for LFG already in place due to regulatory concerns that could be converted to capture LFG
Capacity building/ market transformation	Pilot projects and feasibility studies	Ulsan facility completed – successful pilot project	Feasibility study created replicable model
Financing mechanisms	KEMCO revolving fund ERCs through the CDM	Ulsan construction financed through revolving fund provided by KEMCO, technical assistance provided by NREL through CTP funding from US EPA & US AID	ERCs at US$4.00/ metric ton of CO_2 equivalent projected to make LFG recovery economical

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Case Studies –
Key Factors/Lessons Learned

- General
  - Active in-country 'champion' (KEMCO) of LFG work critical to initiating and implementing successful projects
  - Listing of full suite of benefits of LFG development is key to 'selling' projects
  - Models used for feasibility and other analysis should be adapted to Korea
  - Cooperation between many distinct groups essential to successful outcomes
- Ulsan (fully successful project)
  - Strong in-country partnership established with KEMCO
  - Availability of financing for City of Ulsan through the KEMCO revolving fund
  - Extensive collaboration with several organizations overcame barriers - shortage of qualified in-country technical assistance and regulatory hurdles
- Cheong ju (incomplete project)
  - Successful feasibility study showed promise for development
  - Extensive potential benefits of LFG projects documented
  - Complete analysis of requirements for ERCs through the CDM
  - City leaders decided not to proceed with project development

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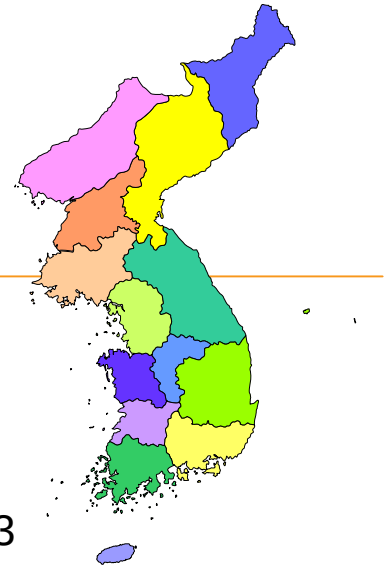
Current Status –
LFG projects in South Korea

- There are currently 17 LFG projects installed in Korea
  - 14 sites use captured gas to generate electricity
  - 4 sites supply the captured gas for direct use

    (total is 18 because one site generates electricity and supplies gas for direct use)
  - Chuncheon landfill site is converting 81 trucks to run on CNG produced from LFG (project supported by EMC)
- Total generating capacity of just over 80 MW
- Total emissions reductions of approximately 900,000 TCE of CO_2 & CH_4
- If CH_4 utilization is admitted as a CDM project, it is projected that benefits worth up to $6 million will occur for installed projects

Future outlook –
LFG projects in South Korea



- Seeking ways to create economic feasibility for smaller landfill sites with a capacity of 500,000-1,000,000 m^3 which account for 30-40% of Korean landfills
- Suggest steps be taken to better align MOCIE's and MOE's efforts in supporting LFG projects to strengthen each ministry's effectiveness by combining their resources
- Continued collaboration (including M2M & LMOP) needed to capitalize on benefits of LFG projects & further deepen market development