A Landfill Gas Generation and Recovery Model for the Central-Eastern Europe Region developed by the Global Methane Initiative

by Alexander Stege with Brent Dieleman of SCS Engineers and Thomas Frankiewicz, U.S. EPA ⁻ LMOP

An important component of LMOP's ongoing efforts to support international landfill gas (LFG) projects has been the development of country-specific LFG models under the Global Methane Initiative (GMI). Because they are designed specifically for individual countries, the GMI LFG models apply more appropriate assumptions and yield more accurate estimates of LFG generation and recovery than any other international LFG models currently available. These modeling tools also have helped to counter the historical trend of overestimating the amount of landfill methane emissions reduction achievable through international LFG projects.

Recently, GMI has modified its approach slightly to consider developing regional LFG models that serve multiple countries in a region with similar climate and landfill characteristics. This approach maintains the accuracy of the country-specific models by incorporating data from each country, but provides a more cost effective alternative to developing multiple country-specific models. In order to serve multiple countries, regional LFG models allow greater flexibility and control by the model user. This feature allows regional models to be used for countries outside of the original set of countries they were developed for, if conditions are within the range covered in the model.

In 2013, a new GMI LFG model was developed for the Central-Eastern Europe region, specifically for the following four countries: Serbia, Poland, Ukraine, and Bulgaria. The model was developed using detailed climate and waste composition data from locations throughout each of the countries. The structure of the model was based on the GMI-Colombia LFG Model, with notable improvements as well as modifications as appropriate for landfills in the Central-Eastern Europe region. In addition, site-specific information on conditions at several landfills in countries in the region was considered, including data gathered from visits to landfills in Serbia and Bosnia-Herzegovina.

Highlights of the GMI Central-Europe LFG Model include the following:

1. Main model features include spreadsheets for each of the following:
    a. Model users' inputs answering questions about the site that are used to develop default waste disposal, Methane Correction Factor (MCF), and collection efficiency estimates.
    b. Adjustments to default model disposal and collection efficiency estimates using site specific data.
    c. Assignment of waste composition based on location (default values) or user inputs with site-specific data.
    d. Output tables and graphs to show LFG generation and recovery projections, actual LFG recovery (if available), and model input assumptions.
2. Use of information on site conditions in each of the countries that was gathered by local researchers on the GMI-SCS team and from site visits to develop a set of user inputs,

default assumptions, and model calculations to capture the range of site conditions encountered at the region's landfills and their estimated effects on LFG generation and collection efficiency.

3. Incorporation of separate calculations for portions of the landfill to be developed with extraction wells. This is a critical step to help improve estimates of collection efficiency by allowing for estimates of LFG generation and recovery from portions of the landfill suitable for development only, and excluding areas with poor LFG recovery potential due to shallow waste, steep slopes, old waste, limited soil cover, etc.

4. Model flexibility and universality for wider application to other countries in the Central-Eastern Europe region besides the four countries used to develop the model. This feature makes the regional model useable for evaluating the feasibility of LFG projects in countries such as Slovenia, Hungary, Romania, Slovakia, Belarus, Moldova, Croatia, Montenegro, Bosnia-Herzegovina, Albania, Macedonia, Greece, and Turkey.

The Central-Eastern Europe LFG Model has been used to prepare an assessment of the LFG project potential of the Vinca Landfill in Belgrade, Serbia (see Figure 1). Preliminary results of its use for assessing a landfill in Turkey with an active LFG collection system and flow data appear to confirm the model's applicability for landfills in other Central-Eastern European countries.
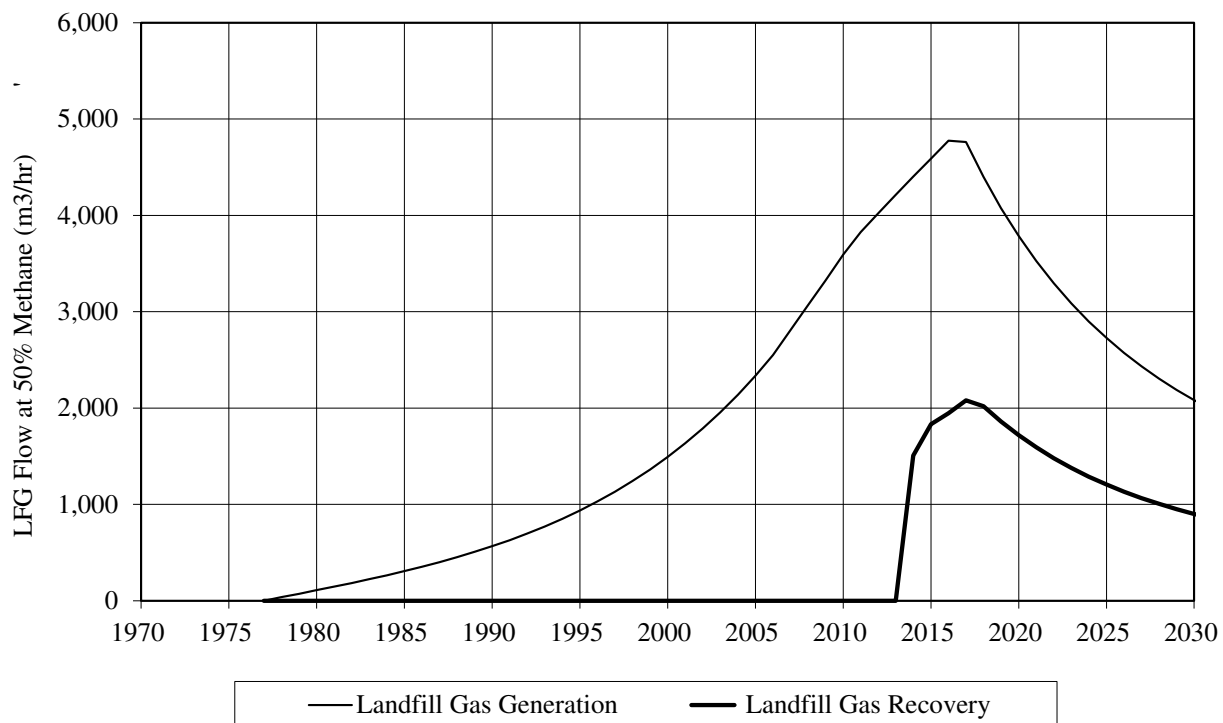

Figure 1. Landfill Gas Generation and Recovery Projections
Vinca Landfill, Belgrade, Serbia