

# Small Landfills— Big Re-development Opportunities

By Jim Michelsen

Smaller closed landfills (30 to 100 acres), present redevelopment opportunity for recreational, residential, institutional, and commercial uses due to their location. In addition these sites may qualify for greenhouse gas (GHG) reduction aspects and brownfield redevelopment aspects with Leadership in Energy and Environmental Design (LEED) programs.

Historically, smaller landfills have not had the same level of attention and opportunities as larger landfills to develop projects that use the energy contained in landfill gas (LFG). With the emergence of climate change, and with the way voluntary control of LFG can contribute to GHG reductions, smaller public and private landfills suddenly have new development options. Because the smaller landfills are typically not required to collect LFG, they can claim that any collection efforts for the purpose of GHG emissions reductions are truly voluntary and thus “additional.”

There are a host of options available at smaller landfills in the U.S. for voluntary GHG reduction projects. A landfill produces GHG reduction credits by gas collection and destruction (flare) system that is not otherwise required by law or by “business as usual.” Such credits have value on the voluntary market now in the U.S., and may have even greater value under a mandatory “cap-and-trade” programs at the state, regional or potentially national level.

The U.S. voluntary market can be classified into two major market segments: the Chicago Climate Exchange (CCX) and the Over the Counter (OTC) market. To date, most, if not all U.S. carbon transactions have taken place in the voluntary markets, with 65 million tons of carbon dioxide equivalent (CO<sub>2</sub>e) transacted in 2007, almost 300% increase over 2006 levels. Of the 65 million tons CO<sub>2</sub>e transacted, the OTC market accounted for about 42.1 million tons and the CCX accounted for the remaining 22.9 million tons. [K.

CCX/OTC	
Advantages	Disadvantages
<ul style="list-style-type: none"> <li>✓ Transparent Internet-based trading platform for CFI® contracts.</li> <li>✓ Relatively easy process</li> <li>✓ Older GHG credit “vintages: have high value.</li> <li>✓ Earliest in-service date for a LFG collection system (Jan. 1999)</li> <li>✓ Flexible, relatively easy due diligence and verification process.</li> <li>✓ Potentially higher prices paid for credits, depending on standard.</li> <li>✓ Lower transaction costs.</li> <li>✓ No requirements of seller to reduce GHG emissions footprint.</li> <li>✓ Can sell GHG credits forward.</li> <li>✓ Carbon Asset Developers will provide investment capital.</li> </ul>	<ul style="list-style-type: none"> <li>✓ May require a contractual obligation to reduce GHG emissions.</li> <li>✓ Lack of transparency of the CFI® and its underlying asset. CFI®s are a commodity.</li> <li>✓ High membership and transaction costs.</li> <li>✓ Potentially lower pricing when compared to OTC.</li> <li>✓ Cannot sell forward w/o GHG reduction obligations.</li> <li>✓ Lack of transparency of the OTC market transactions. No clear market price.</li> <li>✓ Lack of standardization, leading to unique GHG credits (VERs) and pricing.</li> <li>✓ Older vintage GHG credits have lower value.</li> <li>✓ Public entities may require outside assistance or competitive procurement process.</li> </ul>

Hamilton, M. Sjardin, T. Marcello, G. Xu, “State of the Voluntary Carbon Markets 2008”].

Voluntary markets typically trade in units called Verified Emissions Reductions (VERs), which are metric tons of CO<sub>2</sub>e. Voluntary markets use multiple standards (protocols) for qualifying or measuring credits, and GHG credits derived under different standards may have fundamental differences (e.g. eligibility of the project, monitoring and verification requirements, price).

## How Markets regard LFG Projects

Landfills generate LFG during the decomposition of organic material and the LFG can have a methane concentration of 50% or more. Methane is a potent GHG, much more so than CO<sub>2</sub>. Therefore, the

collection and destruction of LFG provides GHG reductions to the market. The basis of trade for GHG markets is known as the carbon dioxide equivalent (CO<sub>2</sub>e) and projects that result in reductions of non-CO<sub>2</sub> GHG’s are converted to CO<sub>2</sub>e via the use of a global warming potential (GWP).

Although the International Panel on Climate Change (IPCC) recently concluded that methane is 23 times more potent of a GHG than CO<sub>2</sub>, most GHG markets use the previous IPCC methane GWP determination of 21. Therefore, for each ton of methane destroyed by a LFG project, an equivalent of 21 tones of CO<sub>2</sub>e is reduced. Because it is relatively easy to measure actual reductions in methane emissions from landfills, these sorts of projects are considered high quality GHG emission reduction projects.

The markets favor landfill projects where a valid argument that the GHG reduction credits generated by landfill gas are indeed additional. Additionality was defined by Clean Air Cool Planet as follows:

“Emissions reductions are ‘additional’ if they occur because of the incentives associated with the existence of GHG markets. A variety of additionality “tests” have been proposed, but at its root demonstrating additionality means showing that the emissions reductions being used as offsets are not “business as usual,” the concept being that without the development of the GHG project, these reductions in GHG would not have otherwise occurred.” [*Clean Air Cool Planet, “A Consumers Guide to Retail Carbon Offset Providers,” December 2006.*]

## Voluntary Market Opportunities

The CCX and OTC are two options to consider for buying and selling credits:

- The CCX, the most visible voluntary market in the U.S., functions as its own “regulated” market, where members make a voluntary but legally-binding commitment to annual GHG emission reductions. Those members who reduce below the commitments have surplus GHG emission credits to sell or bank, while those who emit above the commitments comply by purchasing GHG emission credits. Allowances can be traded for the period 2003-2010. The CCX has its own standard, including a methodology for LFG destruction projects. It has developed its own trading unit, a Carbon Financial Instrument® (CFI®). About 9 percent of the CFI® transactions on CCX have been landfill methane projects. The CCX has a highly transparent financial transaction system with excellent information available online. Landfills with older legacy voluntary LFG collection systems may find the CCX protocol particularly attractive given the early in-service (on or after January 1, 1999) and the ability to sell vintage credits (2003 and later). Landfill owners will most likely be required to join as full members. However, landfill owners with no other significant sources of GHG emissions can join as Offset Providers and not have to commit to

GHG reduction requirements under the CCX.

- The OTC market offers one of the most promising areas for a landfill to sell its GHG credits. The OTC market is highly flexible and dynamic to address changing market demands by buyers and sellers. GHG reduction projects or the GHG credits they produce can be sold through several different processes, including direct negotiation, bilateral agreements, competitive bid, or auction processes.

GHG reduction projects may be structured in any of several ways:

- Carbon Asset Developer – Provide all capital to develop, validate, verify, and install a LFG collection and destruction system and to monitor and verify the GHG credits generated, and sell the verified GHG credits to qualified buyers over the life of the project. In return, the landfill gets an LFG collection system “for nothing,” and potentially may also receive a portion of the revenues from the GHG credit sales.
- Purchase the GHG Credits – The landfill sells the credits to a buyer for a mutually agreed pricing structure and duration. The landfill provides the capital to develop, validate verify and install a LFG collection and destruction system.
- Hybrid – GHG project developers and landfill form a joint venture, both provide investment capital, and both share in the risks and rewards.
- Brokers – Match up interested buyers with sellers of the GHG credits generated under a landfill project for a fee.

The amount of risk a landfill wants to assume (including the amount of capital it wants to put at risk) will determine what structure is most attractive. While the OTC market is highly flexible, it also lacks standardization and interchangeability. Multiple standards (protocols) are used, creating different project eligibility requirements, monitoring and validation requirements, and unique values for VERs from a particular standard and project type.

## Prices for GHG Credits

The CCX has CFI® pricing history available. From an average price in 2006 of \$3.50, prices fell to an average of \$3.15

for 2007, with a price of only \$1.90 at the end of 2007. The price of CFI®s in 2008 has seen extremely high volatility, from a market high price of \$7.40 in late May to a current market low of \$1.20 on October 23, with significant market volume. The OTC market transaction information is far less available, as most transaction details are not made public. The 2007 volume weighted average price for VERs in the OTC market was \$4.10 per ton CO<sub>2</sub>e, ranging widely from \$1.80 to \$300 per ton CO<sub>2</sub>e. While afforestation and reforestation projects have remained some of the higher priced projects, methane reduction projects (such as LFG projects) continue to be valued highly with a weighted average price in 2007 of \$6 per ton CO<sub>2</sub>e. [K. Hamilton, M. Sjardin, T. Marcello, G. Xu, “State of the Voluntary Carbon Markets 2008”].

Some GHG reduction projects have the possibility of incorporating a landfill gas-to-energy (LFGE) project to produce additional revenues, LFG-fired electric generation project or a LFG direct use project (e.g. boilers). The LFG collected for GHG purposes may also provide a cost-competitive source of energy. This renewable energy resource could be used by existing development on or near the landfill, or could be used to encourage new project development near the landfill.

LFGE projects are typically approved methods of methane destruction and are thus eligible to generate GHG credits. The additional revenues generated from GHG credits improve the economic viability of LFGE projects and environmental stature of landfill redevelopment. With regard to electricity generation, additional GHG credits can be earned for the displacement of more carbon intense forms of electricity generation.

In addition, smaller landfills now find themselves at the epicenter of interest surrounding climate change and specifically how voluntary control of LFG can contribute to GHG reductions and revenue. These landfills have several project development options. Those advising clients who own landfills or are developing on or near landfills would serve their clients well to become familiar with this emerging market. **BFN**

*Jim Michelsen is with SCS Engineers, Reston, Virginia*