

Technical Bulletin

United Nations Framework Convention on Climate Change Approval of New Landfill Remediation Approach Increases GHG Offset Value for US Markets

In August 2009, the Clean Development Mechanism (CDM) Executive Board which operates under the United Nations Framework Convention on Climate Change (UNFCCC) approved the Baseline and Monitoring Methodology, **Number AM0083 “Avoidance of Landfill Gas Emissions By In-Situ Aeration Of Landfills.”** Under this methodology, municipal solid waste (MSW) landfill owners which aerobically treat or remediate their landfills by means of air venting or low pressure aeration can generate carbon offsets, or credits, provided the project follows the AM0083 methodology. Depending on the commodity market in which they are traded, and whether a LFG system is required by law to be installed, the credits generated using this approach can, in some cases, provide a higher overall project value in a shorter timeframe than those generated by landfill gas (LFG) flaring or direct LFG use, even in consideration of electricity or gas sales.

Presently, SCS is working with LG Aerobic Solutions, Inc., the Method’s primary author and technology Inventor¹. SCS is providing Greenhouse gas (GHG) support, engineering, and technical services to landfills in Canada and Europe, and soon the US, as a combined landfill remediation/GHG reduction approach. Aerobic projects can reduce the production of landfill methane, a GHG that is 21 times more harmful in the atmosphere than carbon dioxide, as well as generate higher-value carbon

credits. In addition, aerobic treatment can rapidly stabilize organic material in landfills, thus potentially reducing post-closure care (PCC) costs.

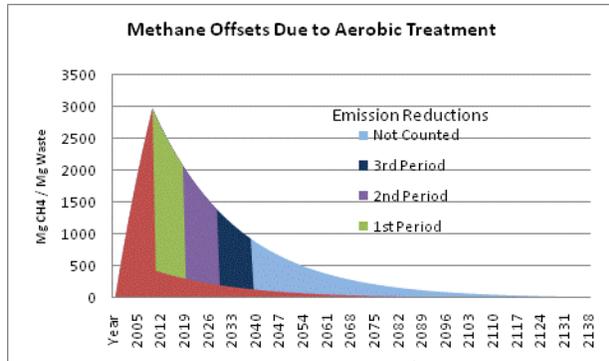
Currently, regulated GHG reductions in the US can be traded or sold in several voluntary markets, both in the US and in Europe, much like any commodity. It is estimated that over one billion dollars (\$1B) in carbon offsets were sold in voluntary markets in the United States in 2008 and that, depending upon future legislation, carbon offsets could increase dramatically in value and their markets could become the largest commodity markets in the world.

Under the Voluntary Carbon System (VCS) <http://www.v-c-s.org>, one of several registries that recognizes UN approved methodologies as viable technologies, offsets (or carbon dioxide equivalents expressed as Voluntary Carbon Units-VCUs) can be verified for trade on the open market and command a price dictated by their quality and demand. In 2008, the price of VCUs from landfills averaged \$8.20 per VCU. Also, in the absence of federal legislation, many states have entered into regional compacts such as the Regional Greenhouse Gas Initiative (RGGI) and Western Climate Initiative (WCI), to create cap-and-trade programs that cover their participating states.

What sets the aerobic approach apart from other methane destruction/avoidance technol-

¹ US Patent Number 5,888,022

ologies is that the voluntary offsets created at certain landfills can be obtained in a much shorter timeframe. For candidate sites (see below), this improves the economics of a GHG reduction project. For example, as shown in the figure below, the VCUs realized for a closed, 1 million-ton landfill, are estimated to be over 940,000 Mg CO₂eq over a 30-year period.



Although these offsets can be realized using other methodologies (such as flaring or LFGTE), they are, instead, obtained in less than five (5) years versus thirty (30). From a net present value (NPV) standpoint, this is significant for candidate landfills – landfills or cells that have (or will have) at least 1 million tons of waste in place and where LFG collection and treatment/usage is not required by law or is uneconomical. Further, taking into account the reduction of LFG collection and destruction efficiencies over time, the aerobic approach compares more favorably since the aerobic system converts much of the organic mass to carbon dioxide, water, and salts in only a few years.

Assuming an 80 percent system effectiveness, the example aerobic system could provide the project offsets over a 5-year period valued at over \$5.6 M, assuming a VCU sales price of \$6.00 per VCU. Although electricity and/or gas sales can be obtained using other approaches, the economic benefit of an aerobic

system bears consideration, especially at closed sites (or cells).

In consideration of: 1) the time value of money (as afforded by AM0083), 2) the challenges at certain landfills to economically generate electricity or supply clean biogas for long periods, and 3) the likely increase in carbon offset values as new federal GHG regulations are imposed or a cap-and-trade system evolves, the aerobic approach may provide more benefits than other approaches. Moreover, there are additional benefits and savings - lowering of PCC costs, less leachate management due to high moisture evaporation, reduced landfill volume due to increases in waste settlement, reductions in foul odors, and opportunities for landfill redevelopment.

Greenhouse Gas (GHG) and Landfill Engineering Services

SCS is one of the few consulting firms that specialize in GHG support services while providing expert environmental engineering services. Formed in 1970, SCS professionals understand landfill and environmental systems, and have the experience to help clients find a practical approach to attain and maintain a proper balance between their missions and the environmental consequences of their operations. For example, SCS designs, installs, and operates landfill gas collection systems that destroy the equivalent of more than 25 million metric tons of carbon dioxide every year. In support of current and future demand in these markets, SCS provides the following services:

- Research and Evaluate emerging technologies and GHG issues
- Prepare GHG Emissions Inventories to establish the carbon footprint of operations.
- Develop Protocols for GHG Emissions Estimates and Offsets.

- Develop/Design Aerobic Landfill Remediation Projects, including design, construction and operation of air/ liquid injection systems, controls, and contingencies.
- Develop Renewable Energy Projects, including design, construction and operation of direct use, electricity generation, liquefied and compressed natural gas projects using biogases from landfills, agricultural operations, and coal beds.
- Identify Opportunities for Voluntary GHG Emission Reductions for landfills, wastewater treatment plants, agriculture wastes, coal bed methane, and fugitive emissions
- Provide Third-party Validation or Verification of GHG emission reductions. (SCS does not validate or verify GHG assertions where SCS provided consulting services to the responsible party that support the assertion)
- Validation services are a "look forward" to determine if a particular project appears to qualify for producing credits going forward
- Develop/Design landfill gas collection systems for energy recovery and/or control. Detailed qualifications materials are available on request.
- Landfill design and permitting services. Detailed qualifications materials are available on request.
- Mark Hudgins of SCS has over a decade of experience in management, design, and operation of aerobic landfill systems. He also was Lead Inventor on a US patent entitled "Aerobic Landfill Bioreactor" Patent Numbers 6,024,513 and 6,364,572. He is currently working on aerobic landfill projects in China, Canada, and the US.
- SCS has been the lead contractor for the U.S. EPA's Landfill Methane Outreach Program (LMOP) for over 10 years, and as a part of that, we keep fully informed of GHG issues at the federal level as well as internationally.
- SCS is the only consulting firm with extensive landfill, landfill gas (LFG), recycling, and air quality expertise who is also approved as a certifier under the California Climate Action Registry's (CCAR) GHG program.
- SCS has provided certification services for numerous GHG credit transactions under the Clean Development (CDM) mechanism of the Kyoto Treaty.
- SCS maintains SCS Energy, which provides us with extensive expertise in all types of LFG-to-energy (LFGTE) projects.

All landfills run some degree of risk, as does any technology to be applied to a landfill. Bioreactors when done properly are not only safe, they can offer environmental benefits with reduced emissions. Aerobic bioreactors as proposed here offer such benefits, but if not properly designed, operated, controlled, and monitored, there is some risk of starting a landfill fire. We urge that you use qualified and experienced professionals in applying this technology, to avoid a landfill fire, and to maximize the intended benefits

Achievements/Advantages

- SCS was hired to draft the solid waste industry GHG inventory protocols for the Chicago Climate Exchange (CCX) and is intimately familiar with their process for certification and trading of GHG credits.
- SCS is at the forefront of the Solid Waste Association of North America's (SWANA) advocacy on GHG issues, with Pat Sullivan of SCS leading those efforts as Chairman of the Rules and Regulations Committee.

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