

# Voluntary Greenhouse Gas Markets and Supply-Side Mechanics

Michael W. McLaughlin, PE  
SCS Engineers  
Reston, VA

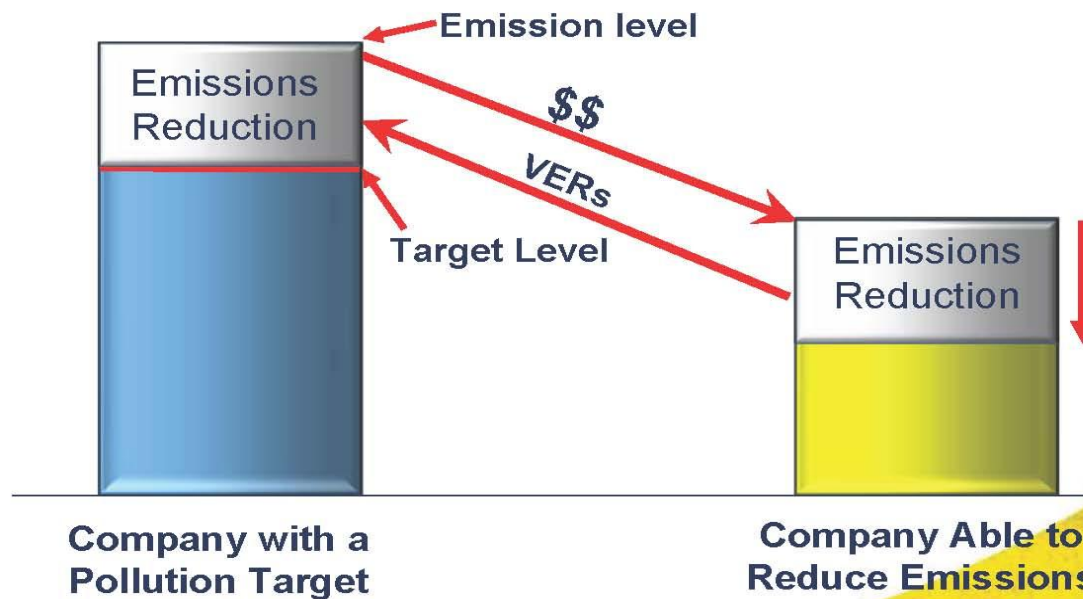
# Presentation Overview

- Emission Trading 101 and GHG Markets
- Voluntary Market Participants
- GHG Credit Development Process
- Review of GHG Credit Development From Landfills

# GHG Markets, How Do They Work?

ECO SECURITIES

## How the Voluntary Market Works



© 2006 EcoSecurities Group plc

Carbon credits - origination to commercialisation

SCS ENGINEERS

# What GHG Markets Exist?

- Voluntary Markets
  - Currently where most of the activity occurs
    - 65.0 Million Tonnes in 2007
  - Chicago Climate Exchange (CCX)
    - 22.9 Million Tonnes in 2007
  - Over the Counter (OTC)
    - 42.1 Million Tonnes in 2007
- Compliance Markets
  - California AB-32
  - Regional Greenhouse Gas Initiative (RGGI)
    - Regional cap-and-trade program in ten Northeast and Mid-Atlantic states (units >25 MW)
  - Federal Program??



# Voluntary Markets or Mechanisms

- Chicago Climate Exchange (CCX)
  - Structured and closely monitored cap-and-trade system the entities voluntarily join.
- Over the Counter (OTC) Approach
  - Fragmented group of voluntary transactions that are not responding to any caps and are not coordinated in a formal exchange.
  - Auction/Request for Proposal



# What is the “widget” here?

- GHG markets trade metric tons of carbon dioxide equivalent (CO<sub>2</sub>e)
- 1 ton CO<sub>2</sub> = 1 ton CO<sub>2</sub>e
- 1 ton CH<sub>4</sub> = 21 tons CO<sub>2</sub>e
  - For most markets, methane GWP of 21 used, from 1996 IPCC Report
  - Current IPCC Report (AR4) indicates CH<sub>4</sub> has a GWP 25 times greater than that of CO<sub>2</sub>e
- 1 ton SF<sub>6</sub> = 22,800 tons CO<sub>2</sub>e

# Who is Buying?

- Corporations, Businesses, & Institutions
  - Growing consumer demand for environmentally responsible companies
  - Competitive Positioning/Market Value for “green” organizations
  - Environmental Stewardship/Corporate responsibility
  - Compliance/Economic Risk Mitigation
  - Settlement agreements for new coal plants
- Investors considering long-term position and \$\$\$

# Who is Buying (cont.)

- Individuals (through retail GHG providers)
  - TerraPass: Purchased offsets and RECs from LFG projects at
    - CrossRoads LF, ME
    - Bavarian LF, KY
    - Tontitown LF, AR
    - **Catawba Co. LF, NC**
  - CarbonFund: Purchased offsets from LFG projects at
    - New Bedford LF, MA
    - North Country LF, NH
  - Atmosclear: Purchased offsets from LFG projects at
    - Des Plains LF, Illinois

## Press Release

### **Greenhouse Gas Services, a GE AES Venture, to Create Greenhouse Gas Credits in Caldwell County, North Carolina**

#### **Google to Use Greenhouse Gas Services' Standard of Practice for Emissions Reduction Project**

ARLINGTON, VA, SEPTEMBER 17, 2008 – Greenhouse Gas Services LLC (GHGS), a venture between GE Energy Financial Services, a unit of GE (NYSE: GE), and The AES Corporation (NYSE: AES), announced today that it has signed a master agreement with Google to co-develop projects that reduce greenhouse gas (GHG) emissions and produce GHG credits. The initial project will capture methane gas at the Mount Herman landfill in Caldwell County, North Carolina.

As one of the first emissions reduction co-development projects in the US, Greenhouse Gas Services (GHGS) will design, build and operate the facility that will capture more than 120,000 tons of landfill gas over ten years. The project will use the GHGS Standard of Practice to govern the creation, management and retirement of the credits. Google will add these offsets to its carbon portfolio to advance its goal of company-wide carbon neutrality.

"We're working with Google at the site level to create GHG credits that are certified to our Standard of Practice, ensuring they represent a real and permanent reduction in greenhouse gas emissions," said Mauricio Vargas, CEO of GHGS.

GHGS will capture the methane gas emitted by the Mount Herman landfill to generate GHG credits, and will work with an independent third party certifying the scientific integrity of the avoided emissions. This is a closed landfill that is not required to capture the methane gas released. The captured methane gas will be destroyed by flare or converted to a fuel source to power a new research greenhouse.

"Caldwell County welcomes the opportunity to work with Google and GHGS to create offsets while improving air quality and promoting agricultural research," said Dr. John Thuss, Caldwell County Commissioner.

As part of the project, a greenhouse will be built for the Caldwell Community College and Technical Institute to promote agricultural research.

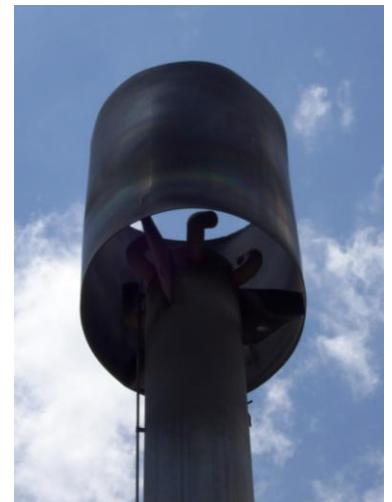
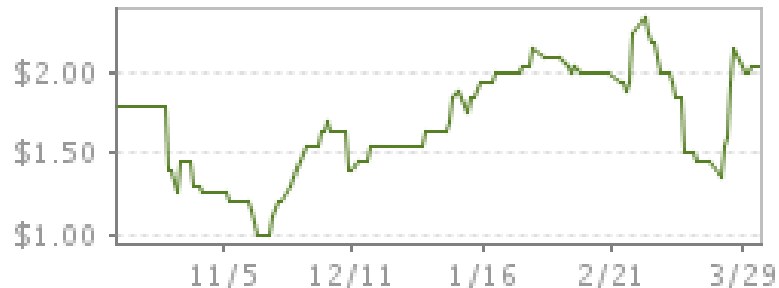
Financial details of the transaction were not disclosed.

# What is Supplying the Market?

- Renewable energy projects
- Methane reduction projects
  - Landfill gas
  - Coal Mine Methane
  - Anaerobic Digestion at feedlot operations
- Forestry Projects
- Energy Efficiency Projects
- Soil Carbon Projects (no-till)
- Industrial gas reduction process (e.g., SF<sub>6</sub>)

# What are GHG Credits Selling For?

- Evaluate Current Market Value (Nov/Dec. 2008)
  - \$8.10 forestry-based
  - \$8.00 methane-based
  - \$6.70 energy efficiency
  - \$6.10 renewable energy



# Trends in GHG Pricing

Program	\$/Tonne CO2e July/Aug 08	\$/Tonne CO2e Nov / Dec 08	\$/Tonne CO2e Jan / Feb 09
CAR	\$10.80	\$8.20	\$6.80
VCS	\$7.20	\$6.20	\$3.70
CCX Exchange	\$3.75	\$1.70	\$1.70 (Currently \$1.45)
CCX (Bilateral)	\$3.75	\$4.20	\$2.90
RGGI	/	\$3.75 - \$4.15*	\$3.50 – \$3.93*

Source - New Carbon Finance –Voluntary Market Research Note

\* Source – TFS Energy Carbon Market Report Feb 2009

# GHG Credit Quality Impacts the Price

- High quality projects would be new, voluntary, located in a compliance market area, and clearly additional.
- Buyers also like “charismatic” projects that promote sustainability (e.g., reforestation, renewable energy)
  - Strict verification procedures also attractive
    - e.g., CAR, VCS, Gold Standard

# GHG Credit Development Process

- Project identified and analyzed
- Due Diligence – Project Agreements
- Selection of Standard and Protocol
- Development of Project Application or Design Document
- Validation of Project
- Generation and Quantification of Credits
- Verification of Credits
- Registration/Transaction

# Standards and Protocols Define Requirements for Market Acceptance

- Project eligibility / “Additionality” criteria
- Baseline evaluation
- Monitoring requirements
- Recordkeeping
- Quantification of GHG credits
- Reporting

# Most Prevalent Standards

- Climate Action Reserve (“The Reserve”)
- CDM/JI
- Chicago Climate Exchange
- GE-AES Greenhouse Gas Services
- Gold Standard
  - Uses CDM Protocol
- VER +
- Voluntary Carbon Standard
  - Uses CDM Protocol, Reviewing CAR Protocol

# Validation

- Project Design Document reviewed by GHG Program or Third-Party
  - Is the project eligible?
  - Correct M/R/R procedures?
  - All project aspects considered per applicable protocol?
- Establishes that GHG reductions from project are valid
- May use simple application and review to “approve” project

# Verification

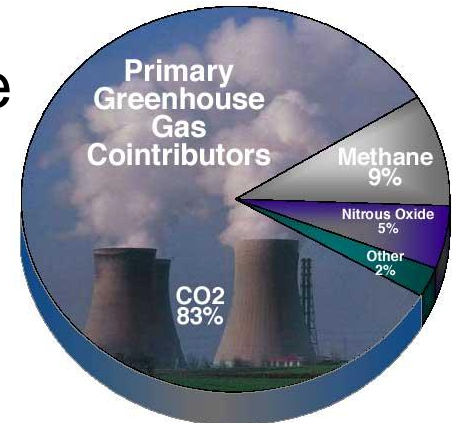
- Third-Party Review of GHG credits
- Confirms GHG project meets protocol requirements
- Review and approval of GHG credit quantification

# Registration and Transaction

- Verified GHG credits are the product
- GHG credits are given unique identifier if registered
- Some GHG buyers may not require registration

# Why Interest in Landfills?

- Methane has a global warming potential 21-25 times that of CO<sub>2</sub> based on recent IPCC assessments
- Destruction of methane easily verifiable
- Technology already exists for LFG collection and control
- Can also use methane for energy (electric generation/thermal energy)



Equivalent Global Warming Basis, AAPG April 2004

# Which Landfills Can Participate in GHG Markets?

- Gas Collection and Control System (GCCS) must be “voluntary”
  - LFG collection and control must not be required by any Local, State, or Federal regulatory

# Which Landfills Can Participate in GHG Markets? (cont.)

- **Current Project Eligibility Dates**
  - 1/1/99 CCX
  - 1/1/01 CAR
    - If registered by 11/17/09
    - After 11/17/09, must register within 6 months of startup
  - 12/20/05 RGGI
    - If registered by 6/30/09
    - After 6/30/09, must register within 6 months of startup
  - VCS Must validate within 2 years of startup
  - GHGS Recent project startups

# GHG Credit Generation and Quantification

- Monitoring of LFG flow rate
- Monitoring of LFG methane content
- Temperature, pressure
- Control device operation
- Overall energy use
- Quantification calculations
- Regular calibration of measurement devices

# Control System Efficiency and Operation

- Default Methane Destruction Efficiency
  - Open Flares (50% - 100%)
  - Enclosed Flares (90% - 100%)
  - Other combustion devices (98% - 100%)
  - Injection into NG Pipeline (98% - 100%)
- Monitor control device operation and operating parameters
  - to ensure continuous destruction of methane

# Maintenance and QA Activities

- Protocols require programs for maintenance and accuracy verification of monitoring equipment
- Flow meters
  - Quarterly verification and maintenance
  - At least annual calibration
- Methane monitors
  - Daily to monthly calibration requirements
- Data can be thrown out if no QA/QC can be demonstrated

# Frederick County, VA GHG Emission Credits



# Calculations

- GHG Credit (metric ton of CO<sub>2</sub>e)
  - LFG flow \* methane % \* STP adjustment \*  
destruction efficiency \* global warming potential \*  
conversion constants
- Other considerations
  - Electrical Use
  - Methane Oxidation
  - Baseline Emission Reductions



# Good References

- *Forging a Frontier: State of the Voluntary Carbon Markets 2008.* Ecosystem Marketplace/New Carbon Finance
- *Making Sense of the Voluntary Carbon Market: A Comparison of Carbon Offset Standards.* World Wildlife Fund. 2008

# Contact Information

Michael W. McLaughlin, P.E.

Senior Vice-President

SCS Engineers

11260 Roger Bacon Dr.

Suite 300

Reston, VA 20190

[mmclaughlin@scsengineers.com](mailto:mmclaughlin@scsengineers.com)

# Contact Information

Chad Leatherwood, P.E.

Project Manager

SCS Engineers

20 Battery Park Avenue, Suite 504

Asheville, NC 28801

828-285-8951

[cleatherwood@scsengineers.com](mailto:cleatherwood@scsengineers.com)