CDM Opportunities in the Oil & Gas Sector

EcoSecurities Group plc

Methane to Markets
Oil and Natural Gas Technology Transfer Workshop
April 17-18, 2008

Paul Soffe
Associate Director
EcoSecurities
EcoSecurities is a leading company in the business of sourcing, developing and trading carbon credits in the global carbon market. Founded in 1997, EcoSecurities’ project portfolio today is comprised of:

- **Over 60 projects registered or submitted for registration** with the CDM Executive Board
- **Over 200 projects validated or submitted for validation**
- Projects have the potential to generate over **142 million CERs through 2012**
- Developed and/or contributed to more than 10 UN approved methodologies
- Over 300 of the projects have secured financing and over 250 are under construction or operational.

> 437 projects at different stages of the CDM cycle
> spanning **36 countries**, using **18 technologies**
Company History

Oct 2005 La Esperanza project, structured by EcoSecurities, receives carbon credits from first-ever issuance

Nov 2005 EcoSecurities Consultancy Services is voted the world’s leading greenhouse gas advisory firm for the 5th year in a row

Dec 2005 EcoSecurities successfully lists on AIM, raising € 80 million

July 2007 Credit Suisse strategic investment and institutional placing, raising € 100 million

Selected EcoSecurities clients

**Governments**: Denmark, Austria, Japan,

**International organizations**: UNDP, UNFCCC, FAO, UNEP, IUCN, WWF, FAO, IPCC

**Financial institutions**: Tokyo-Mitsubishi Securities, World Bank, International Finance Corporation, ADB, EIB

**Private clients**: Shell, Essent, Toyota Tsusho, Harza, Vallourec & Mannessmann, EnXco Windpower, CDC, Alkane Energy, Cargill, Eskom, SGS
The Kyoto Carbon Credit Market

CCX, RGGI
California?
Australia?
US Federal system?

CDM / JI projects

CER/ERU forward stream supply

Large Final Emitters
Canada

Keidanren Voluntary Agreement
Japan

AAU supply via GIS?

Russia, Ukraine,
Former Eastern Bloc
countries

EU25
EU ETS
Secondary Market Environment

Swaps, options, financial products
Physical forward contracts
Spot Market

EXCHANGE/CLEARED

BROKERED

BILATERAL

WHOLESALE MKT

“RETAIL” MKT

INDUSTRIAL ENERGY CONSUMERS

Advance as ITL launches

STANDARD/STRUCTURED

© 2008 ECOSECURITIES GROUP PLC
Historical carbon prices
## EcoSecurities’ diversity

### Diversification by project type

<table>
<thead>
<tr>
<th>% of Volumes</th>
<th>31 Dec 2006</th>
<th>31 Aug 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfill gas</td>
<td>12%</td>
<td>6.2%</td>
</tr>
<tr>
<td>Biomass electricity</td>
<td>17%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>9%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Afforestation</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Hydroelectricity</td>
<td>22%</td>
<td>23.2%</td>
</tr>
<tr>
<td>Coal mine methane</td>
<td>6%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Anaerobic digestion - Wastewater</td>
<td>3.5%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Anaerobic digestion – Swine</td>
<td>1.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Natural gas fuel switch</td>
<td>5.5%</td>
<td>8.4%</td>
</tr>
<tr>
<td>Geothermal</td>
<td>3%</td>
<td>4.7%</td>
</tr>
<tr>
<td>N2O</td>
<td>13%</td>
<td>11.6%</td>
</tr>
<tr>
<td>Other</td>
<td>7.5%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Diversification by geography

<table>
<thead>
<tr>
<th>% of Volumes</th>
<th>31 Dec 2006</th>
<th>31 Aug 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>44%</td>
<td>44%</td>
</tr>
<tr>
<td>Brazil</td>
<td>16%</td>
<td>11%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>7%</td>
<td>11%</td>
</tr>
<tr>
<td>India</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Thailand</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Rest of Asia</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>Rest of South &amp; Central America</td>
<td>13.5%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>1.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Rest of Africa &amp; Middle East</td>
<td>7%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Implementation

Tianji $N_2O$ abatement project, China

Aguascalientes Landfill project, Mexico
The CDM project cycle

1 year

4-8 months

PDD & Methodology

Host Country Approval

Validation

Registration

Financing & implementation

Monitoring

Verification

Executive Board

Issue CERs

Project Owner

Operating National Authority

Operational Entities

© 2008 ECOSECURITIES GROUP PLC
Implementation update

- One of the largest implementation teams in the world, with 77 CDM-trained staff at period end, using sophisticated internal tools and systems.
- Implementing a portfolio equivalent to 18% of global market (UNFCCC)
- Ongoing delays and challenges with local DNAs, the CDM EB and external validators and verifiers (DOEs)
Slow progress through the CDM project cycle

Of the 2042 projects, only 191 have received CERs.
Implementation highlights

- Registration of first gas flare capture project in the Middle East, Al-Shaheen offshore of Qatar
- First project registered by the Company in Thailand
- The Company’s first $N_2O$ abatement project in China has commenced carbon credit generation after the completion of baseline determination

Tianji $N_2O$ abatement project, China
Emission reduction opportunities in the O&G sector

- Oil Sector
  - Upstream Opportunities
  - Downstream Opportunities
- Gas Sector
- Our Presence in Oil & Gas
  - Track Record
  - Current Work
  - Our Coverage
Oil Sector Overview

Avoided Venting / Flaring at Oil Production Facilities
AM9, AM37

Vapour Recovery at Crude Oil Storage Tanks
No Meth

Oil Refining and Petrochemicals Production
Several
Upstream opportunities

- **Oil wells** → **Oil + Associated gas** → **Separation units** → **Recovery of associated or tank gas (vapor)**
- **Venting** → **Tank vapor recovery (No meth)** → **Oil storage tanks** → **Pipe line** → **Oil storage tanks** → **Refining and/or shipping**

- **Recovery of associated or tank gas (vapor)**
  - **AM0037** → **Associated gas**
  - **Gas processing plant** → **Dry gas, LPG, condensate** → **Replaces similar products in the market**
  - **On-site power generation**
  - **Flare (only for vapor recovery)**
  - **Use as feedstock**

© 2008 ECOSECURITIES GROUP PLC
Flare recovery

- AM0009, AM0037
- 2 kg CO$_2$/Nm$^3$ of gas
- 100,000 CERs with 175,000 Nm$^3$/day
Vapour recovery

- No methodology
- 6 kg CO₂/Nm³ of gas
- 100,000 CERs/year with 50,000 Nm³/day
Oil refineries

- Most energy intensive industrial sector
Potential types of projects

- Waste Gas Recovery (Avoided Flaring)
- Steam System Optimisation
- Process Optimisation
- Fuel Switch
- Energy Efficiency
Waste gas recovery

- Flares are safety devices that prevent the release of unburned gas to the atmosphere
  - Risk of reaching an ignition source outside the plant
- Flare Gas Recovery Units can capture waste gases either for use in the plant or for sale
- EcoSecurities developed methodology AM0055
- One project registered (La Plata) generating 194,000 CER/yr
<table>
<thead>
<tr>
<th>j1</th>
<th>acn12, an87</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>j carlos, 2006-1-14</td>
</tr>
<tr>
<td>j2</td>
<td>220, 000</td>
</tr>
<tr>
<td></td>
<td>j carlos, 2006-1-14</td>
</tr>
</tbody>
</table>
Production
- Wellhead Gas Capture
- Dehydrator Vents
- Gas Flare Reduction
- Leak Reduction
- Avoided Flaring
- Waste Heat Recovery
- Leak Reduction

Processing
- Waste Heat Recovery
- Leak Reduction

Transmission

Natural Gas Sector
Wellhead gas capture - production

- **Wellsite completions**
  - Upon completing a well, the dirty gas is vented for a period of time
    - Use portable equipment to recover and clean the gas

- **Casinghead gas**
  - When the well pressure drops below the pipeline pressure, the gas is vented to the atmosphere
    - Install compressors to recover vented gas
    - Require ~ 10 wells to generate 50,000 tCO2/yr

- **No methodology for these techniques**
Fugitive leak reduction

- Projects can be in **all sectors of gas industry**
- Various leak abatement methods:
  - Valve stem packing replacement (asbestos → synthetics)
  - Directed Inspection & Maintenance (DI&M)
    - detect, tag & measure, repair, monitor)
  - Rod packing replacement (reciprocating units only)
  - Wet to dry seal conversion (centrifugal units)
- Historical projects indicate a potential for over **13,000 tCO2/yr per compressor station**
  - Many pipelines have 10’s of compressor stations
    - Thus, a potential for over **130,000 tCO2/yr per network**
Gas dehydrator vents

- Dehydrators are used in condensate (wet) gas wells and at processing plants

- Removes gas liquids prior to transmission
  - **Glycol dehydrators**: absorb water + methane and then vent to the atmosphere when glycol is regenerated (vapours flash at low pressure)
    - **Reduce circulation rates** – often 2-3 times higher than required
    - Install **flash tank separators** – recover previously vented methane
    - Switch to **solid desiccant dehydrators** (no emissions)
    - Generally a relatively low amount of CERs (~3,000 tCO2/yr per unit), but can be many units at large plants or wells

- No methodology for these techniques
Pneumatic devices

- Gas-powered pneumatic devices are used at **sweet gas wells** and at **processing plants**
  - Replace high-bleed pneumatics with low-bleed
  - Convert to instrument air or electric actuators
  - Increase maintenance frequency

- Typical potential for about **1,000 tCO2/yr per device**

- No methodology, though similar in principal to AM0023, leak reduction in compressor stations
EcoSecurities’ track record

- EcoSecurities has developed one of the few successful projects using the approved methodology AM0009
  - "Recovery and utilization of oil gas from wells that would otherwise be flared" on behalf of Qatar Petroleum, in the Al-Shaheen oil field
    - Registered within 1 year of contract signature
  - The project may generate between 1.5 and 2 million emission reduction credits per year.
Current work

- In Argentina, new methodology and Project Design Document for the “La Plata recovery and utilization of flare waste gases” project with YPF S.A. (Repsol YPF)
  - Methodology AM0055 and ACM0012, developed by EcoSecurities and approved by the CDM Executive Board.
- EcoSecurities is also working with Gas Natural from Spain and its subsidiaries in South America.
  - CEG in Rio de Janeiro to develop methodology approved “Leak reduction from a natural gas distribution grid by replacing old cast iron pipes with polyethylene pipes.” AM0043
  - Revision of AM0043 was developed and applied to a similar project in Monterrey, Mexico.
Current work

- In Russia, EcoSecurities is working with the World Bank in the development of a JI project which applies the AM0009 methodology to reduce gas flaring at oil wells. The project is located in the Komsomolskoye field, and is managed by Rosneft.
- Additionally, EcoSecurities is working with Mexico’s national petroleum company, PEMEX, in energy efficiency projects in its refinery operations. Finally, EcoSecurities is developing another project under AM0009 with PT Tanjung Jabung Power in Indonesia.
Our coverage

Buenos Aires
Bangkok
Beijing
Bern
Casablanca
Chengdu
Claremont
Delhi
Dubai
Dublin
Jakarta
Johannesburg
Karachi
Kiev
Kuala Lumpur

Lima
Madrid
Manila
Manama
Mexico City
New York
Oxford
Portland
Rio de Janeiro
Rome
San Jose
Santiago
Singapore
The Hague
Tokyo

Countries where EcoSecurities has projects
EcoSecurities’ current office locations or representatives