

# **PROJECT FINANCE OPPORTUNITIES FOR NATURAL GAS EMISSION MITIGATION**

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## **Abstract**

Worldwide, the natural gas production, processing, transmission, and distribution sectors release as much as 88 billion cubic meters (bcm) of methane, a strong greenhouse gas, to the atmosphere annually. Reductions in methane emissions (i.e., product losses) from the natural gas sector often can be achieved cost effectively, thereby generating a positive revenue stream through increased gas sales. For projects that meet certain criteria, revenues can be further enhanced by monetizing (selling) greenhouse gas emission reductions. For those projects that can successfully achieve and document emission reductions, a host of potential project development finance sources exist and are outlined in this paper.

## **I. Introduction**

The natural gas production, processing, transmission, and distribution sectors release significant quantities of methane to the atmosphere. It is estimated that in 2002, in the United States, 8.4 billion cubic meters (bcm) of methane were emitted from its natural gas system, accounting for approximately 19 percent of total US methane emissions (USEPA 2003a). Global methane emissions from natural gas systems are between 44-88 bcm per year (IPCC, 1996). Some of the releases are intentional while others are inadvertent. In either case, there are technological and procedural options that can be employed to effect the reduction or elimination of these methane emissions, which essentially are product losses to the industry. Achieving cost-effective emission reductions makes good business sense. For example, the US Environmental Protection Agency reports that in 2002 US firms working with the Natural Gas STAR Program reduced their methane emissions by over 1.5 bcm and that those reductions were valued at approximately \$157 million at \$105.00 per thousand cubic meters (USEPA 2003b).

Pursuing natural gas emission reductions also makes good environmental sense. With a global warming potential (GWP) 23 times that of carbon dioxide (IPCC 2001), methane releases from natural gas systems contribute substantially to global greenhouse gas (GHG) loadings to the atmosphere.

Reductions in methane emissions from the natural gas sector often can be achieved cost effectively by applying existing technology or best management practices, thereby generating a positive revenue stream through increased gas sales. In some cases, the incremental cost associated with new technological applications may result in project economics that are not sufficiently attractive to support investments based strictly on gas sales. However, the relatively high GWP of methane can yield substantial carbon dioxide equivalent (CO<sub>2</sub>e) reductions that may be monetized in emerging global carbon markets and that could improve a project's return on investment, possibly making an otherwise unattractive project economically desirable.

A number of market entities have emerged that offer prospective natural gas project operators and developers financial incentives to support the costs of overcoming technical and other barriers for reducing fugitive methane emissions. This paper identifies emerging financial mechanisms that are available to support the incremental investment or revenue requirements associated with eligible natural gas system methane emission reduction projects.

## **II. Emissions Reduction Opportunities**

### **A. Natural Gas System Project Development**

As stated earlier, worldwide natural gas system fugitive methane emissions are estimated to total between 44-88 bcm per year. These substantial fugitive emissions indicate that many project opportunities for natural gas system methane mitigation must exist.

Fugitive greenhouse gas emissions in the natural gas industry occur in four primary sectors: (i) exploration and production (E&P); (ii) processing; (iii) transmission; and (iv) distribution. Emissions of natural gas are found in all countries containing any of the above natural gas sectors. However, quantification of total sector emissions and emissions from specific sources can be difficult due to many factors, including:

- sophistication, diversity, and age of the technology and hardware;
- system management techniques that are not designed to methodically find, address, and track methane leaks;
- lack of detailed data on natural gas system-wide emissions;
- errors in assumed emission factors (default values);
- difficulty in obtaining expert knowledge and detailed data required for the application of a rigorous bottom-up analytical approach; and
- time and cost associated with measurement programs (IPCC 2000).

The development of reliable emission estimates and quantifying the positive environmental additionality of proposed projects initially may pose a challenge to

project developers, but many gas companies have found success through various measurement methodologies as is discussed in Subsection C below.

## B. Emission Sources

As stated above, the natural gas industry is broken into four major sectors. Within each of these sectors, the major fugitive greenhouse gas emissions sources are represented in Table 1.

**Table 1: Major Emission Sources in the Natural Gas Industry**

<b>Sector</b>	<b>Emission Sources</b>
E&P	High-bleed pneumatics, glycol dehydrators, well venting, flaring
Processing	High-bleed pneumatics, glycol dehydrators, venting, compressor rod packing and wet seals, flaring
Transmission	Compressor rod packing and wet seals, reciprocating engines, turbines, high-bleed pneumatics, leaky pipes
Distribution	Gate station hardware, leaky pipes and meters

*{Note: Prospective project developers seeking assistance in identifying project opportunities or in obtaining information on natural gas emission reduction technologies are referred to the US Environmental Protection Agency's Natural Gas STAR web site at <http://www.epa.gov/gasstar>.}*

## III. Framework for Marketing Emission Reduction Credits

The United Nations Framework Convention on Climate Change (UNFCCC), which was ratified by the United States in 1992 and entered into force in 1994, “acknowledges that changes in the Earth’s climate and its adverse effects are a common concern of humankind.” The ultimate objective of the Convention is to achieve “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” To meet this objective, the countries that are parties to the Convention agreed to adopt national policies and take corresponding measures to mitigate climate change. In recent years, as climate change mitigation policies and approaches have emerged in countries around the globe, certain mechanisms have evolved from UNFCCC-derived initiatives that allow nations to cooperatively work to reduce GHG emissions and that provide the potential for monetary reward for such cooperation.

Of particular interest are what are termed project based “flexibility mechanisms” under which project developers in one country are able to generate carbon emission reductions that are recognized as valid and that have monetary value on the emerging world carbon market by developing GHG emission reduction

projects in another country. These reductions can be sold (monetized) to generate an additional revenue stream to complement a project's cash flow or held with the expectation that the emission reduction unit price will be greater in the future.

Because emission reduction monetization involves one party paying money for emission reductions created by another, a host of rules and guidelines are in the process of being developed to guide such transactions worldwide. Thus, project developers seeking finance assistance for carbon emission reduction projects must be able to obtain, organize, and effectively present requisite data necessary to determine and quantify the project's positive environmental impact. These involve making demonstrable assurance that the means of quantifying the emission reductions achieved are accurate, reliable, comparable over time with other such quantifications, transparent and auditable, etc. While beyond the scope of this paper, guidance for making such determinations can be obtained from a number of key reference sources provided by organizations such as the International Organization for Standardization (ISO (2003)), the World Resources Institute (<http://www.wri.org>), and the World Bank's Prototype Carbon Fund (i.e., PCF Plus - <http://prototypcarbonfund.org>).

#### **IV. Project Finance Sources**

Revenue from natural gas sector methane emission reduction projects derive primarily from the sale of saved or recovered natural gas. As stated earlier in this paper, however, the emergence of a carbon emission reduction market may add an additional source of revenue. The basic framework of this market consists of: market drivers, market buyers, and market enhancers or facilitators. Together these three market supporters constitute an institutional framework that can offer project developers opportunity for enhancing project investments or revenues.

##### **A. Market Drivers**

Market drivers are entities or organizations that have helped establish the framework for acceptable carbon emission reduction projects and in the process have created a financial market within which emission reductions can be bought and sold. A number of entities and organizations are working to create markets for selling and buying carbon emission reductions. Notable examples that may be germane to natural gas emission reduction projects include:

- The European Union – In the EU a market is set to begin trading carbon emission reductions in 2005 in what is expected to become the world's largest GHG emissions trading market (WSJ, 2002). Emission caps will be established for each member state, and each state in turn will establish caps for individual companies. Companies that are able to reduce their emissions

to a level below the cap will be able to sell their excess reductions to other companies that are unable to reduce emissions to prescribed levels.

- United Kingdom – A project-based emissions reduction pilot has been implemented under the voluntary UK Emissions Trading Scheme (UKETS). Launched in April of 2002, UKETS is the first program in the world that includes most industrial sectors and all greenhouse gases. Companies that enter into Climate Change Agreements with the government and that meet their targets will receive an 80% discount from the Climate Change Levy which taxes the business use of energy. The system's robustness is reflected in the fact that in its first year almost a thousand companies transferred over seven million tonnes of CO<sub>2</sub>e (DEFRA 2003). Methane abatement and transport is one of five priority sectors targeted by this pilot.
- Denmark – Denmark initiated a CO<sub>2</sub> trading program in 2001 that pertains only to electricity generators. However, if Denmark adopts the EU trading directive it would need to expand its program thereby potentially offering future opportunities for natural gas project development.
- United States – The Chicago Climate Exchange (CCX) has been established as a pilot cap-and-trade program initially focused on achieving voluntary GHG emission reductions in North America but also including offsets in Brazil. It is intended that the program will later be expanded to include international projects, with Mexico and Canada being added in 2003.
- Other Countries – Norway plans to begin carbon trading in 2005 under a program that will mirror the requirements of the EU scheme. Japan also has indicated an interest in exploring emissions trading beginning in 2003, and Switzerland and Canada apparently are planning to begin GHG emissions trading in 2008. (Haite, ND)

#### B. Market Buyers

A number of organizations have been established specifically to purchase GHG emission reductions. A number of key market buyers are listed below:

- Prototype Carbon Fund (PCF) - The World Bank's PCF provides financial support for projects that produce high quality greenhouse gas emission reductions that meet specified criteria in exchange for receiving the title to the resulting GHG emission reductions. Contributors (or "participants") in the PCF receive a pro rata share of the emission reductions that the PCF acquires. The PCF, currently funded at US\$180 million, will implement approximately half of the investments in economies in transition and half in developing countries. As a pilot activity, the PCF does not endeavor to compete in the emission reductions market; it is restricted to US\$180 million and is scheduled to terminate in 2012. As of the end of 2002 the PCF had

established firm plans for emission reduction purchases in 20 countries (PCF 2003). In terms of project risk, the PCF will pay higher carbon emission reduction unit prices (up to US \$4.20 per tonne CO<sub>2</sub>e) for projects that offer little or no risk (Sinha 2003). Although the PCF is still accepting projects for funding, prospective project developers are advised to approach the Fund as soon as possible so as to have their projects considered before available funding is committed. Before the PCF will negotiate the transfer (purchase) of emission reductions from a given project to the PCF, the country in which the project is to be implemented must sign a Host Country Agreement wherein various elements of the transfer are defined.

- Netherlands – Through its Certified Emission Reduction Unit Procurement Tender (CERUPT) the Dutch government is supporting GHG emission reduction projects in developing countries by offering funding to purchase certified emission reductions those projects create. Similarly, under its Emission Reduction Unit Procurement Tender (ERUPT) it is offering funds to purchase future emission reduction units to be generated in specified developed countries and countries with economies in transition. The government will purchase 100 MMT of CO<sub>2</sub>e from qualifying projects. Reported purchase prices are in the neighborhood of US\$4.75 per tonne CO<sub>2</sub>e.
- IFC-Netherlands Carbon Facility (INCaF) – The International Finance Corporation and the Government of the Netherlands have formed the INCaF to benefit the Netherlands by purchasing GHG emission reductions created by projects in developing countries. Methane recovery projects are among the project types listed as being potentially eligible.
- Natsource GHG Credit Buyers Pool - Natsource, a broker of (among other things) carbon credits, announced in May 2003 that it is in the process of establishing a \$200-million Greenhouse Gas-Credit Aggregation Pool (GG-CAP). The GG-CAP is intended to allow its members to obtain carbon credits from a diverse portfolio of project-based emissions reductions, including those originating internationally.

### C. Market Enhancers/Facilitators

Market enhancers and facilitators are sources of finance for projects that are consistent with their goals and that meet certain criteria. In particular, projects acceptable to these organizations must be environmentally sound. Thus, natural gas emissions reduction projects, if structured properly, should be attractive to any of these institutions.

- Asian Development Bank (ADB) - The ADB is a multilateral development finance institution dedicated to reducing poverty in Asia and the Pacific and committed to promoting environmentally sound development. It raises funds

through bond issues and member financing. The ADB also provides assistance to private enterprises of developing member countries through equity investments and loans. The ADB actively encourages developing member country governments and executing agencies to incorporate environmental protection measures in their project design and implementation initiatives. Among the goals explicitly stated in its new Environmental Policy is mainstreaming environmental considerations into economic growth and development planning. Currently the ADB is supporting a technical assistance project in the Peoples Republic of China to promote the development of small-scale projects in the energy sector. Additionally, the ADB has announced the establishment of a facility (termed REACH - Renewable Energy, Energy Efficiency, and Climate Change) that works cooperatively with development funds in the Netherlands, Denmark, and Canada to assist developing member countries to identify, develop, and market GHG emission reduction projects.

- The European Bank for Reconstruction and Development (EBRD) – Although owned by 60 countries and two intergovernmental institutions, the EBRD invests primarily in private enterprises, usually with commercial partners. Among the types of projects that are eligible to receive EBRD financing are technology upgrades, which would be consistent with many natural gas system emission reduction initiatives. In addition, the EBRD has joined FondElec Group, Inc., (a global infrastructure funds manager) and the Dexia Bank of France to create the Dexia-FondElec Energy Efficiency and Emissions Reduction Fund, L.P, a private equity fund focused on environmental protection. The fund offers an investment vehicle to fund projects in Central and Eastern Europe that will utilize clean, renewable energy and/or energy efficient technologies to improve industrial processes and mitigate climate change.
- The Global Environment Facility (GEF) – Working through three implementing agencies (the World Bank, the UN Development Programme, and the UN Environment Programme), the GEF provides cost-sharing grants and concessional funding to help developing countries fund projects and programs that protect the environment. The GEF provides funding to offset the incremental costs of measures to achieve global environmental benefits in four focal areas, one of which is climate change. The GEF Operational Strategy requires that any GEF-funded activity relating to climate change be fully compliant with the directives of the UNFCCC. Properly designed natural gas emission mitigation projects should be consistent with that strategy.
- Carbon Brokers – Integral to the evolution of a global market for valid carbon emission reductions has been the emergence of a number of commercial entities that serve as brokers of those reductions. Functioning essentially in the same manner as stockbrokers, these brokers bring carbon emission reduction sellers and buyers together in a structured environment to facilitate

and make transparent the transactions necessary to monetize carbon emission reductions.

## **V. Value of Carbon Emission Reductions**

As discussed in Lecocq and Capoor (2002), in recent years the world carbon market, in which trading began in 1996, has experienced substantial growth, both in terms of the number of transactions conducted and in the overall tonnages of CO<sub>2</sub>e traded. In 2002, over 100 transactions were reported (as of October) which more than doubled the total number of transactions reported in 2001, and the tonnages traded in the first half of the year alone exceeded the entire amount traded in all of 2001. Project-based emission reductions currently account for the vast majority of transaction volume.

Although reported individual emissions transactions have ranged from <10,000 to >10,000,000 tonnes, typical project-based volumes are in the 1,000,000 tonne range with unit prices varying considerably depending on a number of factors. In countries, where PCF and ERUPT transactions recently have dominated, prices have been reported to range from US\$3.00 – US\$8.10 per tonne CO<sub>2</sub>e, whereas PCF transactions in developing countries reflect a price range of from US\$1.48 to US\$3.50 per tonne.

In the UK market, where early emission reduction unit prices were reported in the US\$7.00 to US\$9.00 range, prices recently have risen to as high as US\$18.00 per tonne CO<sub>2</sub>e. In the Danish market, where a compliance cap of US\$5.00 to US\$6.00 per tonne CO<sub>2</sub>e constitutes a price ceiling, transactions ranging from US\$2.00 to US\$4.60 have been occurring.

## **VI. Conclusions**

Methane mitigation projects in the natural gas sector have significant potential for cost-effective, verifiable emission reductions that qualify for most sources of financing. Natural gas emission reduction project developers will have to develop credible emissions estimates and document that project-related emission reductions are actually achieved. In light of the increasing price of natural gas and unit prices reflected in recent carbon emission reduction transactions, projects that reduce methane emissions from natural gas systems often may yield sufficiently high returns to be attractive to sources of necessary finance.

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