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REGIONAL ASSOCIATION OF OIL AND NATURAL GAS COMPANIES IN LATIN AMERICA AND THE CARIBBEAN

ARPEL Workshop Report

FLARING AND VENTING REDUCTIONS AND GAS RECOVERY OPPORTUNITIES IN LATIN AMERICA AND THE CARIBBEAN

ARPEL Workshop Report
Flaring and Venting Reductions and Gas Recovery Opportunities in Latin America and the Caribbean
November 8-9, 2005
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The Objectives of the ARPEL Climate Change Working Group are:

- to provide the expertise on the development of potential Clean Development Mechanism processes and criteria;
- to facilitate the sharing of best practices among companies;
- to raise awareness and provide education on key aspects of the climate change issue; and
- to serve as the expert group communicating with scientific experts, government policy makers, and other opinion makers.

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EXECUTIVE SUMMARY

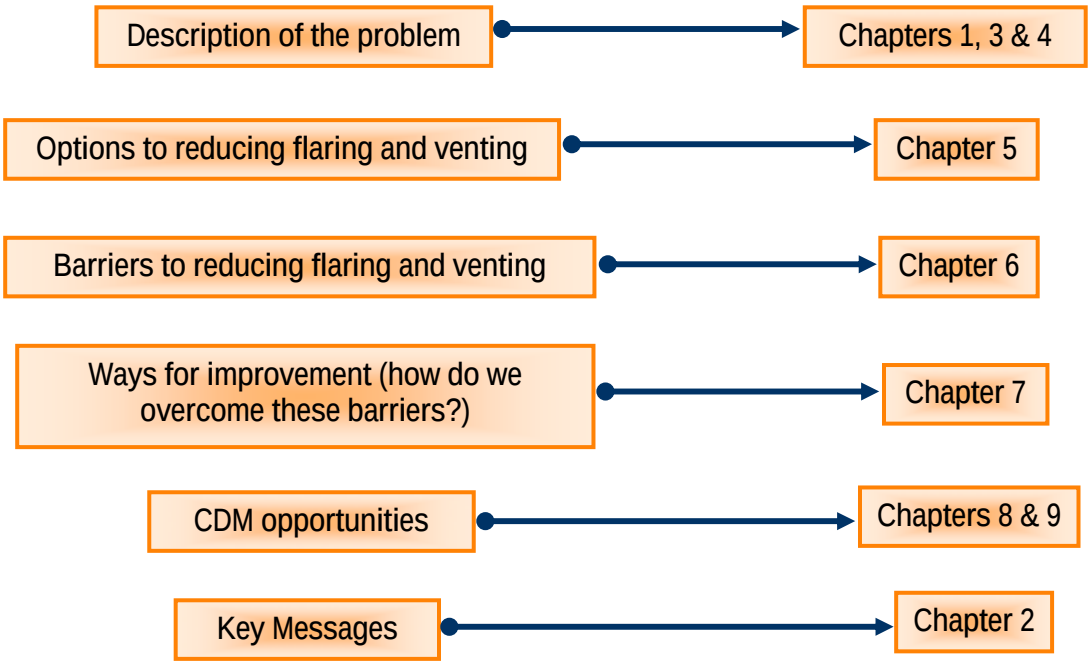
During November 8-9, 2005, ARPEL held a Workshop on *"Flaring and Venting Reductions and Gas Recovery Opportunities in Latin America and the Caribbean"* in Caracas, VENEZUELA.

The Workshop was a forum to share information and knowledge, bringing together more than 100 professionals from the oil & gas industry to discuss practical experiences carried on by different companies as well as national and international policy and regulatory developments on the issue.

The Workshop allowed participants and speakers (26 presentations) to share information on the potential economic and environmental benefits derived from projects aimed at reducing the gas flared/vented in the oil and gas industry in Latin America and the Caribbean, as well as on case studies of profitable projects that have assisted companies in improving their environmental and economic performance. Participants discussed business' opportunities and risks of gas flaring/venting reduction projects in light of national policy developments and gas markets/infrastructure, as well as assessed the role of emerging carbon credits markets to facilitate financing of gas flaring/venting reduction projects.

Several drivers exist to pursue projects aimed at reducing the gas flared/vented in the oil and gas industry. In particular, the Clean Development Mechanism (CDM) may assist in making these projects economically attractive. Potential financing of gas flaring/venting reduction projects to qualify for CDM were presented as well as innovative approaches to commercializing the recovered gas. The barriers which inhibit natural gas development are exacerbated when addressing associated gas utilization, e.g.: absence of a fully developed formal gas policy, gas pricing, infrastructure constraints, access funding constraints, etc.. So, the strategies identified in "flare out policies" could be assisted through the CDM but the emerging frameworks need to recognise the economics. In particular, it is essential to ensure that legislation about flare reduction does not make projects become ineligible for CDM.

STRUCTURE OF THE REPORT



1. INTRODUCTION

Greenhouse gas (GHG) emissions reduction is becoming a key aspect of sustainable development for three main reasons. First, it is the core of international efforts to fight climate change; second, it is closely related to a rational and efficient use of energy resources, and, third, when abating GHG emissions other atmospheric pollutants releases are also reduced and air quality is improved.

When crude oil is brought to the surface, gas associated with such oil extraction usually comes to the surface as well. If oil is produced in areas of the world which lack gas infrastructure or a nearby gas market, a significant portion of this associated gas may be released into the atmosphere, unignited (vented) or ignited (flared).

The World Bank estimates that the annual volume of natural gas being flared and vented is over 100 billion cubic meters, enough to provide the combined annual gas consumption to Belgium and Germany combined. This is also equivalent to more than 10 percent of committed emission reductions by developed countries under the Kyoto Protocol for the period 2008-2012[1]. Flaring in Latin America and the Caribbean alone could produce 35 Terawatt-hours of electricity, about 4 percent of the current electrical power consumption of the Latin American and Caribbean continent[2].

For the past 20 years, global flaring levels have remained virtually constant (although individual country levels have fluctuated) despite efforts made by individual governments and companies, and despite many successes in reducing flaring. The overall effect of these efforts has been limited due to the increase in global oil production and associated gas production; as well as major constraints hindering the development of gas markets, gas infrastructure, and flaring reduction projects, which often require a collaborative approach with key stakeholders taking complementary and supportive action.

In the areas of gas flaring and venting, technology, policies, regulations and commercialization opportunities are developing very rapidly, offering new cost-effective opportunities and solutions –as well as challenges- to improve financial and environmental performance of the oil & gas operations in Latin America and the Caribbean. Also international instruments related to carbon markets, such as the Clean Development Mechanism (CDM) of the Kyoto Protocol, can provide an additional stimulus to work in this field, making available at the same time supplementary financial resources.

In light of this situation, ARPEL[3] (Regional Association of Oil and Natural Gas Companies in Latin America and the Caribbean), joined efforts with the World Bank Global Gas Flaring Reduction Partnership to develop a Workshop on *"Flaring and Venting Reductions and Gas Recovery Opportunities in Latin America and the Caribbean"* during November 8-9, 2005 in Caracas, VENEZUELA. The Workshop was hosted by PDVSA[4] and co-sponsored by Chevron Corporation[5] and RepsolYPF[6].

[1] http://www.worldbank.org/ggfr
[2] ARPEL calculations based on GGFR data (see ibid) and OLADE Energy-Economic Information System – Energy Statistics – Version N° 16, Quito, Octubre/2004. <Online http://www.olade.org.ec/documentos/Plegable%20Siee2004.pdf (cited February 1st, 2006)>
[3] http://www.arpel.org
[4] http://www.pdvsa.com
[5] http://www.chevron.com
[6] http://www.repsolypf.com

This Workshop is the fifth in a series of workshops held by ARPEL concerning climate change, development and CDM issues. In October 2001 in Mexico, the Workshop aimed at raising awareness of potential benefits and uncertainties associated with developing CDM projects in the Region. In December 2002 in Costa Rica, ARPEL joined efforts with IPIECA (International Petroleum Industry Environmental Conservation Association) and UNEP (United Nations Environment Programme) to discuss and provide expert views on practical issues associated with the development of CDM projects.

In October 2003, the ARPEL Workshop –held in Argentina- focused on the experience of oil and gas industry on energy efficiency initiatives and their role in GHG emissions reduction, air quality benefits, as well as improvements in operational and financial flexibility. In September 2004, in Brazil, the event discussed the state-of-the-art resources available in the various fields relevant to the energy business and practical experiences carried on by different companies, including technology transfer and financing[7].

The ARPEL Workshop in Caracas was a forum to share information and knowledge, bringing together more than 100 professionals from the oil & gas industry to discuss practical experiences carried on by different companies as well as national and international policy and regulatory developments on the issue. Potential financing of gas flaring/venting reduction projects to qualify for CDM were also be presented as well as innovative approaches to commercializing the recovered gas.

The objectives of the Workshop included the sharing of information on the potential economic and environmental benefits derived from projects aimed at reducing the gas flared/vented in the oil and gas industry in Latin America and the Caribbean, as well as the presentation of case studies in profitable projects that have assisted companies in improving their environmental and economic performance. Participants discussed business' opportunities and risks on gas flaring/venting reduction projects in the light of the present status on national policy developments and gas markets/infrastructure, as well as assessed the role of emerging carbon credits markets to facilitate financing of gas flaring/venting reduction projects.

[7] See http://www.arpel.org → Library → Climate Change to download the presentations and the Reports of the Workshops mentioned

2. KEY MESSAGES OF THE WORKSHOP

Initiatives and Drivers

Several new initiatives, new technology, a real world value for carbon emissions reductions, and increased demand for gas are offering the promise for greater flaring and venting reduction opportunities to occur in the future.

- Gas is often associated with oil resources and flaring is the least cost option to eliminate the excess of gas while the oil production increases.
- The increase in energy demand of Latin America and the Caribbean offers both a potential for the eco-efficiency and a challenge to flaring and venting reduction.
- Actual and accurate data is required to better understand the magnitude of the problem before starting any energy efficiency improvement endeavours.
- The source typology (e.g., processing, compression, or pipelines facilities) must be assessed to estimate the methane emissions. Software such as SANGEA™, and widely accepted guidelines to develop GHG emissions inventories such as the API *"Compendium of GHG Emissions Estimation Methodologies for the Oil and Gas Industry"* and the IPIECA/API/OGP *"Petroleum Industry Guidelines for Reporting GHG Emissions"*, are helpful tools to accomplish this task.
- Benchmarking initiatives on gas flared/vented –such as the one developed by the OGP- are helpful management tools to assist industry in improving its environmental and economic performance; however harmonizing emissions data gathering still remains a challenge.
- Converting recovered gas to liquid or compressed natural gas, or using it for electricity, may be a solution to reducing or eliminating flaring. However, market barriers often exist that prevent these projects. Local characteristics –such as the need for investment in new facilities- must be considered.
- An important future challenge will be the upgrade of presently obsolete or technologically insufficient gas infrastructure to improve recovery and processing.

National and International Policies and Drivers

A range of governmental and partnership activities are emerging to support flaring and venting reduction.

- Natural gas demand is growing rapidly in Latin America and methane emissions reduction is a focus for the Methane to Markets Partnership, which would promote cost-effective ways to help reduce methane emissions in Latin America.
- The US EPA Natural Gas STAR Program promotes voluntary participation by the natural gas industry of US and Latin American countries to reduce methane emissions.
- The Global Gas Flaring Reduction Partnership has created an international standard that promotes public-private cooperation to address flaring and venting reduction.
- A successful regulation on gas flaring/venting depends on accomplishing stakeholder consensus. Regulations must define clear roles for the enforcement process governmental entity. Voluntary industry standards can play an important "supplement" to conventional regulations, especially for standardizing monitoring and reporting requirements.

Carbon Credits as a Means to Support Flaring and Venting Reduction

The presence of a new global carbon value and mechanisms such as the Clean Development Mechanism offers the opportunity to add new value to –and promote- flaring and venting reduction activities.

- Energy efficiency, environmental management and carbon credits are the cornerstones of gas flaring reduction initiatives.
- Gas flaring reduction should not be mandatory in order to allow for the approval of this type of CDM projects.
- Developing countries will likely support CDM beyond 2012 as the CDM helps countries to modernize and de-carbonize the energy infrastructure.
- It is important to develop a positive momentum by building the capacity (within the oil and gas sector) on gas flaring/venting reduction projects to qualify for CDM.
- Some baseline and monitoring methodologies for CDM projects focusing on gas flaring and venting reduction are beginning to be approved by the CDM Methodologies' Panel.
- Existing CDM procedures are extremely complex and burdensome, leading to delays and transaction costs that increase the risk for investors. Climate change national authorities should keep the CDM process simple and foster developed and developing countries business partnerships.
- There is a need to address remaining uncertainties on the CDM projects' approval process: widely accepted additionality guidelines, merging baseline methodologies and lenient project boundaries, among others.

3. THE OPERATION

Large quantities of gas –usually produced as a by-product of oil production and refining- are flared worldwide.

Upstream sources dominate the global volumes of vented and flared gas. Typical venting sources during upstream operations include: storage tank relief, wellheads (especially from multiple small wells), piping systems, aging or inadequately engineered systems, un-authorized tapping, compression station leaks and gas-operated control valves. Gas produced as normal by-product of oil production operations is generally used to power production systems. However, excess gas is often produced and, in remote regions, gas production typically far exceeds local demand. In this case, flaring is the low-capital, low-operating-cost gas handling alternative, and a more desirable alternative to venting for safety as well as for environmental (i.e., reduced CO_2e emissions) reasons.

Many refining processes produce gas as a by-product, normally utilized for fuel or exported as product. Also, non-steady-state operations result in excess gas or gas produced more rapidly than can be handled by the refining system. Typically, flares are needed to safely handle excess gas.

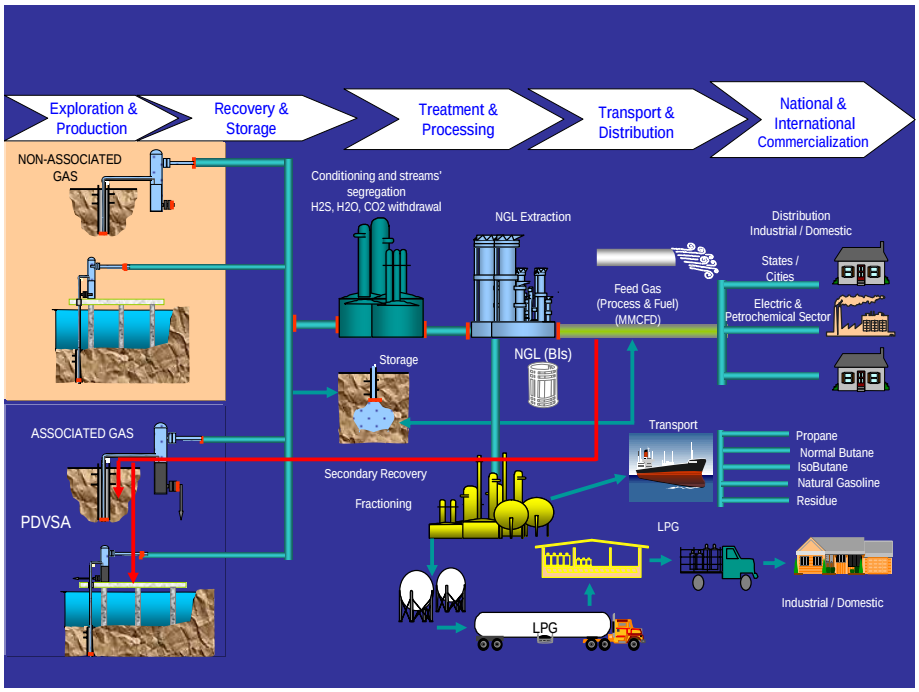


Figure 1: Key Processes of Natural Gas in Venezuela
Source: Presentation of Arcángelo Sena at the Workshop

Given the potential commercialization value of unused gas, companies try to find solutions to reducing or eliminating flaring by converting gas to LNG, electricity or compressed natural gas. However, market barriers often exist that prevent these projects.

At the Workshop, it was made evident that some companies in Latin America have high gas recovery in certain areas of operations and therefore little flaring. Even so, the ageing equipment and technology, which was not designed for gas recovery, may prevent the implementation of effective gas recovery/reduction initiatives in the short term.

Besides individual companies' efforts, the US EPA Natural Gas STAR Program[8], in cooperation with the Methane to Markets Partnership[9], is working with companies in major gas producing countries to reduce methane emissions internationally, promoting voluntary participation by the natural gas industry of US and Latin American countries to reduce methane emissions.

[8] http://www.epa.gov/gasstar/
[9] http://www.methanetomarkets.org

4. THE MAGNITUDE OF THE ISSUE

Although the reliability and availability of data varies widely, global flaring and venting level is over 100 bcm/year, similar to the annual gas consumption of Belgium and Germany[10] combined and more than 10 percent of committed emission reductions by developed countries under the Kyoto Protocol for the period 2008-2012. Eighty percent of worldwide global venting and flaring occurs in fewer than 10 countries.

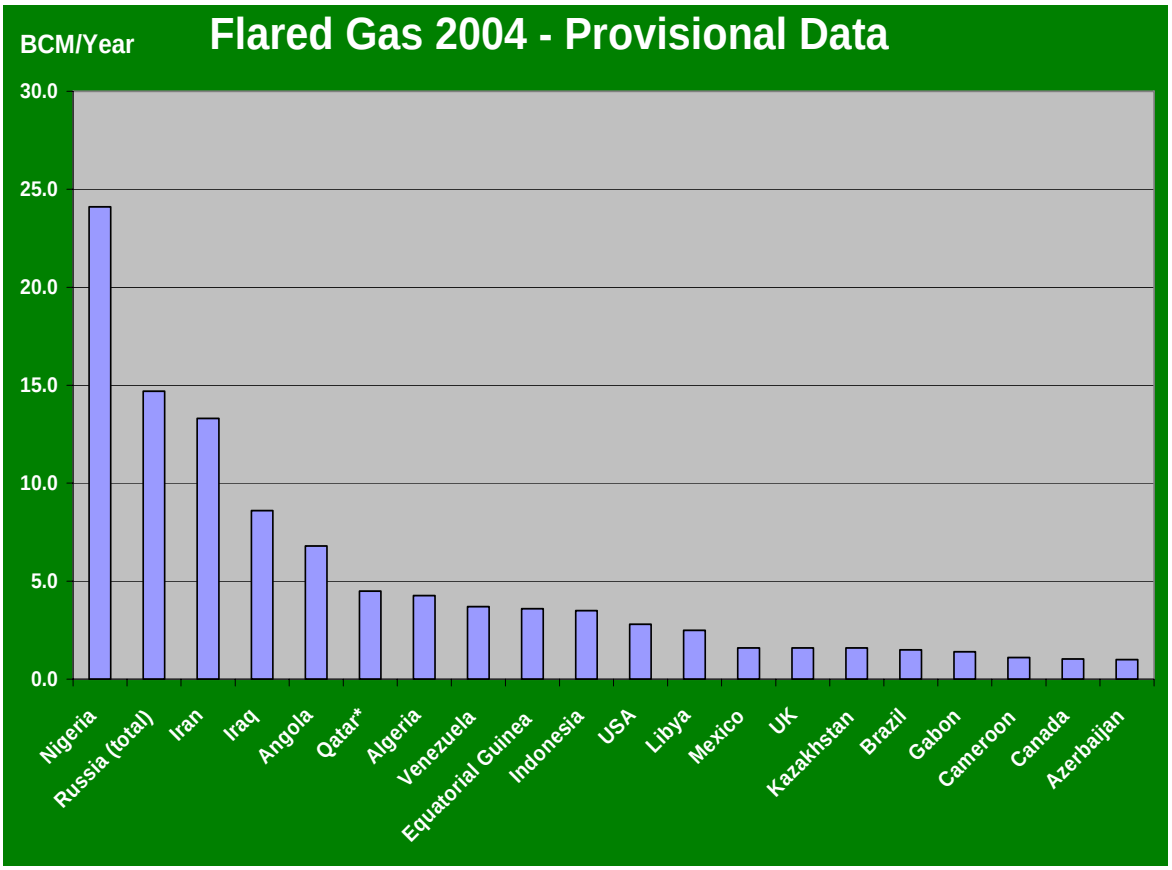


Figure 2: Provisional data on flared gas (10^9 m^3)
Source: Presentation of Sascha Djumena at the Workshop

Since 1998, the International Association of Oil & Gas Producers (OGP[11]) has collected gaseous emissions data from its member companies on an annual basis in order to allow its members to compare their performance with other companies in the sector, hopefully leading to improved and more efficient performance. According to OGP's 2004 data –representing ca. 34% of global oil and gas production- the industry emitted an average of 1.1 tonne of methane and 138 tonnes of carbon dioxide per thousand tones of production. The OGP analysis confirmed the information shared at the workshop: there is a direct link between the level of infrastructure to collect, market and use the gas associated with the production of oil and the level of gaseous emissions of methane; where infrastructure and markets are poorly developed or absent, normalized emissions are significantly higher.

[10] According to BP Statistical review of world energy, the consumption in 2004 was 16.3 bill.Sm^3 for Belgium and 85.9 bill.Sm^3 for Germany
[11] http://www.ogp.org.uk/

Benchmarking initiatives on gas flared/vented –such as the one developed by the OGP- are helpful management tools to assist industry in improving its environmental and economic performance; however harmonizing emissions data gathering still remains a significant challenge. Emissions inventories tools, such as SANGEA™[12] and the API Compendium[13], are vital in promoting global consistency in the estimation of emissions and losses of gases in upstream and downstream operations.

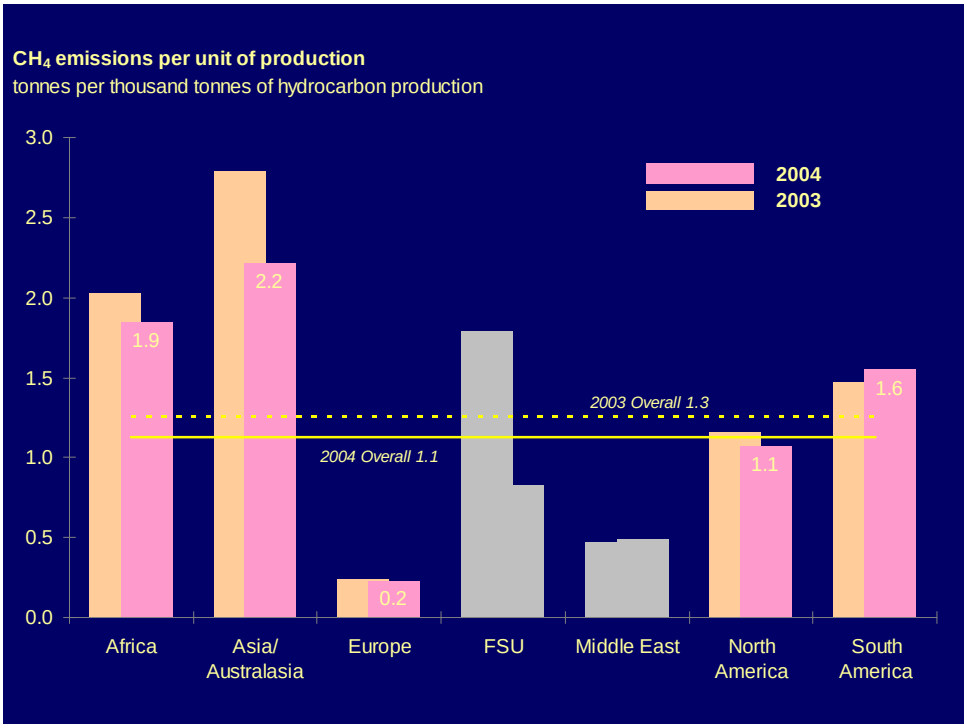


Figure 3: CH_4 emissions/unit production – Data of selected OGP members
Source: Presentation made by John Campbell at the Workshop
(Data for FSU and Middle East are in grey because they represent less than 20% of oil and gas industry activity in those regions and are therefore not used for comparison with other regions)

[12] http://ghg.api.org/
[13] http://api-ec.api.org/policy/index.cfm?bitmask=001001004001000000

5. SOME REDUCTION INITIATIVES

As part of eco-efficiency initiatives and programs, companies of the oil and gas sector are pursuing the maximization of gas recovery and developing innovative ways, sometimes in partnership with governments, to use the gas recovered. These initiatives need to combine the expertise of several divisions of oil and gas companies, including: operations; environment, health and safety; maintenance; commercialization and logistics, among others.

Often, there are barriers that prevent -mostly state owned- companies to proactively pursue gas reduction and recovery projects. These include lack of awareness of the value of gas and of information on technology, the fact that "common practices" make it difficult to implement new processes or technologies, limited methane markets and infrastructure, uncertain investment climate as well as local or regional normative barriers. However, the presentations made in this session highlighted some key issues to encourage the implementation of gas reduction and recovery projects, by pointing out that they:

- can be driven by safety and maintenance issues;
- may support accomplishing specifications regulated for gas;
- should address problems found "at the source";
- can be efficiently boosted by appropriate regulatory and fiscal incentives;
- can power production facilities if associated to dual-system (gas diesel) technology;
- can increase energy efficiency;
- could be utilized to obtain credits under the Kyoto flexibility mechanisms; and
- can reduce local air pollution

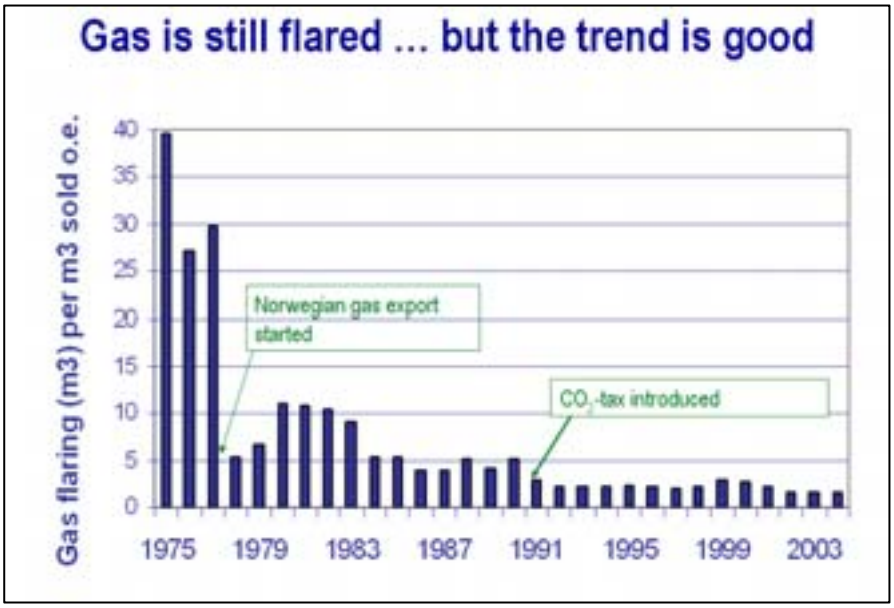


Figure 4: Trends in gas flared at Statoil
Source: Presentation made by Ivar Saetre at the Workshop

Methane emissions reduction is a focus for the Methane to Markets Partnership, a voluntary, non-binding framework for international cooperation to advance the cost/effective recovery and use of methane as a valuable clean energy source, which would promote cost-effective ways to help reduce methane emissions in Latin America. The role of the Partnership is to bring diverse organizations together with international governments to catalyze the development of methane projects. The private sector, the research community, development banks and other governmental and non-governmental organizations are encouraged to collaborate with the Partners and contribute to the Partnership by joining the Project Network. The Methane to Markets Partnership has been working in projects in Colombia utilizing the Methane to Markets initiative within the Kyoto Protocol framework and is willing to expand their work to other LAC countries.

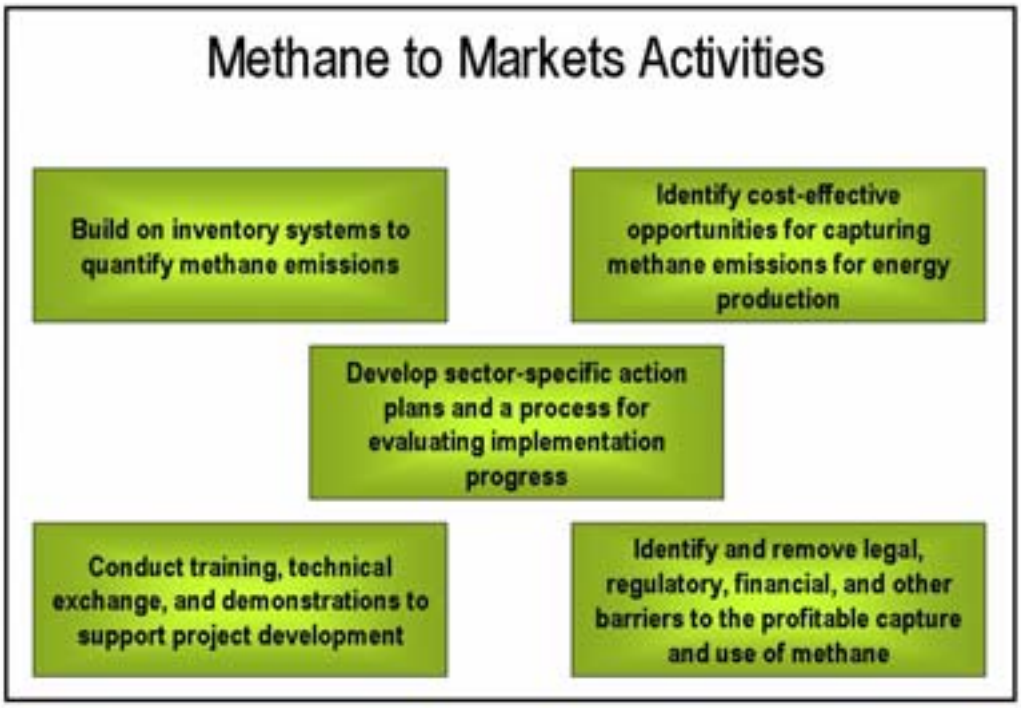


Figure 5: Focus of Methane-to-Markets Partnership
Source: Presentation made by Carey Bylin at the Workshop

6. GAS RECOVERY RELATED ISSUES

In order to be utilized, recovered gas has to be extracted, processed, transported and distributed to reach the end-users with and adequate –often regulated- specification. Typically, the specifications relate to minimum content of methane, and maximum content of impurities such as water, H_2S, C2+ and CO_2. The challenges to make this in a cost-effective manner are various and include the type of reservoir (see Figure 6) and the processes to make the methane available according to the regulated specifications, not to mention the fiscal –and other- regulations that would allow this operation to take place with economic benefits for the operator.

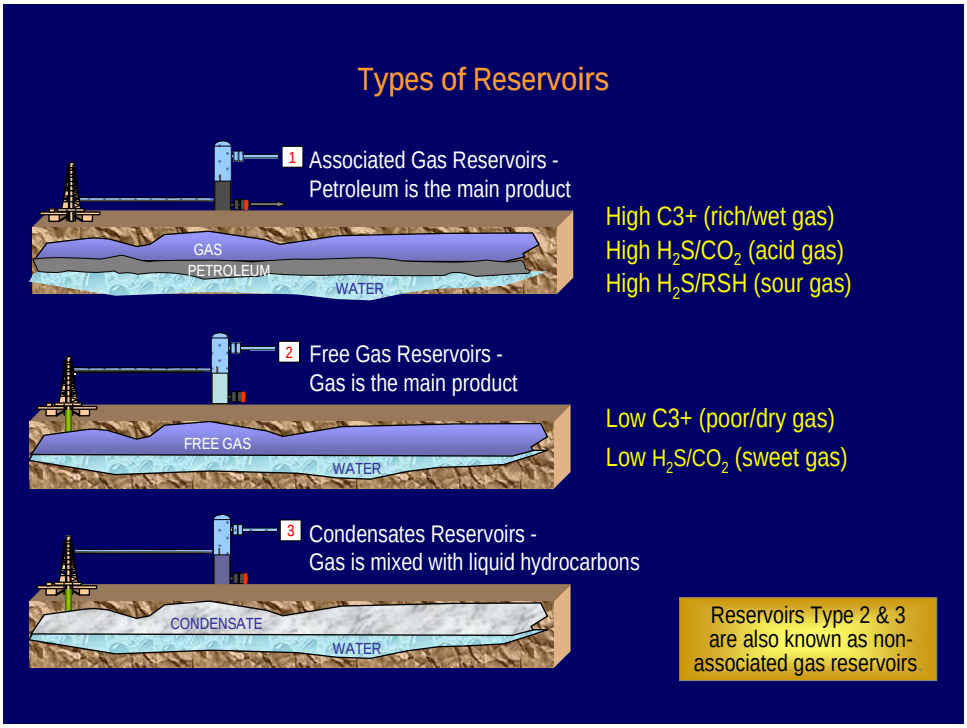


Figure 6: Gas found at different types of reservoirs
Source: Presentation made by Julio Ascanio, Luis Gonzalez & Jaime Bermudez at the Workshop

If governments want industry to maximize the gas recovery for its commercialization, there are several issues they will need to consider:

- Foster internal demand of gas
- Develop energy policies on gas flaring/venting reduction
- Consider the challenge of investment needs
- Develop gas prices' scenarios
- Encourage the use of gas to generate electricity for local communities
- Analyze the distributed gas specifications to maximize gas recovery at an affordable cost (to the operator)

7. NATIONAL & INTERNATIONAL POLICIES AND INITIATIVES

7.1. How Do Companies Prepare for Governmental Gas Flaring/Venting Policies?

Few countries in Latin America and the Caribbean have policies or legislation related to gas flaring/venting standards. With no commitments for GHG emissions reduction under the United Nations Framework Convention on Climate Change (UNFCCC), this might make sense. However, industry –with a proactive attitude- is working towards the development of management strategies, policies and projects that take into consideration the recovery or reduction of the gas flared/vented in its operations.

The approaches taken by oil and gas companies may vary, but are usually based on corporate commitment and policies (top to bottom approach) as well as on GHG management systems identifying current and future sources, establishing vent and flare management –internal- standards and looking for commercial opportunities. Companies are looking for commercial projects to utilize the recovered gas, trying to find synergies to address implementation barriers and encouraging a proactive approach to GHG emissions management with their joint-ventures' partners.

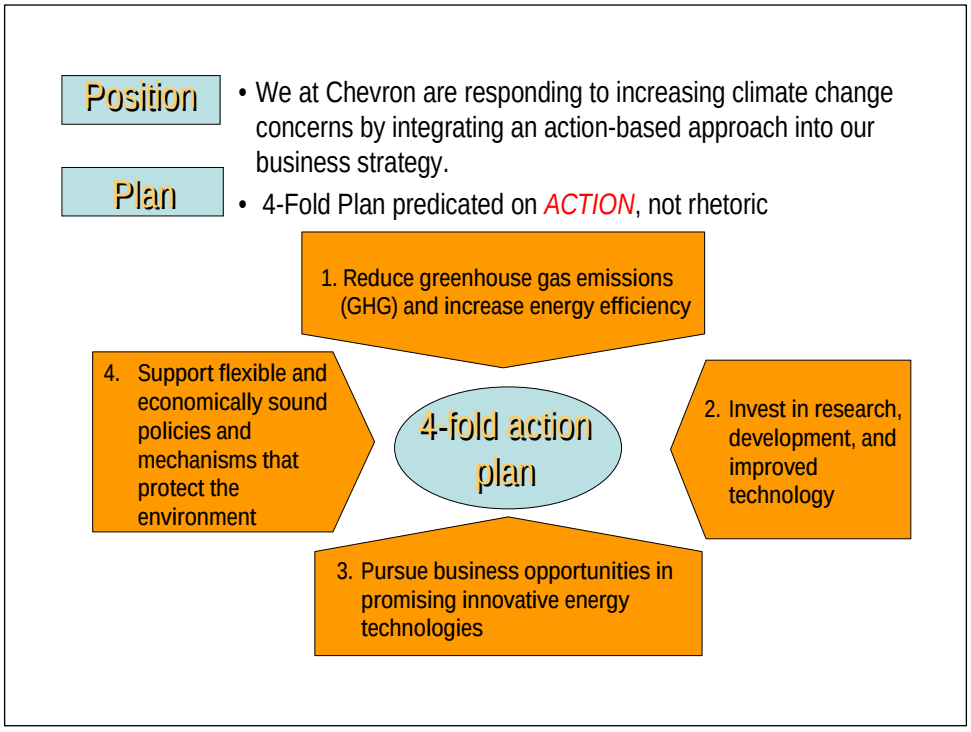


Figure 7: Chevron "Four-Fold Action Plan" to gas flaring/venting management
Source: Presentation made by John Shinn at the Workshop

To make the process in a cost-effective manner, companies develop associated gas recovery plans to first address the largest sources (see Figure 8 in which 25% of flares/vents produces 90% of emissions). Also, expert/stakeholders network are established company-wide.

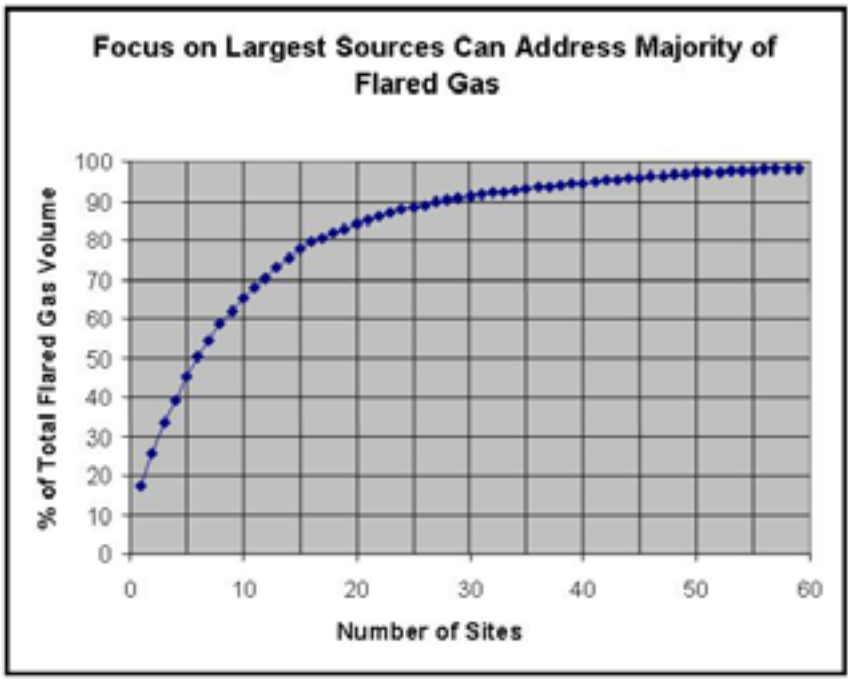


Figure 8: Evaluation of sites' contribution to gas flaring/venting
Source: Adapted from presentation made by John Shinn at the Workshop

Technology innovation is vital in addressing the challenge of future GHG emissions reductions. The different scenarios developed by the Intergovernmental Panel on Climate Change (IPCC) arriving at 550 ppm concentration of GHG in the atmosphere show that even within an ambitious level of implementation of the current technology, new -and maybe even not invented- technology needs to be implemented. Aware of this situation, the oil and gas industry develops its GHG management policies with a strong focus on the development and implementation of state-of-the-art and breakthrough technology.

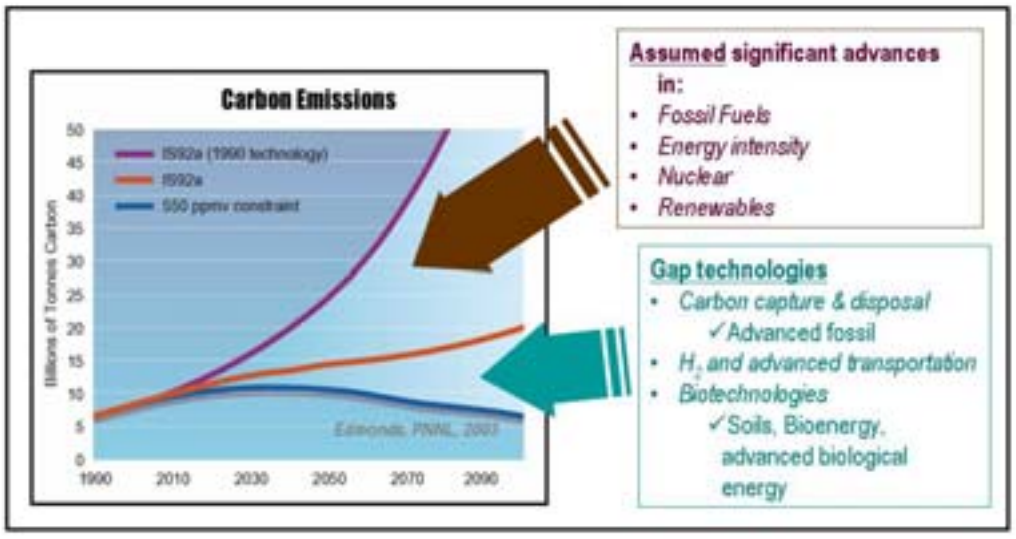


Figure 9: "New energy technology is needed"
Source: Presentation made by Per Øivind Johansen at the Workshop

7.2. Governmental Approach to Developing Gas Flaring/Venting Policies

Two case studies on governments' approaches to developing gas flaring/venting policies were presented: Algeria and Venezuela. Some of the challenges and opportunities these governments are facing in their attempts to develop this endeavor include:

- Laws/regulations enforcing the elimination of gas flared/vented are applicable to new fields. Thus, existing fields could continue flaring and venting gas.
- Limitations on industry's capital investment may be addressed by presenting the project as a CDM project. Governments need to have Designated National Authorities and build their capacity to accomplish this. The issue of Additionality, in the case flaring/venting is prohibited by law, still remains uncertain.
- Legal framework must consider industry operations in the context of best available technological, environmental and safety practices. Regulatory framework must be based on an assessment of infrastructure and procedures in the production fields and encourage the commercialization and use of gas in order to –also- develop emissions reductions strategies.

In 2004, the Global Gas Flaring Reduction Partnership (GGFRP) developed a study analyzing regulatory regimes of 44 different oil producing countries[14]. Several issues were identified as key to a successful regulatory framework focused on reducing gas flaring/venting and the commercialization of recovered gas:

- The role of government in defining flaring and venting policies.
- The institutional characteristics of flaring and venting regulation.
- The adopted operational processes and regulatory procedures.

Other relevant factors that this GGFRP report found having an effect on flaring and venting volumes include: the role of standards, the impact of financial incentives, the effects of contractual rights, and the structure of the downstream energy markets. This report concludes that regulation can, and should play an important role in achieving reductions in flaring and venting volumes in developing countries, and it recommends that governments develop policies and that legislation be established, with regulatory agencies independent from regulated operators, to avoid conflict of interest. Furthermore, clear and efficient operational processes should be adopted and adequate finance available to be able to enforce compliance with regulations. Simultaneously transparent gas flaring and venting application and approval procedures should also be established.

Other non-regulatory factors can improve the economics of commercializing associated gas, thus enhancing the opportunity to rapidly applying a regulatory framework. These include:

- Voluntary industry standards can play an important "supplement" to conventional regulations, especially for standardizing monitoring and reporting requirements.
- Financial incentives (e.g., taxes, royalty waivers, carbon credits, etc.) to incentive operators to reduce flaring.
- An open and competitive downstream market.

[14] "Regulation of associated gas flaring and venting: a global overview and lessons from international experience" - Report # 29554 (2004.04.01).
<Online http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000012009_20040716133951 (cited December 19, 2005)>

International experience demonstrates that those countries that achieved sustainable reductions in flaring and venting volumes have all established a comprehensive and effective regulatory framework (with efficient monitoring and enforcement powers). They have also established a consensus-based approach where all stakeholder, including operators, are actively involved in the development and execution of regulations, as well as open and competitive downstream energy markets that enable operators to market (i.e., utilize) gas.

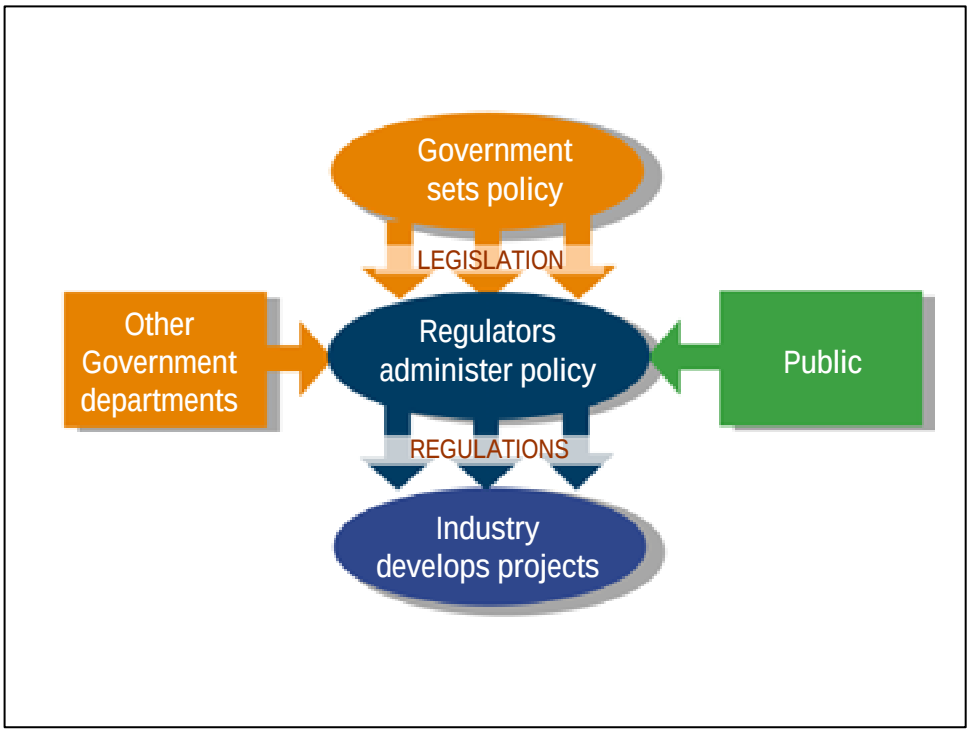


Figure 10: Regulatory framework diagram in the Province of Alberta, CANADA
Source: Presentation made by Calliope Webber at the Workshop

8. ASSOCIATED GAS REDUCTION & RECOVERY AND CDM PROJECTS

GHG emissions are associated to the use of energy. The problem is not solved only by considering mitigation measures but also through an adequate energy management. The most effective way of accomplishing this is considering the "eco-efficiency triangle" (see Figure 11). Any measure taken by addressing any of the issues in the corners of the triangle will affect the other two elements and –then- with a single action, benefits are accomplished in the three elements of the triangle (GHG emissions reductions, criteria pollutants emissions reduction and energy efficiency)

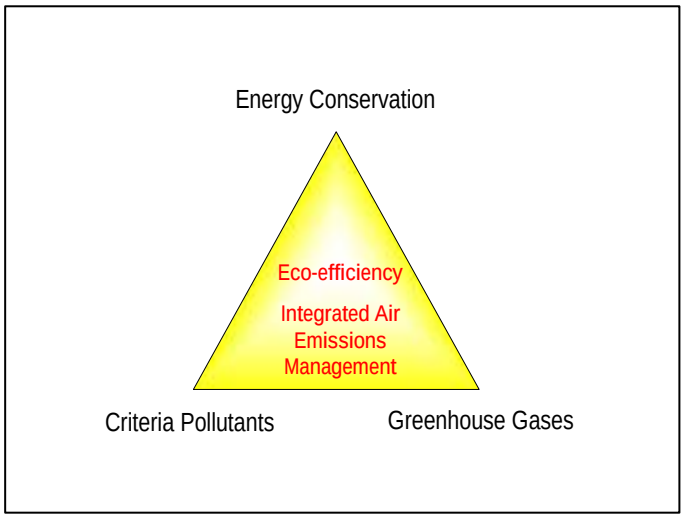


Figure 11: Reducing emissions and improving efficiency
Source: Presentation made by Braulio Pikman at the Workshop

Implementing CDM is a *"learning by doing"* process. Despite this difficulty, CDM is providing some results and the number of projects presented for validation is doubling every 5 months. On November 4, 2005, 406 projects had been presented of which 185 were from Latin America. To date, only one baseline methodology for gas flaring reduction projects has been approved by the Executive Board of the CDM: *"AM0009 Recovery and utilization of gas from oil wells that would otherwise be flared"*[15] derived from the Rang Dong Oil Field Associated Gas Recovery and Utilization Project located in Vietnam.

This session of the Workshop addressed the issues and challenges for associated gas recovery/reduction projects to be approved as CDM projects.

- At least three possible new methodologies should be assessed:
  - ✓ Improving flare destruction efficiency
  - ✓ Destruction of methane that otherwise would be directly vented to atmosphere
  - ✓ Gas flaring reduction projects (improving AM 0009)
- Limitations for approval include:
  - ✓ Accurate and precise measurement the amount of gas flared and currently vented (composition and flow).
  - ✓ Further research on the estimations or measurements of flare destruction efficiencies. At present, estimates of flare efficiency range from 20 % to 99 % and this leads to large uncertainties as to the effects of flaring on the environment.

[15] "Revision to Approved Baseline Methodology - Recovery and utilization of gas from oil wells that would otherwise be flared" AM0009 Version 2 – 13 May 2005. <Online http://cdm.unfccc.int/UserManagement/FileStorage/AM0009version2.pdf (cited January 31, 2006)>

- CDM is very strict in the estimation of emissions reductions. This is particularly relevant to gas flaring reduction projects because, due to the intermittent nature of the process, the majority of flare emissions are concentrated into just a fraction of time of actual flaring. During this period, five or more times the normal emissions are released into the atmosphere and the environmental impacts on local air quality may be larger than anticipated.
- The barriers which inhibit natural gas development are exacerbated when addressing associated gas utilization, e.g.: absence of a fully developed formal gas policy, gas pricing, infrastructure constraints, access funding constraints, etc.. So, the strategies identified in "flare out policies" could be assisted through the CDM but the emerging frameworks need to recognise the economics. In particular, it is essential to ensure that legislation about flare reduction does not make projects become ineligible for CDM.

It is important to note that carbon credits obtained while implementing associated gas recovery projects (accepted as CDM projects) can represent an important source for upgrading facilities. An added advantage is the fact that the Internal Rate of Return of the project would be less susceptible to changes in natural gas price, thus reducing the business risk of the investment (see Figure 12).

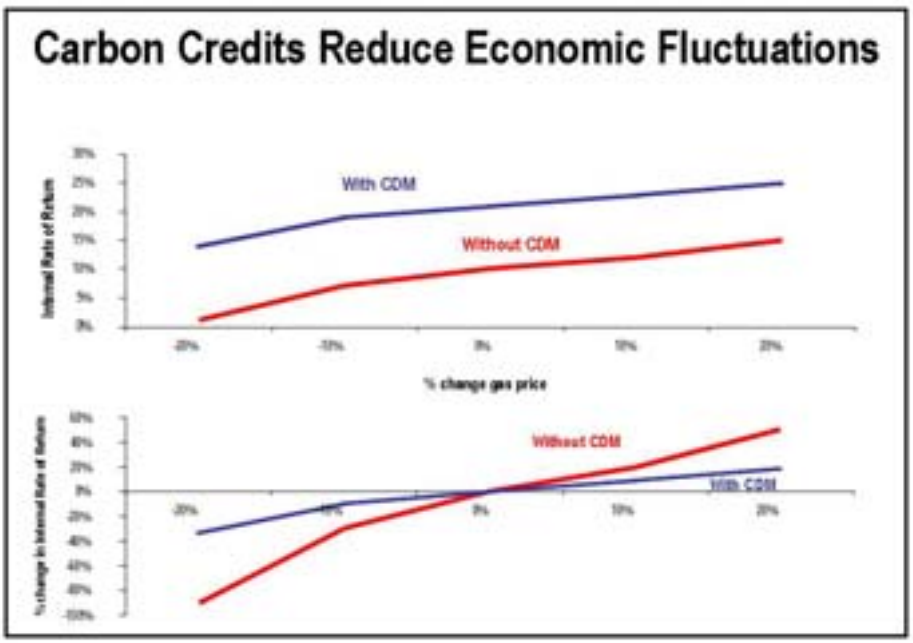


Figure 12: Sensitivity of the IRR of gas recovery projects to gas price changes - With and without CDM
Source: Presentation made by Torleif Haugland at the Workshop

The GGFR Partnership supports its Partners by developing demonstration projects that could be eligible for participation in the Kyoto Mechanisms. They are testing new issues such as ownership and policy development to remove barriers, reduce transaction costs and lead the way forward. They also provide technical assistance to enhance the capacity of host countries to develop, assess and approve high-quality gas flaring CDM (and Joint Implementation) demonstration projects such as re-injection, gas to power, LNG and gas to pipe.

In short, CDM and other Kyoto Mechanisms are drivers for new gas flaring/venting reduction projects, however, countries need to assist in this process by putting an adequate legal, regulatory and institutional framework in place. Also, international institutions need to prove agile in their procedures and methodologies' approval. There is a finite time to develop projects and a need to act now to maximize benefits of carbon funds (2008-2012 commitment period). Action is needed now to ensure incentives offered via mechanisms are optimised, as gas flared/vented is forever wasted.

9. EMISSIONS REDUCTION CREDITING OF ASSOCIATED GAS REDUCTION & RECOVERY

9.1. International Perspectives for Gas Flaring/Venting Reduction and CDM Projects

CDM was presented as a promise of financing projects, addressing money that would be destined for projects with high return and small GHG emissions reductions, access to resources and to promote the compliance with GHG reductions targets.

However there are still many stoppers, complications and risks for gas flaring/venting reduction/recovery projects to qualify for CDM. These CDM stoppers relate to:

- *Policies* – for example countries like Nigeria that plan to legislate a prohibition on gas flaring by 2008; or voluntary company commitments (e.g., Shell Nigeria "flares out" policy[16]), or voluntary programs like GGFR.
- *Financial issues* that exclude profitable projects, thus challenging their additionality, and
- *Leakage issues* such as concerns expressed about precluding the crediting of emissions reductions of projects involving the commercial use of downstream gas.

Experience gained so far by developers of CDM projects related to the use of recovered gas from flaring/venting suggest splitting the project into upstream and downstream components. From the producers' side, the project reduces flaring emissions by putting associated gas into pipeline thus reducing emissions relative to other gas sources. Downstream power stations will be switching from existing fuel oil use to gas use, reducing emissions by lower carbon fuel and efficiency improvements

Under the regulations in place for CDM projects, does the value justify the project? The answer sentences CDM just for small marginal projects with small impact on GHG emissions reductions.

9.2. Financing Gas Flaring/Venting Reduction Projects Proposed for CDM Projects

The multilateral banking and financial sectors play an important role in the implementation of the Kyoto Mechanisms, including CDM. They can assist the process by:

- loaning the funds required to develop a project (see figure 13);
- purchasing carbon credits;
- catalyzing the carbon market through the development of new markets and sectors for carbon finance, building capacity in client countries and providing liquidity to the market;
- addressing market distortions, by opening markets for small projects and small countries; and
- integrating and strengthening technical assistance and capacity building, by assisting participating countries to access markets.

[16] <Online http://www.shell.com/home/Framework?siteId=nigeria&FC2=/nigeria/html/iwgen/about_shell/our_performance/meet_target/flares/zzz_lhn.html&FC3=/nigeria/html/iwgen/about_shell/our_performance/meet_target/flares/dir_ontarget_1103_1556.html (cited February 9, 2006)>

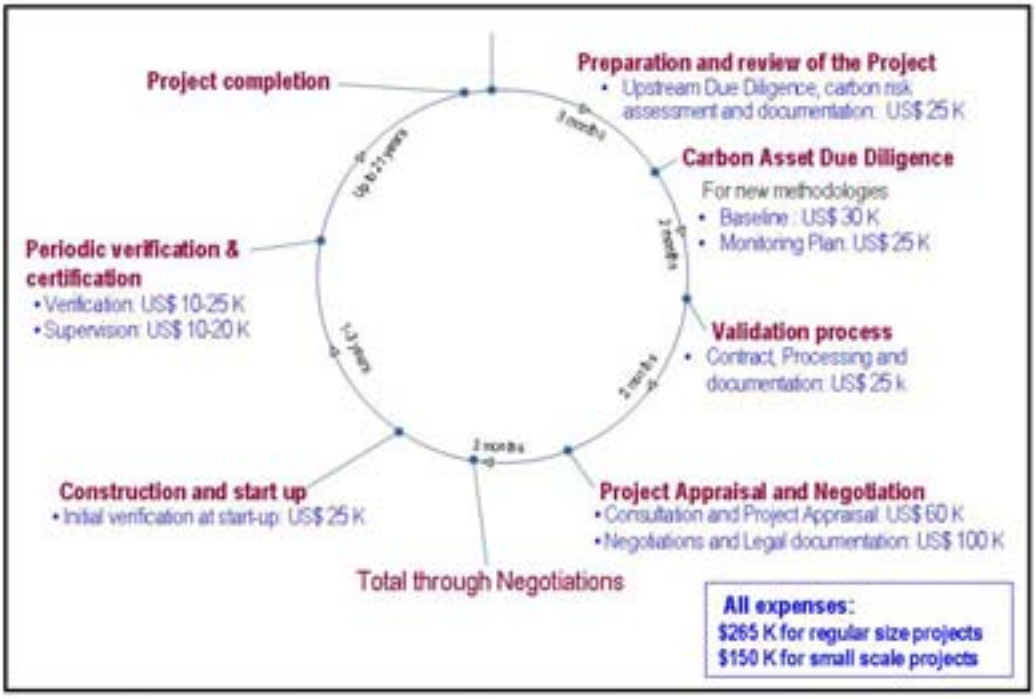


Figure 13: Carbon asset creation and maintenance manufacturing process and costs based on the World Bank experience
Source: Presentation made by Eduardo Dopazo at the Workshop

The Corporación Andina de Fomento (CAF), through its Programa Latinoamericano del Carbono[17], aims at increasing the competitiveness and sustainability of Latin American and Caribbean countries, through the promotion and strengthening of opportunities in the GHG emissions reductions market.

The World Bank Carbon Finance Unit (CFU[18]) uses money contributed by governments and companies in OECD countries to purchase project-based greenhouse gas emission reductions in developing countries and countries with economies in transition. The emission reductions are purchased through one of the CFU's carbon funds on behalf of the contributor, and within the framework of the Kyoto Protocol's Clean Development Mechanism or Joint Implementation. Unlike other World Bank development products, the CFU does not lend or grant resources to projects, but rather contracts to purchase emission reductions similar to a commercial transaction, paying for them annually or periodically once they have been verified by a third party auditor.

The International Finance Corporation (IFC) Carbon Finance Facility[19] is an arrangement under which IFC purchases carbon credits for the benefit of the Government of the Netherlands under the international emission reduction transfer rules of the Kyoto Protocol.

Gas flaring and venting reduction projects, tailored to qualify as CDM projects qualify in the portfolio of opportunities of these three multilateral banks. In some cases, CDM project ideas related to associated gas recovery have already been presented and are under consideration.

[17] http://www.caf.com/plac
[18] http://www.carbonfinance.org
[19] http://www.ifc.org/carbonfinance

ARPEL Workshop

"Flaring and Venting Reductions and Gas Recovery Opportunities in Latin America and the Caribbean"

November 8-9, 2005 – *Caracas Hilton Hotel, VENEZUELA*

Workshop Program

November 8

09:00 – 09:30 am	Introduction ▪ Welcome Remarks of the Host Companies/Organizations ➢ *Ana Elisa Osorio, PDVSA* ➢ *Arthur Lee, Chevron* ➢ *Jaime Martin, RepsolYPF* ➢ *Sascha Djumena, Global Gas Flaring Reduction Partnership* ➢ *Miguel Moyano, ARPEL*
09:30 – 09:45 am	▪ Objectives and Importance of the Issue – Update on Kyoto Protocol and its Relation to Flaring and Venting Reduction ➢ *Vicente Schmall, PETROBRAS - Chairman of the ARPEL Climate Change Working Group*
09:45 – 11:00 am	The Operation – MODERATOR: Vicente Schmall, PETROBRAS ▪ Sources of –and Reasons for- Flaring and Venting ➢ *John Shinn, Chevron* ➢ *Arcángelo Sena, PDVSA* ➢ *Carey Bylin, U.S. EPA Natural Gas STAR Program*
11:00 – 11:30 am	COFFEE BREAK
11:30 – 12:30 pm	The Magnitude of the Issue – MODERATOR: Arthur Lee, Chevron ▪ Impact of Data and Standard on Gas Flaring and Venting from the World and the Region ➢ *Sascha Djumena, Global Gas Flaring Reduction Partnership* ▪ Data on Gas Flaring and Venting from the International Upstream Oil Industry ➢ *John Campbell, International Oil & Gas Producers Association*
12:30 – 02:15 pm	LUNCH HOSTED BY RepsolYPF
02:15 – 03:45 pm	Some Reduction Initiatives – MODERATOR: Andrew Mingst, Chevron ▪ Maximizing Gas Recovery and Gas Production ➢ *José Cordero & Juan Herrat, PDVSA* ▪ Case Studies from Regional/International Companies. Best Practices ➢ *Ivar Saetre, Statoil* ➢ *Hernan Sanchez Chacón, RepsolYPF* ▪ The Methane to Market Partnership ➢ *Carey Bylin, U.S. EPA Natural Gas STAR Program*
03:45 – 04:15 pm	COFFEE BREAK
04:15 – 05:00 pm	Gas Recovery Issues – MODERATOR: Calliope Weber, GGFR Partnership ▪ Policies and Best Practices ➢ *Julio Ascanio & Luís González, PDVSA* ▪ Commercialization of Recovered (i.e., non-flared and non-vented) Gas. New Markets for Gas ➢ *Inti Garzón, Ministry of Energy and Petroleum of Venezuela & Adalberto Nuñez, National Gas Organization of Venezuela*
07:30 – 09:30 pm	COCKTAIL HOSTED BY Chevron and RepsolYPF

November 9

09:00 – 11:00 am	National and International Policies/Initiatives – MODERATOR: Arcángelo Sena, PDVSA ▪ Global Gas Flaring and Venting Reduction Partnership ➢ *Calliope Weber, Global Gas Flaring Reduction Partnership* ▪ How do Countries Prepare their Gas Flaring/Venting Reduction Policies? ➢ *Algeria – Sascha Djumena, Global Gas Flaring Reduction Partnership* ➢ *Venezuela – Inti Garzón, Ministry of Energy and Petroleum of Venezuela* ▪ How do Companies Prepare for Governmental Gas Flaring/Venting Policies? ➢ *John Shinn, Chevron* ➢ *Per Øivind Johansen, Statoil*
11:00 – 11:30 am	COFFEE BREAK
11:30 – 12:30 pm	Associated Gas Reduction/Recovery and CDM Projects – MODERATOR: Ivar Saetre, Statoil ▪ Opportunities and Issues for Gas Flaring/Venting Reduction Projects' Approval ➢ *Braulio Pikman – ERM Brazil* ➢ *Torleif Haugland, ECON* ➢ *Calliope Weber, Global Gas Flaring Reduction Partnership*
12:30 – 02:15 pm	LUNCH HOSTED BY Chevron
02:15 – 03:45 pm	Emissions Reductions Crediting of Associated Gas Recovery/Reduction – MODERATOR: Jaime Martín, RepsolYPF ▪ International Perspectives for Gas Flaring/Venting Reduction and CDM Projects ➢ *John Shinn, Chevron* ➢ *Braulio Pikman, on behalf of the CDM Meth Panel* ➢ *Rebeca Sainz, Climate Change Office of Spain*
03:45 – 04:15 pm	COFFEE BREAK
04:15 – 05:45 pm	Emissions Reductions Crediting of Associated Gas Recovery/Reduction (cont'd) – MODERATOR: Vicente Schmall, PETROBRAS ▪ Financing Gas Flaring/Venting Reduction Projects Proposed as CDM Projects ➢ *Francisco Sucre & Jorge Barrigh, Latin American Carbon Program of the Andean Development Corporation* ➢ *Eduardo Dopazo, Carbon Finance Business Unit of the World Bank* ➢ *Marco Monroy, MGM International* ➢ *Peter Cook, International Finance Corporation*
05:45 – 06:00 pm	Conclusions and Key Messages ➢ *Vicente Schmall, PETROBRAS - Chairman of the ARPEL Climate Change Working Group*

ARPEL

Regional Association of Oil and Natural Gas Companies in Latin America and the Caribbean

Established in 1965, ARPEL is an association of 28 state owned and private oil and gas companies and institutions with operations in Latin America and the Caribbean, which represent more than 90 percent of the Region's upstream and downstream operations. Since 1976, ARPEL holds formal UN-ECOSOC special consultative status.

ARPEL works together with its members –through its various Committees and Working Groups- on issues that contribute to sustainable development in the Region:

- *Economic issues*: regional energy integration, downstream and fuels
- *Environmental issues*: climate change, atmospheric emissions, oil spill contingency plans and best practices in environment and occupational health and safety management.
- *Social issues*: corporate social responsibility, relations with indigenous peoples, gender analysis and transparency

ARPEL develops a proactive attitude on issues of interest to the industry and produces documents representing the views of its members. It also promotes interaction among its members and with governments building alliances and establishing agreements with international organizations with the aim of presenting and developing a regional perspective. To accomplish its objectives, ARPEL organizes regional workshops and symposia to share information and best practices and develops technical documentation for capacity building and information exchange on the issues of interest to its members.

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