Reducing Gas Flaring and Venting: How a Partnership can help achieve success

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Introduction

Every year, roughly 108 billion cubic meters (bcm) of natural gas are flared around the world (see Table 1). This amounts to about 4 per cent of the world's total marketed gas production (associated and non-associated) and to an estimated 20-30 per cent of the associated gas production. Unfortunately, so called associated gas which accompanies the extraction of crude oil is still one source of gas supply that normally attracts little attention, and a large part of it is flared or vented. This represents a major waste of valuable resources and is a significant anthropogenic source of greenhouse gas (GHG) emissions.

These practices and even more so venting present a problem for several reasons. They harm the environment, as Carbon dioxide (CO_2) emissions from flaring and methane emissions from venting have a high global warming potential and contribute to climate change. If all the estimated 108 bcm were flared, that would represent 220 million tons of CO_2 equivalent (tCO_2e) emissions. However, an unaccounted quantity of the associated gas is vented directly into the atmosphere as methane (CH_4), which is 23 times more potent a GHG than CO_2. Assuming a flaring efficiency of 98 percent and given methane's greenhouse warming potential, the impact of flaring and venting is significant and accounts for about 10 percent of the emissions that Annex 1 countries (including the United States) have committed to reduce under the Kyoto Protocol, during the commitment period from 2008 to 2012[2]. Furthermore, flaring may in some places have harmful effects on human health and ecosystems near the actual flaring sites.

[1] The other members of the Gas Flaring Core Team are Bent Svensson (Program Manager), and secondments from BP (Calliope Webber), ChevronTexaco (John Shinn, 50%), and Shell (Jacob Broekhuijsen)

[2] In general the data for gas flaring are of poor quality and it is not known how much of associated gas is vented directly into the atmosphere. For flared gas "Best practice" combustion flaring efficiency is assumed to be about 98 percent. In the remainder of this article, "flaring" can be assumed to refer to venting as well.

Further, flaring wastes resources, and the estimated 108 bcm of natural gas flared could be used productively; the amount being at the same level as the combined gas consumption of Germany and France. Flaring in Africa (37 bcm in 2000; see Table 1) could, if used for power generation in efficient power plants, produce 200 TWh, which is approximately 50 percent of the current power consumption of the African continent, and more than twice the level of power consumption in sub-Saharan Africa (excluding the Republic of South Africa).

Table 1: " Best estimate" on regional breakdown of gas flaring (2000)

Region	**Flared gas** (bcm)	**Share of world total** (%)[(a)]
Africa	37	34
Asia-Oceania	11	10
Europe	3	3
FSU	19	18
Central and South America	10	9
Middle East	16	15
North America	12	11
WORLD	**108**	**100%**

Source: Cedigaz, OPEC, World Bank.

(a) Shares rounded.

Global Gas Flaring Reduction Public-Private Partnership (GGFR)

From the above it is clear that a concerted effort is needed to reduce flaring. For that reason, the Global Gas Flaring Reduction Initiative was originally launched in November 2001 in Marrakech by the World Bank (the Bank) and the Government of Norway. The aim of the Initiative is to support national governments, development agencies and the petroleum industry in their efforts to reduce routine flaring and venting of gas associated with the extraction of crude oil. The Initiative was successfully transformed into a Partnership at the World Summit on Sustainable Development (WSSD) in August 2002 and has come a long way since then.

The Bank has visited numerous client countries and company stakeholders to discuss details of their co-operation and to identify possible Partnership activities that could overcome the barriers that currently inhibit flaring reduction investments through practicable and economic solutions. In addition to the Bank and Norway, the current Partners now comprise the governments of Algeria (Sonatrach), Angola, Cameroon (SNH), Ecuador, Indonesia and Nigeria, as well the United States of America, with sponsorship also coming from Denmark, Canada and the United Kingdom. Furthermore,

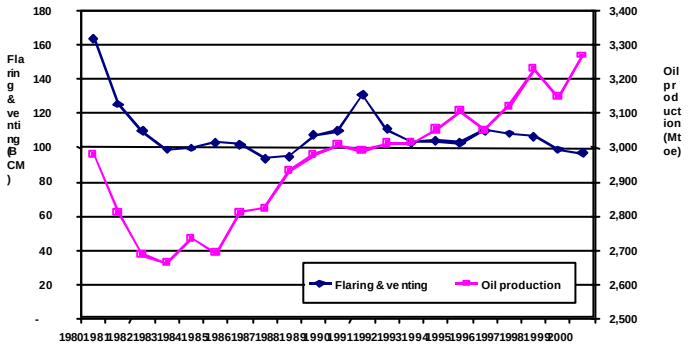
oil companies BP, ChevronTexaco, ExxonMobil, NorskHydro, Shell, Statoil and TOTAL have joined, and the Bank is in discussions with other possible partners in Latin America, Europe, Africa and Asia. Also, BP, ChevronTexaco, and Shell are providing staff secondments to the GGFR.

Meanwhile, the Partnership's first Steering Committee meeting was held in December 2002, approving a three-year work program and budget. In its first two years the Partnership is planning to focus on Algeria, Angola, Cameroon, Chad, Ecuador, Nigeria and possibly Mexico. Other client countries include Brazil, Equatorial Guinea, Indonesia, Russia and Venezuela.

Trends in Gas Flaring

But is there a need for a Partnership and can the Partnership really make a difference? Despite commitments by governments and companies and many successes in reducing flaring (e.g., in the North Sea, Canada and Saudi Arabia), global flaring levels have remained virtually constant since 1983 (see Figure 1). However, global oil production capacity is forecast to increase by 60 percent from 2000 to 2020 and a similar trend can be expected for associated gas production unless strenuous efforts to reduce gas flaring are undertaken. Much of the incremental oil production will come from countries and regions that currently flare large volumes of associated gas (see Figure 2). It is possible that new gas flaring reduction projects and policies in countries such as Nigeria will bring down the level of flaring, but it is also possible that reductions will be neutralized by increases from new oil production. Therefore, companies and countries face a major challenge in finding outlets for this gas that otherwise will be flared.

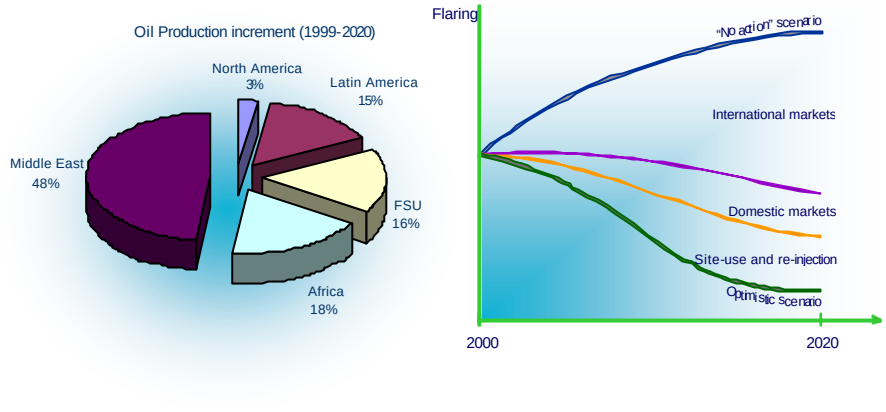
Figure 1: Trends in world gas flaring and venting (1980–2000)[(a)]



Source: Cedigaz. Note: The spike in global gas flaring in 1991 is primarily related to the events surrounding the first Gulf War, when oil output was increased in a number of countries to compensate for the loss of Kuwaiti and Iraqi oil production. This new production capacity included associated gas for which there was little or no infrastructure and which consequently was flared or vented.

(a) Excluding China and Russia.

Figure 2: Future trends in world gas flaring: Optimistic and " No action" scenario



Source: Global Initiative on Natural Gas Flaring Reductions. Report on consultation with stakeholders. World Bank, June 2002.

What constraints to flare reduction exist?

Based on consultation with stakeholders, four main groups of constraints have been identified: access to international markets, development of local and national markets, financing and upstream regulatory constraints. If such constraints are removed, win-win opportunities exist. A number of projects are already identified as viable projects, i.e., financially viable to private entities under existing regulatory/incentive frameworks. Since it can be assumed that such projects will be carried out in any case, the Partnership is not targeting these types of projects, but concentrates on those projects that are termed "Win-win". These projects become economically attractive when market barriers and constraints are removed and domestic, social, and local environmental externalities are internalized. Furthermore, the Partnership is also targeting global public goods projects which are economically attractive when global externalities are internalized in addition to the barriers mentioned above.

How can these constraints be overcome?

Figure 2 indicates that reducing gas flaring will depend critically on three broad alternatives for handling the associated gas from future flaring reductions: international markets, domestic markets, and reinjection. Access to and development of markets were also identified as major constraints. Of these, stakeholders have indicated that international gas markets are the most important potential outlet for associated gas. Thus, apart from reinjection, exports of LNG, and transport by means of regional pipelines will most likely constitute the most important alternatives to flaring.

Market constraints

While market risks for export projects generally will be outside the control of the exporting countries' governments, these governments can still significantly affect the project's economics through investment conditions, including royalty, tax, and depreciation rates. Difficulties in developing domestic markets include prices and taxes for gas, especially vis-à-vis those of competing fuels, whose prices may be distorted by subsidies or special tax benefits. Developing new gas markets for associated as well as non-associated gas usually requires one or more large "anchor" customers. In practice, these customers are often power plants, implying that reforms in the electricity sector, particularly pricing, may be essential for expanding the local demands for natural gas.

Financial constraints

The financial constraints can be overcome through the design of innovative financing mechanisms for gas flaring reduction projects, including through carbon credit trading. A report[3] prepared by the Partnership concludes that gas flaring reduction projects starting from the year 2000 onward may be eligible as projects under the Clean Development Mechanism and Joint Implementation mechanisms. There are no explicit categories of eligible projects under the Kyoto Protocol and no specific exclusions that relate to gas flaring or venting activities. As such, gas flaring reduction projects should be able to compete on equal footing with other emission reduction projects submitted for approval under the CDM or JI. The critical issue is their eligibility according to the additionality criteria: that is, project developers must be able to demonstrate that the emission reductions from the project are additional to what would have occurred in the absence of the project. The report includes specific gas flaring reduction demonstration projects in Indonesia, Nigeria and Russia to show how carbon credit trading can improve the viability of gas flaring reduction projects.

Regulatory Constraints

The issues related to the legal and regulatory framework are at least two-fold: Upstream regulation of the flaring itself and the legal and regulatory framework governing natural gas production and utilization, which is closely related to the contractual framework and petroleum fiscal regulation. The Partnership has reviewed upstream regulation of gas flaring in forty countries[4], representing a cross section of the world. Approaches and practices in areas that have successfully reduced gas flaring, such as the North Sea, Alberta Canada and Argentina vary significantly. However, in general there has been a decisive move toward more stringent regulation of flaring, in some cases combined with ambitious phase-out targets (Nigeria). Countries have chosen a variety of policy instruments to address their flaring problems, and these policies' effectiveness and

[3] See Kyoto Mechanisms for Flaring Reductions, Global Gas Flaring Reduction Partnership, World Bank, February 2003.

[4] Forthcoming

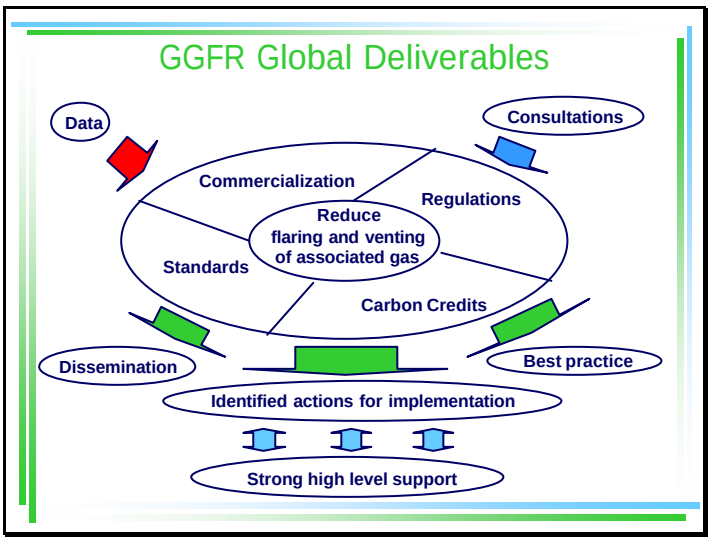
cost-efficiency have varied greatly. Most countries have instituted direct regulations, although with great variety in regulatory approaches and practices. In almost all countries flaring may take place only after authorization by a regulatory body. When authorized, flaring is subject to a variety of conditions, such as emission standards (Egypt, Nigeria, Qatar) or technical requirements. Taxation and emission fees have been introduced in only a few countries, often with little effect.

Global Activities

To bolster the chances of successfully reducing flaring on a world scale, the GGFR is currently undertaking a number of tasks on a parallel track that are designed to reduce the main barriers for gas flaring reduction globally and to address specifically the constraints in individual countries. As identified above (see also Figure 3), these include:

- the issue of commercialization of associated gas; areas covered are access to international markets; local market development; remote field and infrastructure interfaces; incentives frameworks; competing fuels and potential applicability of carbon credits
- the application of best practice for a stable regulatory environment; areas covered are the legal and fiscal environment, including contractual and institutional matters.
- the opportunities to enhanced financing i.e. carbon credits; areas covered are capacity building, developing a guidebook for the Partnership and project assistance on example cases.
- The evaluation and possible development of common international flaring and venting standards, and a possible voluntary certification scheme based on these standards.

Figure 3: Dependencies of constraints and solutions



Country Activities

To increase the chances of successfully reducing emissions even further the Partnership has set up specific work programs aligned to the in-country barriers, so far in Algeria, Angola, Cameroon, Chad, Ecuador, Indonesia and Nigeria. The latter range from lack of access to international markets, lack of local developed gas market, remote fields at distance from gas infrastructure, a gas strategy under development and expanding the legal framework to include associated gas. The preliminary GGFR work program includes support of gas sector strategy and regulatory work, additional market development, associated gas utilization studies, carbon credit capacity building, and possibly assistance to local flare reduction projects, small scale projects and LPG projects. In country flaring reduction may also be facilitated through the instigation of local public-private partnerships.

Work programs are also under consideration for additional countries[5].

Conclusions and Next Steps

Having now established that flaring does indeed constitute a problem that cuts across continents and countries, the aim is now to target the barriers impeding substantial reductions in flaring at the early stage of this Public-Private Partnership. Therefore, the Partnership intends to identify ways to overcome those barriers to investments through practicable and economic solutions, such as by

- Improving the legal and regulatory framework for investments in flaring reductions
- Improving international market access for gas
- Providing Technical Assistance to develop domestic markets for flared gas
- Designing financing mechanisms for gas flaring reduction projects
- Disseminating information, including on international "best practices"
- Promoting the local small-scale use of gas (including LPG schemes) in areas where gas is now flared

As noted, the Partnership has identified a number of specific countries where gas-flaring reduction is possible through a coordinated effort with governments, as well as national and international oil companies. Moreover, the Partnership's Global Activities are focused on providing widely applicable deliverables that, to have any impact on flared gas, require implementation at country and company level. The Global Activities have therefore been explicitly linked to Country Work Programs, where the individual country and company commitment for implementation is key to success in achieving flaring reduction. The combined activity program will contribute to sustainable development as it promotes the efficient use of resources, reduces emissions and environmental effects and assists in the alleviation of poverty.

[5] Details can be found on the Partnership's Website www.worldbank.org/ggfr

Finally, without a committed buy in from the private as well as the public sector the issue of gas flaring will not be addressed adequately. Therefore this Public-Private Partnership's concerted actions offer the best chance of success to effectively reduce emissions on a global scale to date. The aim being to enable collective actions, leading to the sustainable development of this valuable resource, thus benefiting the local and global environment, and not least further enhancing the countries' and the local populations' economic development.