Global Gas Flaring Reduction in Key Countries

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a. Background

The World Bank estimates that in 2010, 134 billion cubic meters (bcm) of natural gas associated with crude oil production was flared and vented annually. This amount is equivalent to approximately 20 per cent of the United States' gas consumption or 30 per cent of the European Union's gas consumption per year.

One of the attractiveness of natural gas is that it is the less polluting amongst the fossil fuels. Yet, in several oil and gas producing countries, vast amounts of natural gas are still being flared or wasted. This volume represents 5% of the global natural gas production and adds the equivalent of 400 million tons of carbon dioxide (CO_2) in annual emissions. Gas flaring is also a loss of valuable resources and deprives developing countries of a clean energy source that could be used in local markets to deliver energy services as electricity, clean cooking fuel or to switch to cleaner transportation systems.

Overall, the loss of revenues through global gas flaring is estimated at approximately US$ 25 billion per year at $5.00 per MMBTU.

b. Aims

The purpose of this paper is to give an overview of the efforts to reduce global gas flaring gas by utilizing gas rather than flaring it and analyze some critical policy interventions and industry practices to reduce gas flaring in three of the main gas flaring regions of the world: West Africa, the Middle East, and Russia.

c. Methods

The Global Gas Flaring Reduction ("GGFR") public-private partnership was launched at the Johannesburg World Summit on Sustainable Development in August 2002 with the objective of facilitating governments and oil companies' efforts, under the World Bank's leadership, to reduce global gas flaring, improve energy efficiency, and mitigate impact on climate change.

The paper analyzes the efforts to reducing gas flaring through policies and regulation and demonstrates in three case studies how a co-operative approach between all stakeholders can obtain results.

Effective Policies

An enabling environment for gas flaring reduction can be established through effective legislation, regulation and market/economic measures.

Specific policy measures will depend on each country's circumstances and are likely to include both upstream and downstream sectors. However, some generic lessons can be

drawn from successes in associated gas utilization already achieved by a number of oil producing countries, such as Algeria, Canada, Norway, Saudi Arabia, the United Kingdom, and Qatar.

Some of these lessons include[1]:

- Oil & gas legislation, and oil & gas concessions/licenses should be clear, comprehensive and unambiguous on the treatment of associated gas.
- Fiscal terms should encourage gas utilization investments. Special fiscal treatment of associated gas investments may be needed to overcome high up-front capital cost of associated gas infrastructure.
- Gas market should encourage and enable associated gas utilization with:
    a) Oil & gas companies given the right to monetize gas, generally including gas export;
    b) Open and non-discriminatory access to infrastructure, including gas processing and transmission facilities, access to electricity grids (to sell electricity produced on-site from associated gas); and
    c) Market-based energy pricing.
- Flare and venting regulation should be clear, with effective monitoring and enforcement: Right market conditions and investment incentive schemes should be complemented by flare and vent regulation in order for operators to evaluate gas utilization options.
- Reduction in legacy flaring requires a comprehensive and methodical approach: A generally accepted approach in addressing legacy flares and vents is (i) to establish a realistic flare/vent-out plan; (ii) create the environment enabling gas utilization investments; (iii) coordinate operators' investment programs, and (iv) closely monitor them to ensure that they are implemented on time. Developing these flare reduction plans should be done as a cooperative approach with consultation with key stakeholders, particularly with operators.
- Although stakeholder consultations will take time and effort, they typically add value by:
    a) Establishing a challenging but realistic flare-out deadline;
    b) Identifying key issues and risks in implementation of operators' associated gas utilization programs, which in turn allow these to be addressed in a timely fashion;

[1] Guidance on Upstream Flaring and Venting, Policy and Regulation GGFR, Washington D.C. March 2009

c) Developing a fiscal framework consistent with the country's flare and vent reduction policy;

d) Transforming the potential of the policy into results on the ground through greater trust, ownership, and commitment by stakeholders.

- New oil developments should include provision for associated gas utilization: In new oil developments, associated gas utilization should be an integral part of the field development planning process. Addressing flaring and venting retroactively is more costly and often more technically challenging

- An integrated plan should be developed for both associated and non-associated gas: Flaring and venting reduction and non-associated gas development should be integrated into the country's integrated gas master plan and/or energy sector strategy

- Finally, a combination of the above measures is essential to achieve significant reduction in flaring and venting.

Regulations and Incentives

GGFR has carried out two major studies of global gas flaring regulation. In 2004, GGFR published a study of 44 oil producing countries investigating the role of regulation in the context of gas flaring and venting.[2] The study found that most developing countries that produce oil lack efficient and effective gas flaring and venting regulations and have inadequate institutional capabilities with often overlapping responsibilities among institutions. In many developing countries, companies that are supposed to be regulated are responsible for carrying out regulatory functions.

More recently, GGFR launched a review of the international experience of gas flare reduction regulation and policies in a number of partner countries. The conclusions are that[3]:

- Government commitment to reduce flaring is critical to success: i) national strategies and master plans for the oil and gas sector must include consideration of associated gas utilisation and flaring reduction, and ii) Government must work to ensure that midstream and downstream markets support flared gas utilisation

- Industry consultation mechanisms are important in ensuring flaring targets are feasible and regulations are realistic

On the regulatory side emphasis should be placed on encouraging industry to look for opportunities to utilise associated gas economically. Deadlines or other limits on flaring need to be seen as part of a package of other market enabling measures, as deadlines by themselves are unlikely to be effective or will result in reduction of oil production unless backed up by measures such as creation of viable downstream markets. On the other hand, only enabling markets without effectively enforced regulation of flaring will not reduce flaring

[2] Regulation of Associated Gas Flaring and Venting: A Global Overview and Lessons from International Experience, World Bank/GGFR Report Number 3, February 2004. http://www.worldbank.org/ggfr
[3] International Regulatory Best Practices: forthcoming on the GGFR website: http://www.worldbank.org/ggfr

to minimum levels. Any penalties must be set at levels that are realistic deterrents but should be used only in combination with market enablers.

Regulatory regimes

The regulatory regime establishes what is regulated and how it is regulated. Key features of a good flaring and venting regulatory regime include:

- Definitions and boundaries
- Regulatory approval
- Economic evaluation
- Measurement and reporting
- Monitoring and enforcement
- Public dissemination

A regulatory regime should be set forth in secondary legislation, for instance in respective sections of existing regulatory rules and procedures in the upstream oil and gas sector, or alternatively, as a stand-alone document. The latter option may require more effort, but is likely to provide a greater clarity and coherence, as well as facilitate compliance by operators. Directive 60 [4], developed in Alberta (Canada), is an excellent example of a dedicated piece of secondary legislation that covers most of the elements of the province's flare and vent regulatory regime.

Finally, the operator should be required to have a focal point to be responsible for compliance with flaring and venting regulation and interactions with the regulator on all flaring and venting issues.

Regulatory agencies

General requirements for flare and vent regulatory bodies are in many respects similar to the ones applied to downstream energy and infrastructure regulators. In particular, the regulator should have administrative independence that would guard it against political interference; financial autonomy to have sufficient resources -such as skills, staff, and technical tools- to carry out its duties; and legal power to enforce regulation.

[4] Directive 60 "Upstream Petroleum Industry Flaring, Incineration, and Venting"

Enforcement

Enforcement is perhaps the most important element of a flaring regulatory framework since, regardless of the design of the framework, it is unlikely to bring expected results unless regulatory infringements are spotted and effectively pursued by the regulator. Therefore, a flaring regulatory regime should be designed in a way that makes enforcement feasible given the regulator's financial and staffing constraints, as well as the country's institutional development and regulatory traditions.

It is a good practice to describe the consequences of noncompliance in detail in regulatory documents, so that operators are all aware of regulator's expectations and enforcement actions. An option would be to list typical noncompliance events under broader categories (such as approval, economic evaluation, measurement, reporting) and establish an enforcement level for each event. The level could range from a notification to license suspension or even revocation.

Global Standard

Today, most GGFR partners have endorsed the Global Standard for Flaring and Venting Reduction, introduced by GGFR in 2004[5]. This Global Standard is a way to engage stakeholders in gas flaring reduction, and provides a framework for governments, companies, and other key stakeholders to consult with each other, take collaborative actions, expand project boundaries, and reduce barriers to associated gas utilization.

GGFR partners that have endorsed the Global Standard are committed to no venting, no routine flaring in new projects, and to eliminate continuous production flaring from existing production in 5-6 years from their joining the GGFR, unless there are no feasible alternatives. While the agreement on no flaring in new projects is a major achievement and has significant impact on future gas flaring, the elimination of flaring from existing production has taken longer than anticipated.

Key Elements of the Global Standard include:

- Initial global with focus on large sources that can make a significant difference early
- Collaborative action and implementation planning through
  - Producer driven Associated Gas Recovery Plans (AGRP) and consultation
  - Government driven Country Implementation Plan and consultation
- Ultimate goal for longer term continuous improvement
- Recommendations for measurement, public reporting and verification
- Recommended timeline

[5] A Voluntary Standard for Global Gas Flaring and Venting Reduction, Report No. 4. ttp://www.worldbank.org/ggfr

The Global Standard calls for operators and governments to prepare AGRPs through identifying flare reduction projects and following through executing the projects. AGRPs have been prepared in Azerbaijan (Socar) and Uzbekistan and are under preparation with assistance from the GGFR Partnership in Kazakhstan, Gabon, Khanty-Mansyisk in Russia and Nigeria (Nigeria Gas Flare Committee). A guidance document[6] has been published on how to effectively prepare such plans.

Fiscal Framework

There are two groups of instruments that could be used by host countries to promote investments in flare and vent reduction projects, namely incentives and penalties. Incentives, or preferential fiscal regimes, can be applied to both upstream operations and downstream investments, while penalties are imposed on upstream activities, namely flaring and venting of associated gas. In general, incentives prove to be more effective than penalties and it is important to find the right balance between the two to create economic outlets for the gas. What's more important, if a penalty-based approach is used to address flaring and venting, a number of conditions should be met, including the right level of penalties and the presence of a strong and empowered regulatory body.

Case studies

The impact of policies and regulation on flaring reduction and how deadlines and targets work can be better illustrated through examples of interventions in the three main gas flaring regions of the world, West Africa, Middle East and Russia.

West Africa: Nigeria

Nigeria has a long history introducing measures to reduce gas flaring through legislation, target dates for "zero gas flaring", and penalties to be imposed for failure to comply. However, this, on its own, has not been effective for reasons, including[7]:

- The economic implications of shutting-in production have been seen as unacceptable given the government's targets for maintaining and increasing oil production (and its reliance on oil revenues) meaning that enforcement has been lax and government has continually authorised ongoing flaring.
- Penalties for flaring have been too low to act as an effective deterrent.
- Government has been unable to meet its obligations under JVs, usually 60% of the funding of the necessary infrastructure to reduce flaring and utilise associated gas.
- Downstream gas markets are difficult to access physically and offer prices that are too low and payment records that are too poor to make them commercially

[6] Preparing Effective Flare Management Plans: A Guidance Document. Produced as a collaboration of the Global Gas Flaring Reduction (GGFR) Partnership and the Greenhouse Emissions Task Force (GET) of IPIECA and OGP

[7] International Practices in Flaring and Venting Policy and Regulation and their Adaptation for Indonesia Nigeria Country Case Study, June 2011

viable. This is despite the desperate need for new power generation, in particular.

The approach taken in GGFR's Standard for Flaring and Venting Reduction (mentioned above) focuses on collaboration between industry and governments and avoid the risk of governments setting targets without industry consultation and tests of the economic or commercial viability of reducing flaring. In Nigeria, where such targets have been set they proved unachievable.

Nigeria provided financial incentives to develop projects based on associated gas though the promotion of the Associated Gas Framework Agreement (AGFA) and to projects for LNG exports which have resulted in large investments in gas projects and contributed to reducing gas flaring. This also led to an expansion of the domestic gas market, including gas supplied to power stations as an outlet for the gas that would otherwise be flared.

The Nigerian government, the GGFR and oil & gas operators have developed a collaborative approach to flare reduction in Nigeria through the "Nigeria Flare Reduction Committee" (NFRC), which was set up in 2007 and is chaired by the Minister of Petroleum Resources.

The NFRC has analyzed a number of options to achieve and accelerate flare reduction. From 2005 to 2010, gas flaring decreased around one third in Nigeria. Tthe operators are making significant progress in flare reduction and current plans for the utilization of associated gas will reduce routine flaring steadily over the coming years. In the short term however, the Government can only accelerate flare reduction through at a cost of some reduction in oil production and consequently revenues.

Russia and Central Asia

Russia is the number one gas flaring country in the world. In 2010, an estimated 35 cm were flared based on estimates using satellite imaging. Only a few years ago gas flaring was not a priority of the government. In 2007, authorities sent unequivocal signals of its willingness to reduce gas flaring and in 2008, the government issued an Order[8] that set a target for 2012 and beyond, limiting flaring levels to only 5 percent of the entire associated gas output. Starting Jan. 1, 2012, producers would be liable for paying increased fees for excessive flaring. However, as many producers did not make the deadline, a new Order proposes to delay the deadline to year 2014 and multiplying the flaring penalty by 100 for producers not complying.

The government policies have accelerated investment activities by oil companies to utilize the associated gas. From 2010 to 2015 Russia's biggest oil companies are planning to invest more than 10 billion USD in the implementation of flared gas utilization projects. However, in some regions, e.g. Yamal-Nenets the oil production is expected to increase significantly from 2012 and infrastructure to gather the gas and transport it to markets is not yet in place. The distance to markets is a strong impediments to develop economical solutions for gas flaring reductions. Therefore, it is expected that increased gas flaring from

[8] "On the Measures Stimulating Reduction of Atmospheric Pollution by Products of Associated Petroleum Gas Flaring."

new fields may offset earlier reductions. The planned investments will mainly be projects utilizing associated gas for re-injection into the reservoir and power generation for internal needs, processing and transmission to main gas pipelines. To give incentives to the use of associated gas the Government has adopted amendments to the law "On Power" providing priority access to the wholesale market of electricity generated by using associated gas or and several oil companies made a preference toward the power generation.

GGFR has successfully worked with administrations at the regional level in Khanty-Mansiysk and Yamal-Nenets to improve legislation, economically assess small scale gas utilization projects, and establish reliable data on flared gas volumes.

d. Results

Some key results achieved by the GGFR public-private partnership in reducing global gas flaring, includes:

- **Satellite estimates for global gas flaring show a decline** in global gas flaring volumes from 171 bcm in 2005 to 134 bcm in 2010. That's a reduction of 22 per cent, as well as the equivalent of reducing some 80 million tons of CO2 emissions.
- **Global awareness and understanding of the gas flaring and venting issues**: Major flaring countries have decided to tackle the flaring issue (i.e. Russia, Nigeria, Angola, Qatar) and many companies' policies do not allow flaring in new oil developments.
- **New Regulations on Gas Flaring in several countries:** Russia, Kazakhstan, and Gabon. New laws being progressed in Indonesia, Cameroon, Nigeria.
- **Development of tools to monitor and measure the flaring worldwide:** Satellite imaging of gas flares worldwide, and improvement of measurement and estimating tools and methodologies
- **Gas Flaring Reduction Plans on the way in several countries:** Canada, Nigeria, Kazakhstan, Azerbaijan, and Uzbekistan have completed their plans or are in progress to complete them, while Russia, Qatar, Gabon are starting up.
- **Gas Utilization Projects have been identified in a number of countries:** Angola, Nigeria, Kazakhstan, Qatar, Uzbekistan, Gabon, Cameroon, and others.
- GGFR and its partners are **improving Carbon finance methodologies** to improve the economics of gas flare reduction projects.

e. Summary /Conclusions

Over the 10 years GGFR partners have accumulated a wealth of experience, lessons and best practices about gas flaring reduction, so they now better understand how to overcome the barriers, including:

- Governments need to have not only effective regulations in place but also clear policies with the right incentives for industry, so that the necessary infrastructure is put in place and markets for gas utilization are developed.
- Country buy-in, high-level support and an effective local partnership between government and industry are key ingredients to ensure success in gas flaring reduction. There should no longer be any doubt that government and the private sector need to work as real partners if tangible results are to be achieved.
- Leadership and commitment play a critical role in both the public and private sectors in order to sustain progress over the long term.
- Better data to gauge the magnitude of the practice at the country and company levels.
- New and small-scale gas utilization technologies need to be nurtured to commercialization, to provide additional economic alternatives to flaring.