CARBON LIMITS

Pilot Auction Facility for emission reductions in the oil and gas sector

Briefing Note

EXECUTIVE SUMMARY

The World Bank Group has developed the Pilot Auction Facility for Methane and Climate Change Mitigation (PAF), currently tested for methane emission reductions in landfills, animal waste and wastewater projects. The PAF delivery model offers a price guarantee for future emission reductions determined through a bidding process, and as such leverages private sector financing and ensures the efficient use of public funds for climate financing. Replication and scale up potential, beyond the sectors already tested, are large, and this note summarizes the results of an analysis of the suitability of applying a PAF-like instrument to spur investments in flare and methane emission reductions in the oil and gas sector.[1]

A number of empirical studies have shown that flaring and methane emissions contribute a large part of global greenhouse gas emissions, but at the same time the potential is significant for emissions reductions at low or no net costs. Results from the analysis presented in this note suggest that the PAF delivery model can help remove barriers to realize these reductions. The suitability for a PAF-like mechanism has been assessed for a large number of project categories in the flare and methane emission sectors and is summarized as follows:

- For flare reduction projects the best candidates are small and medium scale projects which capture gas and either produce electricity locally or bring the gas to the market.
- Suitable project categories within methane emission reductions are primarily leak detection and repair programs (LDAR) and investments in various equipment, such as pneumatic devices and pumps, gas engines and compressors.

The World Bank Group invites stakeholders to present their feedback and particularly comment on the set of questions presented at the end of the note.

[1] Current contributors to the Pilot Auction Facility include Germany, Sweden, Switzerland and the United States. This study, funded by the World Bank Group, is intended to explore the potential of a PAF-like mechanism in the oil and gas sector.

Introduction

The Pilot Auction Facility for Methane and Climate Change Mitigation (PAF) is an innovative climate finance model developed by the World Bank Group to stimulate investment in projects that reduce greenhouse gas emissions while maximizing the impact of public funds and leveraging private sector financing. The instrument was first tested for so-called “stranded” methane emission reduction projects related to landfills, animal waste and wastewater registered under the Clean Development Mechanism (CDM). PAF’s first auction in July 2015 allocated price guarantees for 8.7 million tons of CO2 emissions reductions to 12 firms. The PAF delivery model has features with a strong potential for replication and quick scale-up, and applying a PAF-like instrument to the oil and gas sector is now being considered.

This briefing note presents results from an early analysis of the suitability and efficiency of a PAF-like instrument to spur investments in reduction of associated gas flaring and methane emissions in the oil and gas supply chain[2]. The World Bank Group invites stakeholders to provide feedback on the note, and communicate other comments to the idea of extending the PAF mechanism to oil and gas sector emissions.

The Pilot Auction Facility

Delivering a price guarantee for emission reductions is a financial innovation to support climate-friendly projects pioneered by the World Bank through the Pilot Auction Facility for Methane and Climate Change Mitigation (PAF). The PAF delivery model consists of allocating tradable price guarantees to projects reducing greenhouse gas emissions (GHGs) through put options. The firms that are selected to receive the options are done so by means of online auctions, where the bidders win the right to the price guarantee through a transparent competitive process. This model allows to maximize the use of scarce public funds, while at the same time leveraging additional private sector financing for climate change mitigation.

The put options are tradable rights allowing their holders to sell future carbon credits (or other predefined results) to the PAF at a price established by the auction. The World Bank will issue a special type of tradable bond with the same properties as a put option to the auction winners, meaning the right to sell the emission reductions to the PAF is transferrable and ensuring stronger guarantee of the delivery of emission reductions to the PAF.

The nature of the put option means that the facility’s resources will only be disbursed after the results have been independently verified, making the PAF a “pay for performance” facility. This approach also allows to take advantage of existing carbon market infrastructure such as the Clean Development Mechanism (CDM).

Put options establish a right, but not an obligation, to sell emission reductions to the PAF. This optionality allows put option owners to benefit if market prices rise above the strike price by selling it in the market rather than to the PAF. In this case, the PAF will have achieved its objective to stimulate private sector investment in mitigation at no cost to it. If prices fall, the put option owner has the right to sell the carbon credits to the PAF at the strike price. Thus, the put option sets a floor price for future emission reductions (or other predefined results) at which they are guaranteed to be sold. The price guarantee provides private investors the financial incentive to fund new projects, or continue to operate projects at risk of discontinuation.

[2] A methodology was developed to evaluate the suitability of a PAF-like instrument for flare and methane emission reduction project categories. Information on technical and economic aspects with the project categories has formed the basis for suitability assessments by use of the methodology. Further, a review has been conducted of mitigation potentials and barriers to project implementation.

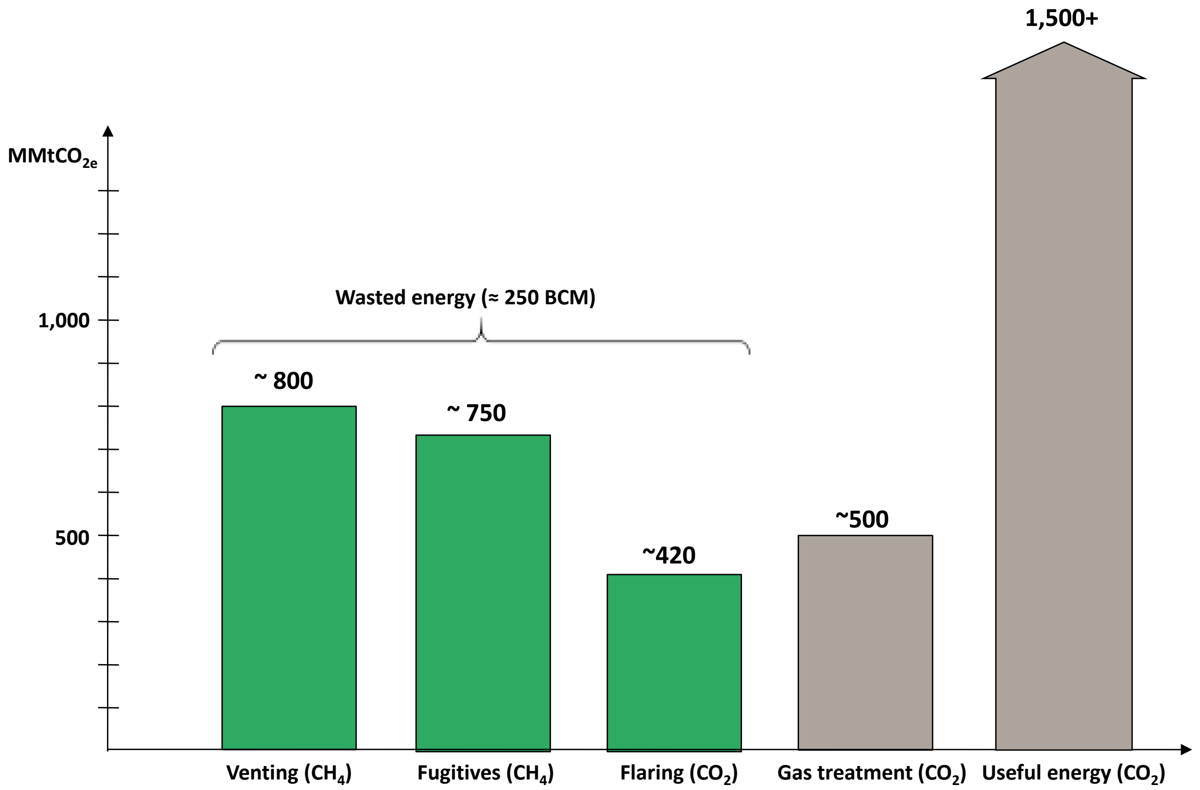
The competitive nature of the auction used to allocate the put options reveals the price required by the private sector to generate desired results, therefore maximizing the impact of public funds and achieving the highest volume of climate benefits per dollar.

Why oil and gas sector emissions?

The oil and gas sector contributes to almost 10% of global GHG emissions[3] and an important part of these emissions can be reduced at low or no net costs. Many potential emission reduction measures within the sector are not undertaken due to a range of complex financial or non-financial barriers. A results-based incentive, such as the one that could be provided by a PAF-like instrument, has the potential to unlock a large share of the sector's emission reduction potential.

GHG emissions in the oil and gas sector are made up of (in order of magnitude): fossil fuel combustion for the sector's own energy use; engineered venting of methane as part of safety or production cycles; unintended escapes of methane from facilities as fugitive emissions, release of CO_2 contained in natural gas and separated through treatment, and finally temporary or permanent flaring of natural gas. Figure 1 provides estimates of annual GHG emissions from oil and gas sector operations for each of these categories.

Figure 1 Estimates of annual greenhouse gas emissions from oil and gas operations, Million tCO2e.



Sources: Carbon Limits analysis based on data provided by NOAA/GGFR, IEA and Rhodium (2015).

GHG emissions in the sector represent an enormous energy wastage – annually, close to 250 billion cubic meters (BCM) of gas is wasted through venting, flaring, and as fugitive emissions. Their respective contribution is shown as the three green stacks in Figure 1. While methane release (vented and fugitive) is the largest source of GHG emissions and the one with the greatest low cost emission reduction potential, flaring contributes more to energy wastage; close to 150 BCM out of a total of 250

[3] Not including emissions from end use of oil and gas and products that can be produced thereof outside the sector.

BCM of gas lost. Direct emissions of methane from oil and gas sector operations and emissions of CO_2 from routine flaring of gas are the two broad emission sources being reviewed initially for a scaled-up PAF-like instrument.

Although there are no firm global estimates of the potentials for methane and flare emission reductions, the empirical studies that do exist suggest they are substantial. The US Environmental Protection Agency (EPA)[4] has estimated that 660 million tCO_2e in methane emission reductions can be achieved globally by 2020 at no net costs, and substantial further abatement opportunities can be achieved at a costs of less than 10 US$ per tCO_2e.

Relative to the total emissions the low cost potential for flare reduction is also large. One recent study[5] has indicated that the total annual reduction potential associated with profitable measures to reduce venting and flaring (i.e., with an abatement cost < 0 $/$tCO_2e$) is estimated at 127-143 million tCO_2e. These measures are still subject to significant implementation barriers that will be discussed later in this note. The majority of the potential for profitable measures is considered to be related to the recovery and productive utilization of associate gas which is based on the extensive literature review prepared for this report.

Recently the “Zero Routine Flaring by 2030” initiative was launched, and is endorsed by a number of countries, oil companies and international development organisations[6]. As an initiator and having endorsed the initiative, the World Bank commits to facilitate cooperation and implementation, and consider the use of financial instruments and other measures in order to achieve the objectives of zero routine flaring by 2030. Considering the use of a PAF-like instrument may be seen as part of this.

Available emission reduction technologies and approaches

This section provides an overview of major technologies and approaches that could be used to reduce direct emissions of methane and emissions of CO_2 from routine flaring – the two priority emission sources considered in this report. There are numerous technologies and measures available, and the most commonly applied or promising approaches are summarized by major categories in Tables 1 and 2 below. Each category is assigned a reference number for easier assessment and reference. As there are significant differences between measures directed at the reduction of methane emissions and measures directed at reduction of routine flaring, they are presented separately in this section.

Each category has some commonalities with respect to mitigation technology, the part of the production cycle involved, the size of potential emission reductions, cost structures and lead time, and approaches needed for emission reduction calculations. They do not necessarily encompass all alternatives for emission reductions and actual mitigation alternatives may include elements from more than one of the sub-categories. Nevertheless, it is believed that separation into discrete categories forms a good basis for analysing what part of flare and methane emission reduction actions might be suitable for a PAF-like instrument.

[4] EPA “International Non-CO2 Mitigation” data (2014)
[5] Reduction of Upstream Greenhouse Gas Emissions from Flaring and Venting. The International Council on Clean Transportation, 2014. Available at: http://ec.europa.eu/clima/policies/transport/fuel/docs/studies_ghg_venting_flaring_en.pdf
[6] http://www.worldbank.org/en/programs/zero-routine-flaring-by-2030

Methane emission reduction categories are presented in Table 1. Methane emissions in the oil and gas sector are mostly the result of fugitive equipment leaks, process venting, and disposal of waste gas streams. The emission reduction measures include state-of-the-art procedures and technologies for detecting and repairing methane leaks at oil and gas facilities and pipelines - referred to as Leak Detection and Repair (LDAR), retrofits and replacements of various system components, use of new technologies, such as installation of catalytic converters to improve combustion efficiency and prevent methane escaping in flue gases, installation of plunger lift systems that apply gas pressure to lift accumulated fluids out of the well instead of venting it out to atmospheric pressure, and use of portable equipment to separate the gas from the solids during completion and well clean-up in unconventional hydraulically fractured natural gas wells.

Table 1 Categories of methane (M) emission reduction measures in the oil and gas sector[7]

M1	*Oil and gas production and processing – LDAR (leak detection and repair)* Leak detection and repair program covering oil and gas production sites, gas gathering systems and processing plants (including compressors in these installations).
M2	*Gas transmission – LDAR* Leak detection and repair program covering gas transmission lines including boosting stations.
M3	*Gas distribution – LDAR* Leak detection and repair program covering gas distribution systems including metering stations and regulators.
M4	*Pneumatic devices and pumps* Retrofit or replacement of pneumatic controllers or pumps that release or *"bleed"* natural gas to the atmosphere as part of their normal operation.
M5	*Gas engines - Exhaust vented* Installing catalytic converters on gas fueled engines and turbines to improve combustion efficiency and prevent methane escaping in flue gases.
M6	*Compressors* Investments to upgrade or change reciprocating or centrifugal compressors that vent methane. This category does not include improved maintenance procedures or LDAR on compressors.
M7	*Distribution – Investment* Replacement of pipelines or line sections in the distribution system to reduce unintentional leakage.
M8	*Plunger Lift* Installation of plunger lift systems in gas wells to replace the practice of venting the well out to atmospheric pressure to release the fluids hindering gas flow.
M9	*Unconventional gas wells* Reduction of emissions during unconventional gas well workovers and completions by using portable equipment to separate the gas from the solids, thus preventing it from being vented to the atmosphere.
M10	*Other investment* This category includes all the other investments (equipment purchase or upgrade) not included in the categories above. These investments generally have high abatement costs (EPA 2014).
M11	*Other maintenance* This category includes all the other maintenance (improvement of procedures, optimization of systems, etc.) not included in the categories above.

[7] The categories are constructed based on the long list of mitigation technologies in EPA 2014http://www3.epa.gov/climatechange/Downloads/EPAactivities/MAC_Report_2013-Executive_Tech%20Summary.pdf

Flare reduction categories are presented in Table 2. Flaring of gas produced in association with crude oil can be avoided in numerous ways, of which gas re-injection is by far the most important. According to the Energy Information Administration, 58% of associated gas production in 2012 was re-injected, 15% was flared and 27% was utilized. This flaring rate can be substantially reduced, primarily through elimination of so-called routine flaring[8].

Policy measures have been introduced in many parts of the world to reduce routine flaring, however technical challenges, remote locations of the fields, either at sea or on land, and cost considerations often stall potential flare reduction projects. Barriers to flare reduction investments are common both for small-scale and larger projects, although the large investments normally get most attention from regulatory authorities and corporate management, and economies-of-scale may make these investments financially viable when carefully planned. Small-scale projects typically are faced with larger barriers, both due to low economic returns and because the scale itself implies that they are not prioritized by the corporate management.

Table 2 Categories of flare (F) reduction measures in the oil and gas sector

F1	*Power for own use* Associated gas is captured and used for power and heat at the production site.
F2	*Power for own use and delivery to a market* Includes the activity under F1 and in addition has facilities and capacity to supply power to a grid owner/power utility or directly to targeted end-users outside the production site.
F3	*Gas delivery by pipeline* Gathering, pre-treatment and transportation of associated gas for export by pipeline for further processing and/or end use.
F4	*Gas delivery by mobile equipment (CNG/LNG)* Cover technologies for treatment and transportation of the associated gas from the production site as compression (CNG) or liquefaction (LNG), normally by trucks or train.
F5	*Small and medium size gas to liquids (GTL)* These are new small scale GTL technologies (GTL Fischer Tropsch or GTL-methanol) under development for utilization of stranded associated gas at remote small and medium size fields.
F6	*Reinjection of gas* Associated gas being reinjected for storage and/or for enhanced oil recovery (EOR).
F7	*Large scale gas processing and delivery by pipeline* No specific size limit or other precise criteria are set for this category. Typically it would be large investments not only involving associated gas and/or a green-field development including a broad set of investment in oil and gas processing facilities and transportation solutions.
F8	*Large scale LNG/GTL/GTC* Again there are no specific size limit set but projects under this category have in the past been based primarily on non-associated gas. Associated gas can be used, but the quantities required would be too small, and supplies not stable enough, to meet the entire gas supply required.

[8] As defined by GGFR in connection with launch of the “Zero-routine flaring by 2030“ Initiative, routine flaring is defined as “flaring of gas during normal oil production operations in the absence of sufficient facilities or amenable geology to re-inject the produced gas”.

Assessment criteria and preliminary screening

Not all of the available emission reduction measures in the oil and gas sector would be suitable for financing under a PAF-like mechanism. Some approaches are not suitable for climate financing in principle due to difficulty of objectively measuring their performance or high risk of including non-additional projects that would have happened anyway[9]. Other mitigation measures are not suitable for the PAF delivery mechanism because they are inconsistent with a competitive auction and expectations of the delivery of results within a specified time-frame.

In order to determine the potential for a PAF-like scheme in the oil and gas sector, and to understand under what conditions the PAF delivery model could be an efficient and sustainable model of climate financing of oil and gas mitigation projects, the following assessment criteria have been developed to evaluate the mitigation categories listed above:

- **C1. Quantification and verification of results:** Sound standards and procedures should be available for calculating emission reduction impacts, not being too onerous, but adequate for the purpose of ensuring environmental integrity. They should be based on existing monitoring, reporting and verification (MRV) standards and procedures, or there should be a possibility to develop new MRV standards and procedures for them with reasonable effort and at reasonable costs.
- **C2. Impacts on the economic returns on investments:** A guaranteed carbon price would have the highest chance of leveraging additional private financing in cases where it has a tangible impact on projects' economic returns and thus on decision-making currently hindered by existing barriers. Based on the objective of the current PAF instrument to spur low-cost mitigation action, the focus of the analysis has been to identify mitigation opportunities where a price of up to 10 US$ per tCO_2e is enough to impact on the investment decision.
- **C3. Free-riders and perverse incentives:** For the environmental integrity and efficiency of funds used, it is important that the PAF-like instrument manage to target projects which are faced with implementation barriers, while the risk of admitting free-rider projects that would occur anyway is excluded or significantly reduced. The scheme should also not be encouraging less stringent emissions policies and regulations than otherwise would be the case, hence avoiding the so-called perverse incentives.
- **C4. Efficiency of auctioning and trading:** Delivery through auctioning and transferability of a carbon price guarantee through trading would provide suitable incentives only to some of the possible mitigation options. Important characteristics in this regard are: lead time to commissioning and emission reduction generation, cost structure of the investments, project life time and time profile of emissions, and existence of sufficient number of possible market participants to ensure competitive environment.

Screening of mitigation options. As a first step, the assessment criteria have been used in order to exclude categories for which a detailed evaluation of suitability for the PAF-like instrument was not considered to be worthwhile. Five methane categories and four flare categories were excluded and the rest were given a more detailed consideration.

Five methane categories were excluded because of high abatement costs as in the case of investments in replacement of pipelines and other unspecified investments (M7 and M10)[10], important challenges in setting verifiable baseline emissions and quantification of results as in the case of

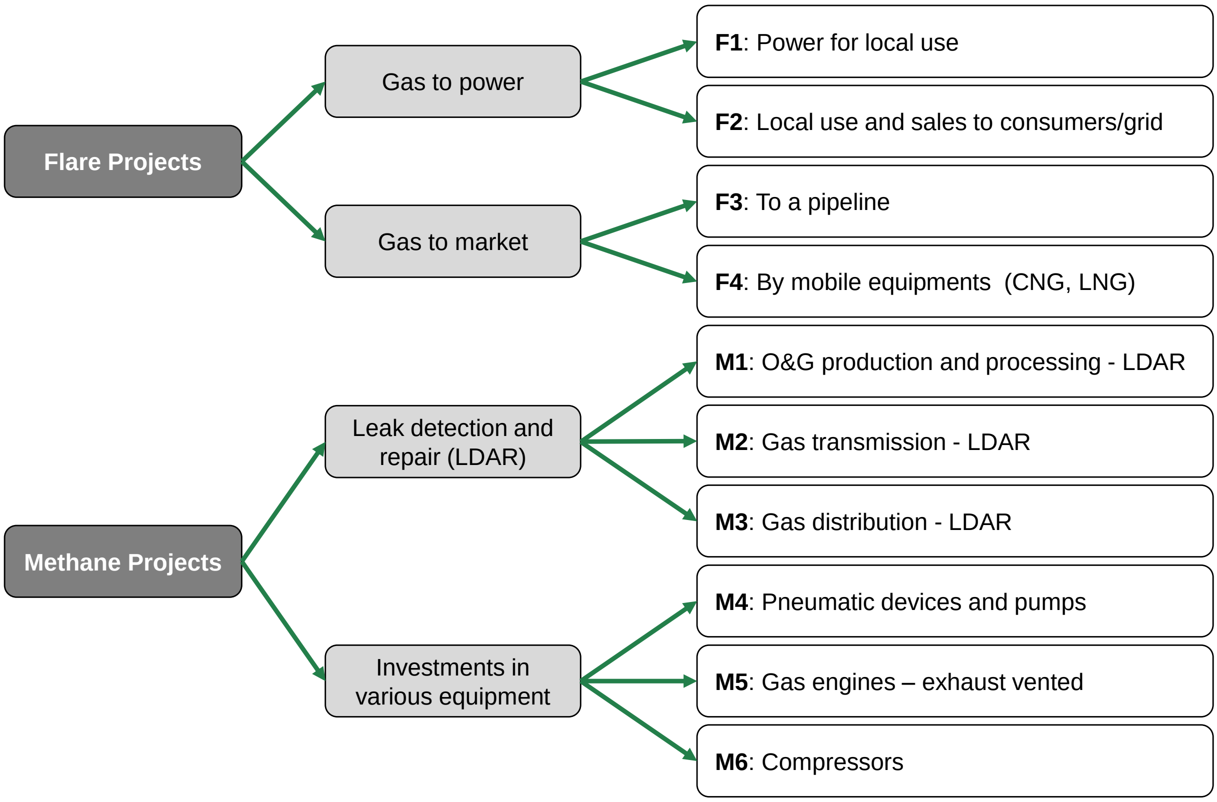
[9] Non-additional projects would not result in emission reductions below a Business-As-Usual scenario
[10] References: EPA 2014 (http://www3.epa.gov/climatechange/EPAactivities/economics/nonco2mitigation.html), Carbon Limits 2014 (http://www.catf.us/resources/publications/view/198), ICF 2014 (https://www.edf.org/sites/default/files/methane_cost_curve_report.pdf)

installation of plunger lift systems and unspecified procedure improvements (M8 and M11), and limited/uncertain abatement potential as in the case of reducing emissions during workovers and completions in unconventional gas production (M9).

Four flare categories were also excluded. Small and medium scale GTL (F5) are not mature technologies and are capital intensive with respect to emission reductions. Re-injection projects (F6) normally have high costs if they do not have enhanced oil recovery (EOR) benefits, and have environmental integrity and MRV issues when associated with EOR. The two categories of large scale flare reduction projects (F7 and F8) encompass many projects with very diverse and complex technical designs and therefore cover a great variety in project economics and difficulties in establishing simple and yet sound methods for calculation of results (emission reductions). Differences in project economics and the growing importance of regulatory requirements for these project categories imply that the risk of attracting free riders is large.

The remaining categories, six for methane and four for flaring, are considered to offer the greatest potential for delivering GHG mitigation at scale using a PAF-like delivery model and are scrutinized further below. They are illustrated in Figure 3 below.

Figure 3 Project categories evaluated for PAF-instrument suitability



Potential challenges and considerations

Although the less suitable mitigation categories have been excluded from further consideration, each of the ten categories selected include projects with different characteristics, which needs to be considered for the design of a PAF-like instrument. The analysis highlights these potential challenges and presents some suggestions to accommodate them (e.g. MRV standards and procedures) following the same assessment criteria that have been used for the preliminary screening.

Quantification and verification of results

These aspects are considered manageable for all of the considered mitigation options. For some of the project categories it would be possible to use existing CDM methodologies, and for others further efforts may be needed to develop new or adapt existing MRV standards and procedures to the specific characteristics of the project categories. It is also important to ensure adequate balance between MRV costs for project owners and considerations of environmental integrity. The exact design of the quantification and verification framework under the PAF-like mechanism for the oil and gas sector would hence depend on the mitigation options chosen for inclusion and the desired level of balance between complexity and stringency. The choice of MRV approach will also determine the degree of linking between the put options offered through the PAF-like instrument and existing markets for emission reductions. With a MRV approach in full compliance with an underlying market (e.g. the CDM market), the optionality to redeem the price guarantee, or not, could have value for auction bidders.

CDM methodologies. At the outset it appears natural to use already approved and tested CDM methodologies since they should give assurance of high environmental integrity and would enable the use of existing CDM infrastructure for administration of verified results and link the put options offered to the CDM market. Two CDM methodologies are applicable; flare methodology AM0009 for category F3 and partly F4 (CNG), and methane leak methodology AM0023 for LDAR projects (M1 to M3)[11]. One option is to use the CDM methodologies directly, another is to take elements from them and not use them in their entirety, including, for example, the certification and issuance steps. There are three arguments for not using them directly:

1. The methane methodology (AM0023) is somewhat controversial due to potential problems with baseline determination.
2. The flare methodology (AM0009) is considered onerous and resource demanding to use.
3. For many of the categories (M4, M5, M6, F1, F2 and F4) there are no applicable CDM methodologies, hence alternative MRV standards and procedures must be found. The alternatives may not necessarily align well with the CDM methodologies.

The value of developing new standards to ensure environmental integrity and define appropriate MRV requirements must be carefully evaluated against the cost of such developments and the administrative costs associated with developing a dedicated system to manage projects and verified results related to a PAF-like instrument. In any case, it is considered important that MRV requirements are clearly defined prior to launching any auctions.

Other possible approaches. The generic ISO 14064-2 is a possible alternative to heavy reliance on CDM methodologies. ISO 14064-2 will be used to certify emission reductions investments in the oil and gas sector which can be used for compliance under the Fuel Quality Directive of the European Union. Other methodologies/protocols available (e.g. from the British Columbia and Alberta offset schemes) could also be leveraged. A pragmatic approach would be to create a set of category specific standards based on relevant elements of CDM methodologies, ISO 14064-2 and other standards used by the industry.

[11] In the past AM0023 has been mainly used for gas distribution projects

Some preliminary thoughts on how this can be done for some of the considered mitigation options are presented here:

- *Methane LDAR projects*: As noted above establishing baseline emissions for these project categories is challenging. Baseline emissions are based on measurements (before repair), which may give raise to engineered (and artificially high) emission levels that are difficult to spot during verification. One alternative approach is to base payments on another indicator, e.g. assuming an average emission rate for each component being detected and repaired (rather than directly measured emission reduction results). The emission rates should be set conservatively, but still be realistic and attractive enough for the operator to pursue the LDAR program. A cap on the emission reductions that can be claimed could also be considered.
- *Investment in equipment for methane emission reductions:* Also for these categories, benchmarks, rather than measured emission reductions, probably is the better approach. Using technical benchmarks is quite common in existing methodologies/protocols and have been applied for methane emissions (e.g. M4). Benchmarks would also normally help to ensure that MRV costs are kept at a reasonable level.
- *Gas to power – flare reduction:* Although there is no CDM methodology for previously flared gas used for power production there are elements from various methodologies[12], including for power projects, which can be used to create the necessary guidelines for quantification of emission.
- *Gas to markets – flare reduction:* For project category F3 (gas to pipeline) AM0009 already exists and has been tested. It should be considered to simplify it for use under the PAF-like scheme, and to assure that it is in line with the other standards. For F4 (gas delivery by mobile equipment) there are also elements of AM0009 and other CDM methodologies (e.g. AM0077) that can be used.

Impacts of improved economic returns on investments

The PAF mechanism's effectiveness in leveraging private financing of emission reduction projects depends on how it impacts project economics and hence decision making. Due to the difference of abatement costs among the mitigation options, the impact of providing a price guarantee for emission reductions (or other verifiable results) will vary between project types. Detailed comparison of abatement costs shows that the economic impact of a carbon price is generally greater for methane than for flare projects; and that among flare projects some technologies can, under certain market conditions, achieve a significant improvement of internal rate of return at a price of up to 10 US$ per tCO_2e.

Methane abatement measures of the type scrutinized here demonstrate the strongest sensitivity to any given price paid per unit of GHG emission reductions. The reason for this are the relatively low mitigation costs and high emission reduction intensity which is a result of the high radiative forcing of methane. With a carbon price of 10 US$ per tCO_{2e}, the payback periods for methane abatement technologies are typically in the range from a few months to 3 years. As described above[13], about 800 million tCO_2e in emission reductions can be achieved in 2020 (compared to a business-as-usual scenario) at a costs of less than 10 US$ per tCO_2e, of which half are in developing countries.

The economic impacts of a guaranteed carbon price of 10 US$ per tCO_2e is less for flare projects since these projects are more capital intensive. They generally capture more gas and therefore generate more revenues from gas/power sales, but the existing methodologies provide revenues from the CO_2 rather than methane emission reductions and are therefore rewarded less financially. The

[12] Including AM0009 and various fuel-switch methodologies
[13] Reference: EPA 2014

economic returns of flare reduction projects are very site specific and will also depend on local power and gas prices. A 10 US$ per tCO_2e carbon price can give a sufficient improvement in the internal rate of return for flare projects located in regions with low net-back prices for sale of end products. The use of APG to produce power for local consumption only (flare category F1) can be quite attractive due to reduced dependence on alternative fuels (e.g. imported diesel), but there are numerous operational considerations which could limit the economic attractiveness in the absence of an economic value of emission reductions.

Free-riders and perverse incentives

Many of the emission reduction projects in the oil and gas sector have positive economic returns and, hence, are in danger of free-riding from projects that would have been implemented anyway. Past experience, however, shows that in developing countries these projects do not happen under business-as-usual circumstances despite negative abatement costs due to various organizational and financial barriers. Free rider risk considerations should therefore focus on a good understanding of common practices in the application of new technologies and practices, and the non-financial barriers which exist. Specific eligibility criteria should also be developed for each category for the purpose of excluding projects with a high risk of free-riding.

Free-riders due to financial considerations could exist within all of the categories examined in this report. Some of the mitigation options are also at risk from projects which, in one form or another, should have been implemented in response to regulatory requirements. Even if the categories evaluated here are considered to include less potential free riders than (some of) the categories excluded, admissibility of projects in the ten suggested categories cannot be automatic. Nor is it advisable to avoid oil and gas projects altogether because of free-rider issues, as the vast mitigation potential a PAF-like payment can unlock in the sector is too great to ignore.

Defining appropriate eligibility criteria is therefore fundamental to the credibility and effectiveness of the PAF-like instrument, keeping in mind the balance between a desired level of specificity and predictability and the transaction costs faced by project proponents to demonstrate compliance. Specific criteria will need be developed for each category for the purpose of excluding projects with a high risk of being free riders. These criteria are not examined in detail here, but some considerations are offered on what the challenges are for the categories in limiting free riders.

Methane projects: Methane reduction projects are less at risk of free-riding due to the fact that companies are often unaware of the scale of their fugitive emissions and the extent of venting, unless the volumes are significantly large to attract attention. The economic value of the lost gas is also typically moderate, and there can be challenges related to implementation and securing financing and management attention. As a result, despite negative abatement costs for many mitigation options, the mitigation effort in developing countries have been modest to very low.

To reduce the risk of free riding, considerations should focus on a good understanding of common practices in the application of new technologies and practices and the non-financial barriers which exist. The risk can also be reduced by making ex-ante assessments of the rate of return on specific methane investment categories, and for LDAR programs setting design criteria so that “cherry picking” of particularly attractive emission sources are avoided and broader and systematic approaches are encouraged.

The danger of perverse incentives is also lesser with the methane projects. Outside a few countries[14] there is little regulation of methane emissions in the oil and gas sector (other than those motivated by safety concerns). To the extent that there are technology standards (BAT), they are often not

[14] E.g. USA; Canada, Norway

specifically defined and enforced for the type of equipment relevant for the project categories scrutinized here.

Flare reduction projects: Projects within the suggested categories are for the most part small and medium scale and are therefore typically less profitable and less prone to regulatory requirements, compared to larger projects. Still, the economic return on investment can vary greatly depending on factors such as gas pressure, gas composition and impurities included, distance to markets and gas and power prices that can be achieved. For this reason some sort of standardized eligibility requirements related to presence of implementation barriers may be needed, whereby the economic returns are revealed. The existence of regulatory requirements should also be considered but it may not be necessary to do this on a project specific level, but rather decide on eligibility at the national level for each of the defined flare reduction categories.

For flare projects eligible for carbon offsetting, perverse incentives are a legitimate concern since flare reduction is raising on the policy agenda in many countries. It should be noted however that climate finance, such as a PAF-like instrument, can help in the enforcement of flare regulation and can also be incorporated as one component in new national policies and regulations targeting flaring of associated gas. In many countries broad and general flaring prohibition applies, but with widespread lack of compliance. International experience shows that regulation which both have a “stick” (e.g., flaring ban and/or fines) and a “carrot“ (e.g. temporary permits to flare, economic incentives) are more effective than rigid schemes. The PAF-like instrument could be part of the “carrot” of such policies, in particular if applied at the domestic level.

Efficiency of auctioning and trading

An important condition for the efficiency of auctioning as an allocation and price discovery mechanism is the participation of a sufficiently large number of bidding entities. The project or program in question would normally be a specific concession or licence for oil and gas activities, but could also have more confined boundaries, or for example be an LDAR program encompassing several licences. Guidelines on project and program boundaries need to be defined as part of the design of the PAF-like instrument, giving consideration to the prerequisite of real competition in the auctions.

The number of companies with operations upstream (oil and gas production and processing) is large and the number of independent production entities is even larger as companies typically form joint ventures for the concessions. Transmission of gas is often operated by large state-owned companies, while the structure in gas distribution varies from country to country. In some countries gas distribution is centralized in one or a few state-owned companies, while in other countries gas distribution is organized in a large number of entities, often utilities owned by municipalities. The ownership and framework conditions under which transmission and distribution companies operate may imply that they will not always have an incentive or the capability to take part in a bidding process. For example, quite a number of companies have their revenues determined by the gross amount of gas being distributed or transmitted and do not have benefits from reduced gas leaks.

Based on the evaluation above of projects suitable for a PAF-like scheme, the number is potentially large. There may be somewhere between 2000 and 4000 oil fields that currently flare associated gas on a global basis and a much higher number of installations having methane vents and leaks. Although some project categories may count a small number of entities, overall the main challenge does not seem to be the number of eligible projects, but rather to attract their attention and interest to the scheme.

In order for an auction to be an effective price discovery mechanism, the results for which payments will be made under the PAF delivery model must be comparable. Related to this the scheme design challenges are less when projects have a short investment lead and project do not differ too much in emission reduction profiles and project lifetime. Flare reduction projects (F1 to F4) are more diverse along these parameters than methane reductions projects. If results (emission reductions) for LDAR and investment methane reduction projects are based on benchmarks there is good predictability of the emission reduction profile and future payments, while this would not be the case for LDAR if results are based on direct measurements (e.g. based on AM0023). Methane projects also have the advantage of very short lead time and flexibility with respect to start up and stop of mitigation activities. For flare reduction investments with time-dependent emission reduction generation profiles, including different project lifetimes, specific design challenges with the instrument must be addressed. Project category F1 (gas to power for local use) is expected to have more stable emission reduction generation profiles than the other categories, as only a portion of the associated gas is typically utilized to meet on-site demand.

Conclusions

This note has presented some first considerations on the relevance and suitability of extending the PAF instrument to methane and flare reduction projects. The next step is to receive comments from and engage with stakeholders and on this basis eventually, if considered relevant, further explore how a PAF-like instrument can be designed in order to become an efficient and effective instrument for accelerated efforts to reduce flaring and methane emissions.

A condition for a PAF-like instrument having an impact on methane and flare reduction efforts is that some of the design and methodological problems encountered with project specific mechanisms such as the CDM are avoided. Applicability (MRV and eligibility criteria) must be simpler, with a degree of standardization where relevant (e.g. eligibility criteria), so that more project developers have the possibility and interest to participate. For example, a set of simple technical and economic parameters describing key features of small and medium scale projects can be considered adequate in order to determine eligibility. Transaction costs must come down as well as the risks perceived by project developers. This should be balanced against the efficiency of using public funds and ensuring environmental integrity.

Although the evaluation above has focused much on the complications and challenges of extending the PAF-like instrument to methane and flare reduction projects, the conclusion is that these project categories represent a very interesting potential for replicating the scheme. Methane and flare reduction projects hold a large potential to reduce GHG emissions at low or negative abatement costs. The potential not realized is large due to barriers, of which some are the result of deficiencies in regulations and policies and need interventions by relevant national authorities. Other barriers can be reduced by a number of other measures, of which support through a PAF-like instrument is one. A guaranteed payment for results obviously would help in reducing financial barriers, but also lack of awareness and knowledge could be reduced with the use of a PAF-like instrument, for example in combination with other measures. A case in point is small and medium size emission reductions investments not being prioritized by corporate managers even if they are profitable.

The fact that a PAF-like scheme for a large part would address such barriers and that capital expenditures for a large part are modest and companies often, though not always, have the required funds to invest suggests that the support scheme should not rely only on public funds. The scheme should primarily aim to catalyze mainstreaming of emission reduction efforts by companies themselves or with support of the dedicated national/sectoral programs. A PAF-like scheme could also help create momentum bottom-up when companies are engaging at their higher management level into initiatives like the “Zero Routine Flaring by 2030” initiative. It should also be considered whether the PAF-like scheme could be combined with other national climate mitigation policies, including for example future required technology standards and mandatory or voluntary LDAR programs. The PAF-like instrument could also be considered as one of the instruments available to support the implementation of broader national policies and objectives for the oil and gas sector such as defined in the INDCs.

Issues for consultations with stakeholders

The PAF team invites stakeholders to provide their views both on the basic rational and suitability of a PAF-like instrument for methane and flare reduction projects, and more specific issues relevant for the design of such a scheme. Specific issues that need considerations include, but are not necessarily limited to:

Rules and procedures for quantification and verification of results

- Should CDM methodologies be the main reference for quantification and verification?
- Should separate and category specific standards and procedures be developed?
- For methane projects, should benchmarks rather than measured emission reductions be used as bases for payments?

Risk of attracting free riders and creating perverse incentives

- Should one or several category specific eligibility criteria be developed as part of the scheme?
- What should be the main components/criteria to minimize the risk of free-riding?
- How can non-financial barriers be identified and determined?
- How can the PAF-scheme be designed as a precursor for future mainstreaming of action by companies and/or regulatory reforms by national authorities?

How to mobilize funds for the scheme

- What are the conditions for public funds, directly from national governments, being available for the scheme?
- Under what conditions can broader funds managed by institutions dedicated to climate financing be made available?
- What are the opportunities to obtain funding from the oil and gas industry, e.g. through its industry association or through initiatives such the Climate and Clean Air Coalition (CCAC), Global Gas Flaring Reduction Partnership (GGFR), Global Methane Initiative (GMI) or the Oil and Gas Climate Initiative (OGCI)?
- What other possible private funding opportunities are there?
- Can linkages be made to existing or new offset schemes (e.g. Fuel Quality Directive of the EU)?

Design issues & Efficiency of auctioning

- Given the variability in abatement costs and differences in emission reduction generation profiles, how should to the auctions be designed to maximize the efficiency of allocation of price guarantees?
- Is a guaranteed price on emission reductions an important part of such a scheme?
- Are auctioning and tradability preferable features as compared to other approaches such as administrative pricing?