Pilot Auction Facility for flare reduction investments

For the purpose of stimulating investments in greenhouse gas emission reductions, the World Bank Group has developed an innovative climate finance instrument; the Pilot Auction Facility for Methane and Climate Change Mitigation (PAF). The PAF delivery model consists of allocation of tradable price guarantees through an auction, providing a floor price to be paid for verified emission reductions, or other predefined results, in order to enhance mitigation action. The instrument was first tested for so-called “stranded” methane emission reduction projects in landfills, animal waste and wastewater registered under the Clean Development Mechanism (CDM). Through the first auction in July 2015, 8.7 million tons of CO_2 equivalents (tCO_2e) were contracted with 12 firms. The PAF delivery model has a strong potential for replication and quick scale-up, and extending it 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. 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 (PAF)

The PAF has as its objective to stimulate reductions in greenhouse gas emissions (GHGs) while maximizing the impact of public funds and leveraging private sector financing. Its results-based payment mechanism will set a floor price for future emission reductions (or other predefined results) in the form of a tradeable put option, which is competitively allocated via auctions.

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.

The optionality allows put option owners to benefit if market prices rise above the strike price. 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. Either way, the price guarantee has provided the private investors the financial incentive to fund new projects, or continue to operate projects at risk of discontinuation.

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.

Considering a PAF-like instrument for oil and gas sector climate change mitigation

Extending the PAF delivery model to the oil and gas sector is being considered for two main reasons:

1. The sector’s own emissions account for almost 10% of global GHG emissions.[1]
2. 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 these emissions which are currently being hindered by financial or non-financial barriers.

Direct emissions of methane from oil and gas sector operations and emissions of CO_2 from gas flares are the two broad emission sources being considered initially. Estimates of their respective contribution to GHG emissions are shown as the three green stacks in Figure 1. In addition, there are direct release of CO_2 from gas processing, and CO_2 emissions from the sector’s own energy use. Figure 1 provides estimates of annual GHG emissions from oil and gas sector operations.

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

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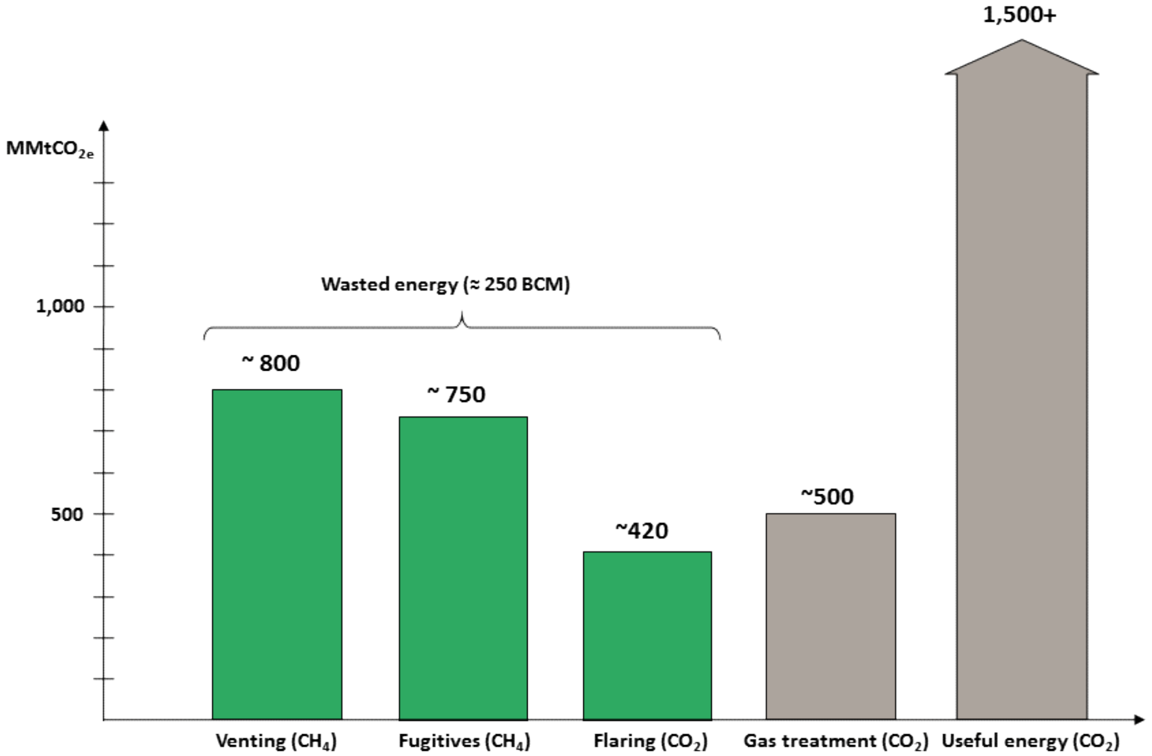
Figure 1 Estimates of annual greenhouse gas emissions from oil and gas operations



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

While methane is the largest source 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 loss of 250 BCM of gas.

Although little public information exist on low cost flare reduction potential, it is considered to be substantial. One recent study[2] has estimated that the total annual reduction potential associated with profitable measures in the oil and gas sector (i.e., with an abatement cost < 0 $/tCO_2e$) is estimated at 127-143 million tCO_2e. While this figure is not split between flare reduction measures and other measures related to venting, the majority of the potential for profitable measures is considered to be related to recovery and productive utilization of associate gas based on the extensive literature review presented in this report.

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 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[3]. Recently an initiative has been launched, and is currently endorsed by 10 countries, 12 oil companies and 7 international development organisations, to eliminate all routine flaring by 2030[4]. Applying a PAF-

[2] http://ec.europa.eu/clima/policies/transport/fuel/docs/studies_ghg_venting_flaring_en.pdf
[3] 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".
[4] http://www.worldbank.org/en/programs/zero-routine-flaring-by-2030

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like mechanism as a climate finance instrument should be seen as one possible means of reinforcing national policies and measures to achieve the ambitious target of this initiative.

The economic attractiveness of flare reduction investments are affected by numerous factors, many of which are site specific (e.g., gas production profile, gas composition, presence of impurities, gas pressure, distance to existing infrastructure or markets). License and other framework conditions and energy prices can also vary due to country specific factors. These cost and revenue determinants are important factors that can hinder investments in flare reduction, but there are also a number of other barriers caused by policies and regulations, structural features of national energy markets and (lack of) awareness, knowledge and priorities of oil sector managers. 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. The suitability, effectiveness and potential impacts of a PAF-like instrument will be determined by the degree the instrument design takes into account the particular characteristics and challenges associated with gas flare reduction investments.

Assessing the suitability of a PAF-like instrument for the oil and gas sector

In order to determine the potential of a PAF-like scheme in the oil & gas sector, and to understand under what conditions the PAF delivery model is an efficient and sustainable model for disbursement of public funds with Results-Based Financing (RBF) objectives, the following aspects have been assessed for different sub-categories of flare reduction investments:

Quantification and verification of results
Sound methodologies and procedures (MRV framework) for calculating emission reduction impacts of investments are essential in order to ensure environmental integrity. Another important consideration is that the MRV framework is practical and not too costly for project operators to adhere to. Relevant methodologies have been developed under the CDM, but for practical purposes only one of these (AM0009) is straightforward to use. The generic ISO 14064-2[5] has broader applicability and yet other industry standards may be applicable (or have important elements which are applicate and straight forward to use). In addition, new methodologies can be developed for some sub-categories, drawing on elements from existing standards and methodologies without too much extra effort.

Impacts of improved economic returns on investments
The PAF mechanism will be effective primarily through impacting the economics of investments and hence investment decisions. Important factors are the scale of emission reductions, including the certainty of these being achieved and successfully verified, and the price at which emission reductions are transacted. For the purpose of this analysis, the focus is on projects where a price of up to 10 US$ per tCO_{2e} is enough to impact on the investment decision.

Free-riders and perverse incentives
Oil companies are continuously considering and implementing projects to reduce flaring, either because the investments are financially viable or due to regulatory requirements. 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. Further, the PAF-like mechanism should be designed and operated such that there is little risk of altering flare regulations and policies in a negative/less stringent manner, hence avoiding so-called perverse incentives.

Efficiency of auctioning and tradability
Given the variations and complexities of flare reduction projects, auctioning and tradability represent challenges for some project categories. Projects are different with respect to lead times for

[5] ISO 14064-2:2006, see http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=38382

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commissioning, cost structures, lifetime and time profile of emission reductions, and financing. These aspects are important for suitability and eventually for the more detailed design of the PAF instrument. In addition, auctioning and tradability will only serve the purpose of contributing to the cost efficiency of disbursement of funds if there are a certain number of project developers interested in participation and results are comparable between projects. The likely number of eligible and interested participants within each sub-category is an important consideration.

Sub-categories of flare reduction projects considered

Technologies and approaches for utilization of otherwise flared gas have been grouped into sub-categories such that each of them have some commonalities with respect to size (although no specific gas volumes are defined), cost structures and lead time, and approaches needed for emission reduction calculations. They do not necessarily encompass all alternatives for flare reduction and some investment projects may include elements from more than one of the sub-categories. Nevertheless, it is believed that separation into the eight categories shown below forms a good basis for analysing what part of flare reduction investments might be suitable for a PAF-like instrument

ID:	Sub-categories:
GF1	*Power for own use* Associated gas captured and used for power and heat at the production site.
GF2	*Power for own use and delivery to a market* Includes the activity under GF1 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.
GF3	*Gas delivery by pipeline* Gathering, pre-treatment and transportation of association gas for export by pipeline for further processing and/or end use.
GF4	*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.
GF5	*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.
GF6	*Reinjection of gas* Associated gas being reinjected for storage and/or for enhanced oil recovery (EOR).
GF7	*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.
GF8	*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.

Preliminary results of the assessment

The following four sub-categories are considered to offer the greatest potential for delivering GHG mitigation at scale using a PAF-like delivery model:

- **GF1** Power for own use
- **GF2** Power for own use and delivery to a market
- **GF3** Gas delivery by pipeline
- **GF4** Gas delivery by mobile equipment (CNG/LNG)

The rationale for these four sub-categories being considered particularly suitable for a PAF-like instrument are summarized below for the each of the key aspects evaluated:

Quantification and verification of results
These aspects are considered manageable for all sub-categories. CDM methodology AM0009 is directly applicable for GF3 and GF7, but GF7 has a lower scope because these are large scale, complex projects which, following AM0009, would pose challenges in defining project boundaries and setting monitoring points and often entail relatively large costs for monitoring and reporting of emissions. For the other sub-categories, the generic ISO 14064-2 can be used, either directly or supplemented with a new methodology, which is not considered too costly to develop or too onerous to use. The lack of any approved CDM methodology for GF6 would be considered a problem since re-injection has the risk of resulting in “methane leakage”, and additional oil production raises issues of baseline determination. These factors undermine the perceived environmental integrity of re-injection projects.

Impacts of improved economic returns on investments
The economic (and emission reduction) impacts are considered to be best for sub-categories GF2, GF3 and GF4. The impact for GF1 (power for local use only) is generally somewhat lower because the use of associated gas (and hence flare reduction) is constrained by the local power demand. GF5 (small and medium size GTL) are not mature technologies and generally a carbon price of 10 US$ per tCO_{2e} would not be enough to alter the financial viability of relevant investment projects. Part of the explanation is that emission reductions are much less than the avoided flaring due to the energy intensity of operating the GTL plant. Other financial support schemes would probably be better in order to contribute to the mainstreaming of these technologies. Re-injection for storage (part of GF6) would also typically need more than 10 US$ per tCO_{2e} support since there are no other source of revenues from such investments. Re-injection projects with EOR are often economic with revenues from sales of addition crude oil being much greater than eventual contributions from emission reductions (which may also be small or questionable if the EOR effect is counted in). Large scale projects (GF7 and GF8) show great variations with respect to economic viability, and the impact on economics will depend on the degree these projects also handle other sources of gas.

Free riders and perverse incentives
Although there may be a number of potential free riders within all the sub-categories, the challenges to exclude them from participation in the PAF scheme will differ between different categories. Some form of standardized “additionally test” would be needed, whereby the economic returns and/or regulatory requirements of the flare reduction are revealed. The larger and more complex the flare reduction investment are, the more difficult it will be to determine “additionality” through a set of simple and standardized criteria. GF1, GF2, GF4 are considered to have the best prospects for such standardization, while it would be very challenging for GF6, GF7 and GF8.

Perverse incentives are a legitimate concern particularly for large scale projects and/or “green field projects” (new oil and gas field developments), since large and new flares typically are the target of regulatory authorities. 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

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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 that rigid schemes. The PAF-like instrument could be part of the “carrot” of such policies.

Efficiency of auctioning and tradability
The efficiency of auctioning as an allocation and price discovery mechanism will primarily depend on the likely number of eligible and interested participants within each sub-category. Based on global estimates of flaring and detailed analysis of flaring in a few countries, Carbon Limits estimates that between 2,000 and 4,000 fields are currently flaring continuously. Some of these might be larger fields, with multiple flare sites which can be reduced through multiple smaller investment projects. In some countries or regions one oil company, or other potential participant in an auction, may have interests in multiple fields. The eventuality of collusion or other factors affecting efficiency of an auction, therefore, requires consideration.

The number of investment projects that meet the eligibility conditions of the PAF and are likely to be developed with additional support within each sub-category will depend on instrument design and a number of techno-economic factors. Based on experience with the CDM, it is considered likely that sufficient participation for competitive bidding could be secured for sub-categories GF1, GF2, GF3 and GF6. These categories are considered to hold the largest potential in terms of new projects in the near- to mid-term (some of which might be economically attractive without additional support). An increasing number of projects within sub-categories GF4 and GF5 might be developed in the longer term, depending on technology and market developments, while the number of projects that are likely to be developed under categories GF7 and GF8 are assumed to be limited (albeit with large emission reduction results).

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. For flare reduction investments with time-dependent emission reduction generation profiles, including different project lifetimes, this poses particular challenges with respect to instrument design that should be addressed. Project category GF1 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.

Concluding remarks and way forward

This note has presented some first considerations on the relevance and suitability of extending the PAF instrument to 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 flare reduction efforts.
The CDM was never a success for flare reduction projects. A condition for a PAF-like instrument having an impact on flare reduction efforts is that some of the problems encountered with the CDM are avoided. Applicability criteria (MRV and additionality tests) must be simpler 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 fund and ensuring environmental integrity.

The PAF team invites stakeholders to provide their views both on the basic rational and suitability of a PAF-like instrument for flare reductions, and more specific issues relevant for the design of such a scheme, including:

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- Can financial support through result based climate financial play any significant role in reducing current barriers to flare reduction investments?
- 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?
- Does the four sub-categories GF1 to GF4 cover investments with the best suitability for a PAF-like instrument and/or should the sub-categories be differently defined?
- Given the great variability in abatement costs and the many variables determining project profitability, how should eligibility criteria be defined to minimize the risk of free riding?
- Given the lack of so-called “stranded projects”, how to ensure interest from project developers to guarantee an effective auctioning process?

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