

Global Gas Flaring Reduction

A Public-Private Partnership

A VOLUNTARY STANDARD FOR GLOBAL GAS
FLARING AND VENTING REDUCTION

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A Voluntary Standard for Global Gas Flaring and Venting Reduction

THE WORLD BANK

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Current partners of GGFR are the Bank, the governments of Angola, Chad, Canada, Ecuador, Equatorial Guinea, Indonesia, Nigeria, Norway and the United States, Sonatrach of Algeria, SNH of Cameroon, BP, ChevronTexaco, Eni, ExxonMobil, NorskHydro, Royal Dutch Shell, Statoil, and TOTAL.

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1 Executive Summary

This *Voluntary Standard for Global Gas Flaring and Venting Reduction* (the “Standard”) provides guidance on how to achieve reductions in the flaring and venting of gas associated with crude oil production worldwide. The approach set forth in the Standard is intended to support other flare reduction initiatives and go beyond prevailing flaring and venting practices that would otherwise occur in many countries. The parties supporting this Standard voluntarily choose to endorse the principles laid out in the Standard and to work in cooperation with GGFR Partners to seek solutions to overcome barriers that prevent significant gas flaring and venting reduction.

Consistent with the objective to achieve significant reductions, the Standard focuses initially on the largest sources of flaring and venting of associated gas globally, encouraging prioritization of resources to those operations with the largest potential for reduction. The specific focus of this Standard is to:

- Eliminate routine sources of associated gas venting that could be captured and conserved or routed to a flare, thereby reducing the direct emissions of methane; and
- Eliminate or reduce the large sources of associated gas flaring, primarily the major sources of continuous production flaring, other than those related to emergency, safety, and operational upsets.

The Standard has been developed by building upon existing standards, policies, and best practice aimed at reducing flaring and venting, and identifying improvements in those through extensive consultation with the oil and gas industry and the governments of countries where flaring and venting occur.

Standard Overview

Table ES-1 outlines the key elements of the Standard, which is structured to include initial goals aimed at achieving significant reductions in associated gas flaring and venting in the near term, as well as an ultimate goal that will encourage continuing improvement over a longer time period. The Standard also sets out monitoring and transparency guidance and best practice, and a recommended timeframe to adopt and implement the key goals of the Standard.

The Standard’s initial goal for flaring and venting is:

No continuous flaring and venting of associated gas, unless there are no feasible alternatives.

For venting, the initial goal focuses on larger sources where the vent stream could potentially be eliminated or at least routed to an efficient flare system. It allows for those situations where routing to a flare system is not feasible for technical, environmental, or safety reasons.

For flaring, the initial goal provides guidance on a process for identifying and evaluating alternatives for gas utilization solutions. It outlines a cooperative approach for identifying feasible gas utilization alternatives for the reducing gas flaring through consultation with key stakeholders and, as required, for expanding the project boundaries to other fields or operations within the region. In parallel, it recommends considering options to modify the economic approach or improve the incentives to enhance project feasibility. For any remaining flaring, it is recommended that industry best practice be adopted to design and operate flare systems.

The ultimate goal of the Standard is to:

Minimize continuous and noncontinuous production flaring and venting of associated gas.

The ultimate goal has been included to encourage continuing reductions in gas flaring and venting that may be achieved over the long term by prioritizing and addressing flaring and venting sources that were not initially addressed or deemed not feasible under the initial goal.

The measuring, reporting, and verifying practices introduced by this Standard aim to provide a simple but transparent mechanism for tracking performance toward achieving the Standard's goals and documenting the resulting reductions in associated gas flaring and venting volumes and emissions.

The Standard provides recommended timeframes for implementation, recognizing the need to distinguish between new and existing projects and to accommodate circumstances under which these timeframes may not be met.

Implementation by GGFR Partners

The key voluntary actions by producers and governments under the Standard include:

- Endorsing the Standard's principles, with the intent to work toward associated gas utilization and the reducing flaring and venting in cooperation with the GGFR Partners and other key stakeholders.
- Preparing Associated Gas Recovery Plans by producers in consultation with other key stakeholders to document efforts undertaken to identify feasible alternatives to flaring and venting and plans for implementation.
- Developing a Country Implementation Plan by governments that addresses the barriers to gas utilization within the country that are identified through the stakeholder engagement process.
- Implementing the Associated Gas Recovery Plan by producers and the Country Implementation Plan by governments.
- Regular reporting of flaring and venting levels and progress on implementation.

Anticipated Results

Demonstration that GGFR Partners have effectively implemented the Standard will be based on the completion of the Associated Gas Recovery Plans by producers and Country Implementation Plans by governments, progress toward meeting these Plans, and through public reporting.

The voluntary Standard's effectiveness in achieving its objectives will depend upon the cooperation of all GGFR Partners in seeking proactive measures aimed at eliminating or reducing associated gas flaring and venting and promoting broader adoption of the Standard outside the GGFR Partnership. Although the Standard, being voluntary, does not provide prescriptive reduction targets, successful implementation may lead to significant flaring and venting reductions in the medium term that would not otherwise have occurred.

Table ES-1: Summary of Key Elements of the Global Gas Flaring and Venting Reduction Voluntary Standard

Element of Standard	Recommended Action	Recommended Timeline (years from endorsement)	
		New Projects	Existing Projects
Endorsement	The GGFR Steering Committee endorses the Standard.	March 2004	
Adoption	Organizations and governments adopt the endorsed Standard	1 year	
Initial Goal— Venting	Eliminate continuous production venting of associated gas, unless there are no feasible alternatives.	1 year	2–4 years
Initial Goal— Flaring	Operators prepare Associated Gas Recovery Plans demonstrating efforts to identify feasible alternatives to flaring.	2–3 years	
	Governments prepare Country Implementation Plan.	2–3 years	
	Eliminate or reduce continuous production flaring of associated gas, unless there are no feasible alternatives.	1 year	5–6 years
Ultimate Goal— Flaring and Venting	Minimize continuous and noncontinuous production and flaring of associated gas.	Regular review of remaining flaring and venting	
Monitoring and Transparency	Producers conduct monitoring of flared and vented volumes and associated greenhouse gas emissions either through estimation or metering.		
	Producers report annually on flaring and venting volumes and emissions.	2 years (If currently not reporting)	
	Governments publicly report volumes and emissions annually.	2 years	
	Periodic verification of reported data is recommended through existing internal or external assurance processes.		

The key target dates that have the most significance toward meeting the objectives of the Standard are the following:

- Partners adopt the Standard;
- Initial goals for flaring and venting for new projects;
- Producers prepare Associated Gas Recovery Plans for existing projects ;
- Governments prepare the Country Implementation Plans; and
- Public reporting by governments and companies.

The actual timing to implement alternatives to flaring and venting for existing projects in specific instances will depend more on the outcome of the consultation process and the plans developed by producers and governments for implementating flaring and venting reductions.

2 Introduction

The flaring and venting of gas associated with crude oil production, estimated at over 100 billion cubic meters per year worldwide, is gaining increased attention with the international focus on energy conservation and global climate change. To address these issues, the Global Gas Flaring Reduction Public-Private Partnership (GGFR) was established to support national governments and the petroleum industry in efforts to reduce flaring and venting of associated gas. The GGFR is undertaking a number of initiatives on a parallel track that are aimed at identifying and overcoming the main barriers to gas flaring reductions globally and to address the constraints in specific countries. One of the aims of the GGFR is to develop a global voluntary standard for the GGFR Partnership and beyond to promote the effective reduction of flaring and venting worldwide.

This Standard (see definition in Appendix B) provides guidance on how to achieve reductions in the flaring and venting of associated gas that go beyond what would otherwise have occurred. It has been developed by building from existing standards, policies, and best practice aimed at reducing flaring and venting, and through consultation with the oil and gas industry and the governments of countries where flaring and venting occur.

The Standard's intent is to achieve significant reductions in flaring and venting of associated gas globally, by focusing initially on eliminating or reducing the largest sources. The Standard sets out a voluntary approach based on cooperation between GGFR Partners and other key stakeholders to overcome existing barriers to gas utilization. As such, the ultimate success of the Standard in effecting reductions in global flaring and venting depends on the adoption of the Standard and dedication of the GGFR Partnership.

3 Objectives

The objectives of this Standard are to:

- Provide the oil and gas industry with a common framework that can be applied to encourage consistent objectives and approaches with regard to eliminating or reducing flaring and venting associated gas.
- Provide governments with common guidance that could assist and enhance the success of achieving the country objectives with respect to flaring and venting practices, market development, environmental protection, and advancements toward sustainable development.
- Encourage cooperation between industry and governments by defining mutually agreeable and consistent objectives and targets with respect to gas flaring and venting practices.
- On both a global and local scale, effectively reduce the environmental impacts of flaring, particularly greenhouse gas (GHG) emissions, and encourage utilization of a valuable and clean energy resource.

4 Applicability and Focus of Standard

The Standard provides guidance designed to achieve global reductions in flaring and venting of associated gas through a voluntary and cooperative approach among companies, governments, and other key stakeholders. The Standard's initial focus is on the large sources of associated gas flaring and venting where improvements can potentially make a significant difference on a global scale. To this end, it is aimed at effecting large reductions in flaring and venting activities within the short-to-medium timeframe, with a longer-range goal to encourage continuing progress toward more comprehensive reductions in associated gas flaring and venting activities over time.

The Standard specifically focuses on:

- Eliminating routine sources of associated gas venting that could be captured and conserved or routed to a flare, thereby reducing the direct emissions of methane¹; and
- Eliminating or reducing the large sources of associated gas flaring, primarily the major sources of continuous production flaring, other than those related to emergency, safety, and operational upsets.

By focusing initially on the major sources and those with a high probability of successful solutions to flaring and venting within a partner organization, the Standard encourages prioritizing resources to those operations with the largest potential for reduction. For example, a producer or government could initially focus on the top 80 percent of the flaring and venting operations within their organization or jurisdiction. In the spirit of voluntary participation, each partner organization will need to evaluate its flaring and venting profile and determine its own goals for initial coverage in the near to medium term.

Activities potentially involving gas venting or flaring that are within the recommended applicability of this Standard are summarized in Tables A-1 and A-2 of Appendix A. These tables also indicate the part of the Standard that applies to each type of activity, that is, either the near-term improvements (that is, initial goals) or the longer-term improvements (that is, ultimate goal) (refer to Sections 6 and 7, respectively).

The Standard is not intended to contradict any national, regional, or local laws, regulations, and other legal requirements, or existing contracts and agreements, such as production sharing contracts and operating agreements. If any such law, regulation, legal requirement, contract, or agreement are in contradiction with this Standard, the Standard assumes that these documents will be given priority. However, the underlying principles of the Standard may be used to support efforts toward meeting and exceeding flaring and venting reduction requirements reflected in these documents.

Definitions of important terms as they are used in the context of this Standard are provided in Appendix B.

¹ Methane has a global warming potential 23 times higher than CO₂ on a mass basis.

5 Standard Outline

This Standard addresses gas flaring and venting activities associated with existing and new oil production operations throughout the world, and its implementation is intended to result in significantly reducing the volumes of gas flared and vented by such operations. It is designed as a voluntary guidance that can be adopted by international and national oil companies for application to their oil production activities in all countries, and as a tool that may be used by national governments to facilitate the reduction of flaring and venting within their national borders. Accordingly, the Standard consists of the following elements:

- Goals for reducing flaring and venting of associated gas, including:
 - Initial goals to achieve near term reductions in flaring and venting
 - An ultimate goal, intended to stimulate continuous improvement over a longer timeframe
 - Distinction between new and existing projects and the associated timing to meet the initial goals
- Monitoring and transparency
- Guidance on implementation roles and administration of the Standard

These elements of the Standard are presented in Sections 6 through 11. Supporting technical information is provided in the appendixes.

6 Initial Goal

6.1 Initial Goal for Venting

6.1.1 Goal Statement

The Standard's initial goal for venting is:

No continuous venting of associated gas, unless there are no feasible alternatives.

At a minimum, the vent gas stream should be routed to an efficient flare system, with the resulting gas flaring covered under the initial goal for flaring described in Section 6.2.

This initial goal does not focus on small vented streams (for example, tank blanketing and gas-operated pneumatics, as indicated in Appendix A, Table A.1) that are generally more difficult and less cost-effective to recover. Over the longer term, however, the Standard's ultimate goal (Section 7) does encourage continuous improvement in eliminating or reducing these small venting sources as industry best practices and new technologies evolve.

6.1.2 Acceptable Venting Circumstances

The initial goal's intent for venting (Section 6.1.1) is to find viable alternatives to continuous venting to the maximum extent practicable and to ensure that exceptions to this goal are limited to those situations in which venting is necessary for specific reasons. As suggested previously, routing of vented gas streams to a flare can be accomplished in most cases as a minimum venting reduction measure. However, technical, environmental, safety, or practical reasons may prevent the viability of flaring the vent gas under specific circumstances. Such reasons may include lack of sufficient hydrocarbon content in the gas stream to support combustion in a flare, or lack of sufficient gas pressure to allow the vented stream to enter the flare system. When such conditions exist, alternative technologies for hydrocarbon disposal should be evaluated based on current industry best practices and newly developed technologies before venting should be considered.

6.2 Initial Goal for Flaring

6.2.1 Goal Statement

The Standard's initial goal for flaring is:

No continuous production flaring of associated gas, unless there are no feasible alternatives.

Section 6.2.2 describes a process for evaluating the range of potential alternative associated gas management practices and Section 6.2.3 presents a description of acceptable flaring circumstances. This initial goal is implemented through a decision tree-type process, as shown in Figure 6.1. The initial goal's primary objective is to eliminate continuous production flaring of associated gas through a process of identifying and evaluating alternatives that would lead to using the associated gas in lieu of flaring.

The first step in the decision tree is to determine if there are more stringent regulatory requirements that must be met, and if so, meeting those requirements while considering the Standard's underlying

principles where useful to support these efforts. Existing projects are assumed to comply with all applicable regulations and other legal requirements that relate to flaring and venting and should be brought into compliance promptly if they do not.

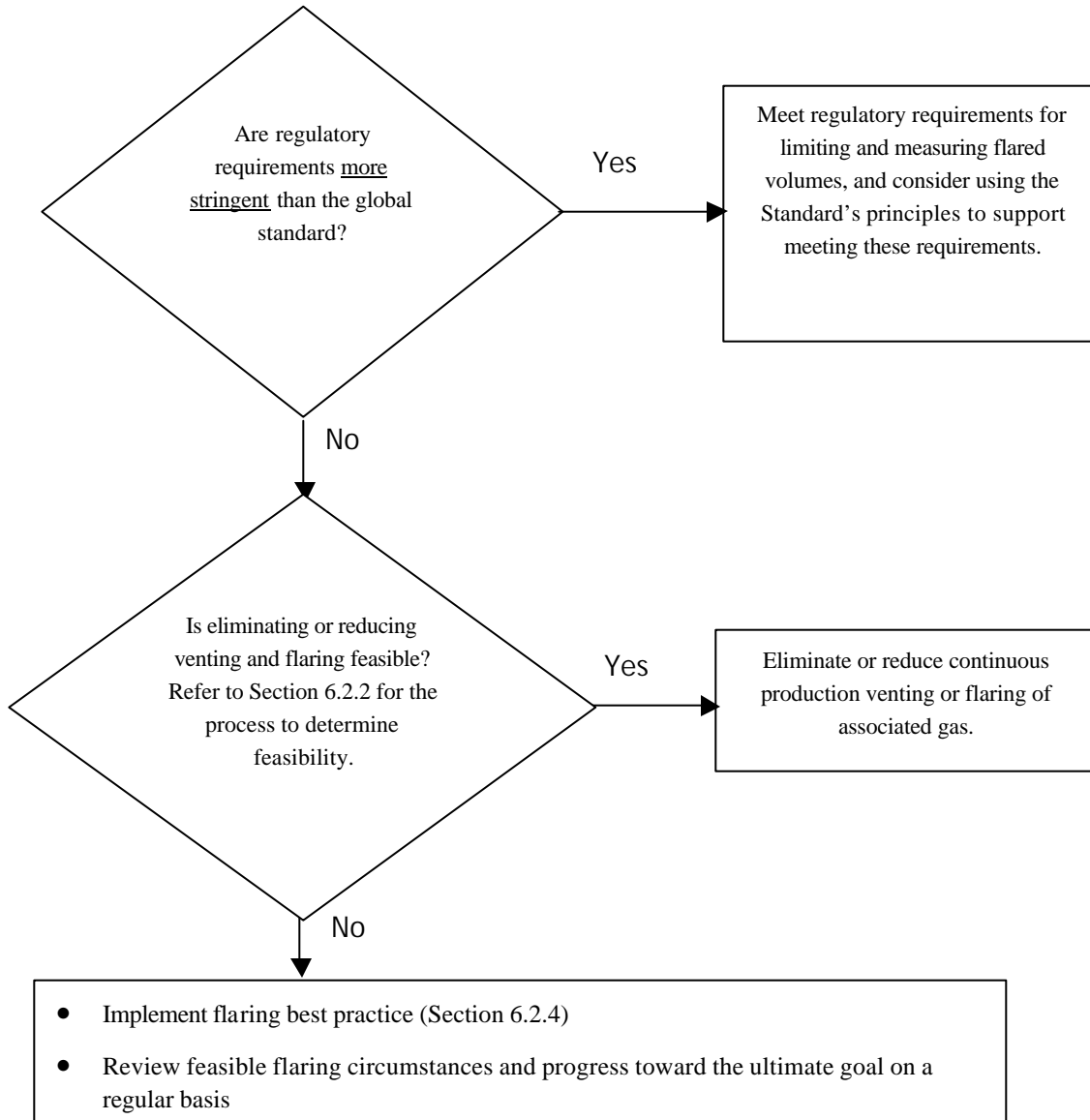
Under the recommended evaluation process for the initial goal, project operators have the role of engaging joint venture partners, government ministries, and commercial or industrial customers and, as needed, financing institutions, infrastructure owners, and representatives of local communities in consultations to seek such nonflaring options. The country governments' role is to facilitate and promote the consultation process and encourage commercialization options for associated gas.

Alternatives to reduce flaring in the near term (for example, gas utilization for onsite energy needs) should be evaluated parallel to options for eliminating the continuous production flaring of associated gas. Ideally, measures to reduce flare volumes should be evaluated as an interim solution, with elimination of continuous production associated gas flaring as the preferred goal.

The above recommended process would be applied to effectively eliminate or reduce continuous production associated gas flaring for new and existing projects, as follows:

- For new projects, the initial goal of no continuous production flaring of associated gas should be the starting point of the evaluation. If options to eliminate continuous production associated gas flaring are not viable, then options to utilize the associated gas to the maximum extent possible should be evaluated and integrated into the project design.
- For existing projects, options to eliminate or reduce continuous production gas flaring should be evaluated. Options to reduce associated gas flaring in the near term and options to eliminate the continuous production flaring of associated gas should be considered, and a plan should be developed for implementation of those projects for which the relevant stakeholders agree that gas utilization is feasible.

Figure 6.1: Standard's Initial Goals for Flaring



For any remaining flaring, it is recommended that industry best practices be adopted for designing and operating flare systems (refer to Section 6.2.4).

6.2.2 Stakeholder Engagement Process for Evaluation of Associated Gas Utilization Alternatives

The recommended approach to identify feasible alternative gas management practices for gas flaring cessation is a process through which alternatives are evaluated based on economic feasibility, with an increasing degree of stakeholder engagement and project boundary expansion. In conjunction with expanding the project boundary to include other fields in the producing region, alternative considerations

for the economic approach and financial incentives can be used to enhance the feasibility of nonflaring solutions.

An overview of the recommended process for evaluating alternate gas management practices is depicted in Figure 6.2. This process, summarized in the steps below, is to be initiated by the producer responsible for gas flaring, with country governments supporting the consultative process and facilitating associated gas commercialization:

1. Evaluate the existing field or operational project boundary to identify associated gas utilization options and assess their viability for both the operator and the joint venture partners. If the most attractive alternative to flaring is not viable, then options to increase the project boundary and options to modify the economic approach or improve the incentives should be pursued on a parallel path, as described below.
2. Expand the gas utilization project boundary to include other key stakeholders outside the joint venture and outside the project area. These other key stakeholders can include, but need not be limited to, other third party joint venture groups in need of gas recovery options, nonproducing third party investors, infrastructure owners, or gas or energy consumers who need new or additional energy supplies. The government plays a key role in this consultation process to facilitate and promote associated gas commercialization.
3. On a parallel path, evaluate alternative economic approaches and investigate the incentive structure within the expanded group of stakeholders to enhance the economic viability of the most attractive alternatives to associated gas flaring.

Potential options for consideration that producers, governments, and other key stakeholders have used to enhance the economic viability and present value of gas utilization alternatives are listed below:

Gas Producers

- *Integrate economic, environmental, and social benefits* to assist in justifying gas recovery projects.
- *Consider integrated economics* as an approach to evaluate the financial performance of a project based on the combined costs and revenues associated with both oil and gas production.
- *Expand the project boundary* to include other producers, customers, and infrastructure owners in the region to:
 - Trade gas between fields and producers;
 - Supply associated gas to gas deficient fields, electrical interconnection between fields, and so forth; and
 - Transfer best practices and technologies between JV Partners and third party operators in the region.
- *Investigate carbon credits* as a potential mechanism for generating additional revenues for some flaring reduction projects.

Governments

- *Clarify regulatory framework and contractual rights* to associated gas to maximize the potential for its commercialization.
- *Promote third party access to infrastructure* on cost-related terms to further encourage associated gas recovery and utilization.
- *Consider Production Sharing Contracts (PSCs)* that will allow the costs associated with any gas infrastructure development to be recovered, encouraging investment in gas gathering schemes and associated infrastructure.
- *Examine cost recovery and profit sharing mechanisms* and ensure that all costs associated with associated gas recovery are recognized.
- *Establish reasonable gas market development periods* in PSCs to give the producer adequate time to investigate and develop markets for associated gas, rather than be faced with relinquishing gas exploitation rights.
- *Institute tax and royalty incentives* that reflect the costs and benefits of investment in associated gas recovery schemes.
- Consider the true value of associated gas to the economy in *associated gas pricing in relation to competing fuel subsidies and environmental benefits of gas*, where this is deemed to be necessary.
- *Develop a National Gas Strategy*, which includes an associated gas utilization strategy.
- *Develop local markets* for associated gas recognizing the importance of legal and fiscal frameworks to primary customers, particularly the power sector.
- *Provide payment guarantees* for associated gas supply to reduce the producer's financial risk and encourage investment in gas recovery facilities.
- *Coordinate stakeholders* to enhance opportunities for gas utilization.

Commercial or Industrial Customers

- *Negotiate long-term contracts* for associated gas supply to reflect legitimate needs of the producer in sourcing large or small gas volumes, as determined by total hydrocarbon production.
- *Accept associated gas pricing* to reflect the economic value of gas to the economy, taking into account prices of alternative fuels, opportunities for exporting liquefied natural gas (LNG) and the environmental benefits of gas compared with other fuels.
- *Negotiate take or pay contracts* up to levels that reduce the producer risk based on anticipated gas projection and incentivize them to invest in gas recovery facilities.

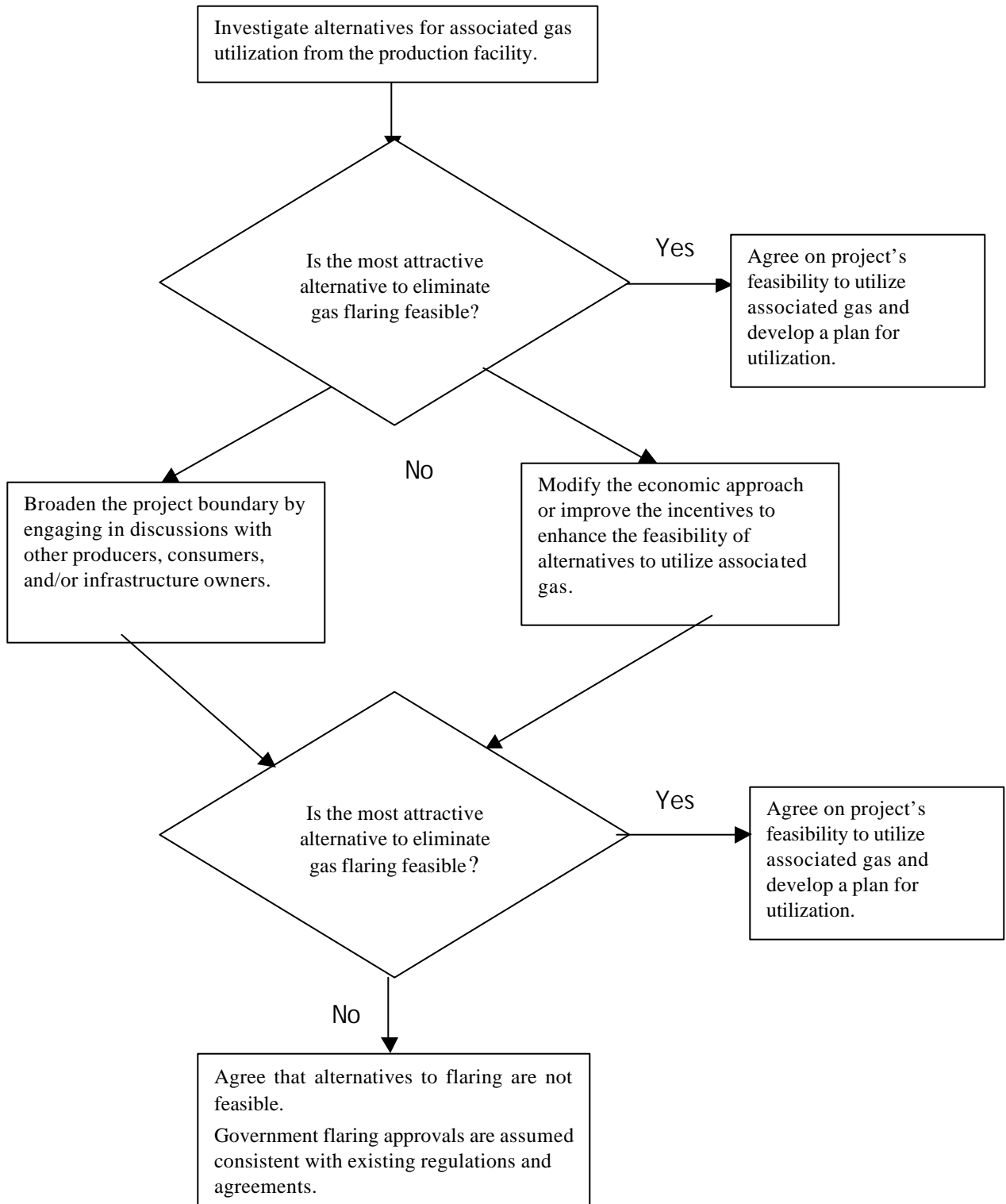
- *Provide payment guarantees* for associated gas supply to reduce producer's financial risk and encourage investment in gas recovery facilities.

Gas Infrastructure Owners

- *Examine capital investment and operating cost requirements* for utilizing existing infrastructure for gathering or transporting new associated gas supplies.
- *Prioritize the purchase of new associated gas supply* to fill commitments under existing gas contracts.
- *Allow third party ownership* of infrastructure through participation in capital investment required by expansion.
- *Participate in infrastructure expansion projects* by collecting tariffs on transport of third party gas volumes for recovery of capital, operating costs, and a reasonable operating fee.
- *Examine tariff assessments* on the transport of new associated gas owned by third parties to recover infrastructure operating costs.

A more detailed explanation of the above options and considerations is provided in Appendix C.

Figure 6.2: Process to Determine Feasibility of Alternatives for Associated Gas Utilization through Stakeholder Engagement



6.2.3 Acceptable Flaring Circumstances

As a key outcome of the stakeholder engagement process, alternatives to gas flaring will either be determined to be feasible or not. Continuous production flaring of associated gas is considered acceptable when all key stakeholder parties, including the government, have taken steps to facilitate the process without positive results. Outcomes that result in continued flaring should be sufficiently documented² to allow periodic reevaluation.

Government approval requirements for remaining flaring are assumed to be consistent with existing regulations, contracts, and agreements such as production sharing contracts and operating agreements.

This initial goal does not focus on small flaring sources, as indicated in Appendix A. The Standard's ultimate goal, however, encourages continuous improvement through implementation of best practices and new technologies (refer to Section 7).

6.2.4 Flaring Best Practice

It is recommended that flare systems be designed and operated consistent with industry best practice and in accordance with appropriate engineering codes and standards, such as the American Petroleum Institute's Recommended Practices 521. Other recommended practices covered by this Standard are expressed in the form of performance goals based on best current industry practice, rather than specific equipment and procedural requirements.

The best practice flare design and operating performance criteria adopted by this Standard are summarized below and are not intended to compromise safety in any way.

Flare Efficiency

While manufacturers are able to design flares with ever improving combustion efficiencies under test conditions, the difficulty of guaranteeing flare efficiency in the field is well recognized. Factors such as crosswind velocities, the heating value of the flared stream, and exit velocities, among others, all contribute to the variability of the actual combustion efficiency. Therefore, this Standard does not prescribe a desired combustion efficiency, but rather recommends suitable design characteristics and guidance for operation that are considered to lead to efficient and stable flaring.

Flare Performance Characteristics

Proper design and operation of flare systems, leading to optimum flare performance, include consideration of the following:

- Minimize risk of pilot blow out by installing a reliable flare system.
 - Ensure sufficient exit velocity or provide wind guards for low/intermittent velocity flare streams.
 - Ensure use of a reliable ignition system.

² Documentation of the barriers to associated gas utilization will be important for candidate Clean Development Mechanism (CDM) projects. How these barriers to associated gas utilization are overcome by the CDM project will require documentation to demonstrate the additionality for CDM projects.

- Minimize liquid carry over and entrainment in the gas flare stream by ensuring a suitable liquid separation system is in place.
- Minimize flame lift off and/or flame lick (not applicable for sonic flow flare designs).
- Maximize combustion efficiency by proper control and optimization of flare fuel/air/steam flow rates to ensure the correct ratio of assist stream to flare stream.
- Ensure heating value of flared gas is sufficiently high to maintain efficient and stable combustion. Where viable, additional gas may be required to raise the heating value adequately.
- Implement proper burner maintenance and replacement programs to ensure maximum flare efficiency and meet best practice.

Process Leakage

The gas leakage to the flare system from isolation valves and emergency release devices can be minimized by proper installation and maintenance.

7 Ultimate Goal

The ultimate goal's intent is to promote longer-term, continuous improvement, recognizing that some sources of flaring and venting will not be addressed as part of the initial goal. The focus and approach recommended under the ultimate goal is a periodic review and prioritization of the remaining sources of flaring and venting with the aim of further progressive reductions over time.

The Standard's ultimate goal is to:

Minimize continuous and noncontinuous production flaring and venting of associated gas.

This element of the Standard is included to encourage continual reductions in gas flaring and venting over the long-term through the application of new technologies and best practice, based on:

- Regular reevaluation and prioritization of associated gas flaring and venting activities including:
 - Alternative gas management practices initially not feasible with respect to the initial goal and gas volumes created by modifications to the original project. For the sources where flaring and venting reductions were initially deemed not feasible under the initial goal, a reevaluation of the local situation and remaining barriers is recommended to determine whether there are sufficient changes to warrant renewal of the initial goal stakeholder engagement process and reevaluation of feasible alternatives; and
 - Continuous production flaring of associated gas that was not initially targeted. For the remaining sources of continuous production flaring and venting, a review and prioritization of these remaining sources is recommended with the highest priority sources being reevaluated using the initial goal process to identify alternatives to flaring and venting.
- Progress toward the ultimate goal beyond the initial goals, by prioritizing those sources of small continuous and noncontinuous flaring and venting not targeted under the initial goal (Appendix A).

It is recommended that the review and reprioritization process should occur on a three-year basis, depending on the local developments in the region to support associated gas utilization and technological developments.

The timeframe for achieving this ultimate goal has been left to individual operators, companies, and governments to determine, based on their specific circumstances and advances in best practices and technologies.

8 Implementation Planning and Timeframes

As a key outcome of the initial goal process to identify alternatives for associated gas flaring and venting, plans to implement activities that will support gas utilization will be developed by both the producer and government. The producer will lead the development of an Associated Gas Recovery Plan in consultation with other key stakeholders to document the approach and activities to meet the intent of the Standard for reducing both flaring and venting. The government will lead the development of the Country Implementation Plan, which explores and addresses the key barriers related to associated gas utilization and flaring and venting reduction. These Plans will be interlinked through the consultation process under the initial goal to foster a coordinated approach to seeking solutions to associated gas flaring and venting.

8.1 Associated Gas Recovery Plan

Consistent with the spirit of the Standard, Partners are encouraged to review their global flaring and venting activities to determine the sources to be targeted under the initial goal. As an outcome of the initial goal process, producers will prepare an Associated Gas Recovery Plan in consultation with other key stakeholders. The Associated Gas Recovery Plan development process will identify those barriers to associated gas utilization that can potentially be addressed by key stakeholders, particularly barriers that can be addressed by the government in the Country Implementation Plan (see Section 8.2).

The facility operator or operating partner should prepare an Associated Gas Recovery Plan for the field or fields within a region initially targeted under the initial goal, to document the steps that were taken to explore feasible alternatives to flaring. It is recommended that the Associated Gas Recovery Plans include the following elements:

- The quantity of associated gas generated;
- The approaches and feasibility of eliminating and/or reducing flaring and venting within the operational project boundary or within an expanded operational project boundary;
- Documentation of the barriers to alternatives for associated gas utilization and rationale for government support;
- Detailed documentation of the barriers for future reference and review, if no alternatives are feasible;
- The approach that will be followed in the design of flaring systems and their operation;
- The approach to long-term continuous improvement toward achieving the ultimate goal of the Standard (Section 7);
- The approaches for measuring, reporting, and verifying (see Section 9); and
- The activities and timing for implementation of the Plan.

The Associated Gas Recovery Plan should be prepared for the operations that generate associated gas within the operational project boundary where there are feasible alternatives to flaring and venting. If it is concluded that there are no feasible alternatives to flaring, the operational project boundaries should be expanded and the stakeholder engagement process initiated in accordance with the procedure

defined in Section 6.2.2. In this case, the Associated Gas Recovery Plan should be developed for the expanded project and should document the steps that have been taken to facilitate the expansion of project boundaries and the plans to implement the feasible alternative to flaring. If the operator already has adequate plans in place to reduce gas venting and/or flaring, then an Associated Gas Recovery Plan is not needed.

A recommended outline indicating the key topics to be covered in an Associated Gas Recovery Plan is provided in Appendix D.

8.2 Country Implementation Plan

In parallel with the facility operator or operating partnership preparing the Associated Gas Recovery Plan, the appropriate government agency is encouraged to develop the framework in which these Associated Gas Recovery Plans can be implemented. This framework, referred to as the Country Implementation Plan, should explore and address the key barriers for associated gas utilization and flaring and venting reduction. The plan should be developed in consultation with oil companies, infrastructure owners, potential consumers, and other key stakeholders. Without such dedication on the part of the country governments to take actions that will encourage gas recovery and commercialization, it may be very difficult for operators to justify the investments that will be needed to achieve major flaring and venting reductions.

The Country Implementation Plan should consist of, but not be limited to, the following key elements, as it is anticipated that a variety of issues will need to be resolved during the evaluation of alternative gas utilization options:

- Integrate an overview of the approach and development of associated gas recovery and utilization into the *National Gas Strategy*.
- *Identify and develop the domestic market* by encouraging gas use, for example by supporting the buildout of critical infrastructure for electric power generation and transmission. Other measures include identifying potential consumers within the country who could benefit from associated gas supply and a strategy for allowing them access.
- *Identify barriers to international market access*, and develop supportive measures to assist in associated gas utilization.
- *Develop a legal framework* within the country to provide incentives for associated gas recovery. For example, legal ownership of the associated gas produced will assist in providing an incentive to the producer for recovery of associated gas.
- *Develop a fiscal framework* with respect to government take in PSCs and other contracts including:
 - *A royalty payment scheme* which provides a share to the country government but also provides reasonable incentives to investors for gas recovery utilization; and
 - *Taxation* that recognizes the costs and risks associated with the investment in associated gas recovery facilities. Special tax credits for consumers who use low emissions-producing fuels can be included in this consideration. Also included are:

a) considerations for cost recovery of depreciable infrastructure assets against associated gas recovery income; and b) reasonable cost deductions for joint costs and relevant infrastructure assets against associated gas recovery income.

- *Implement gas and competitive fuel pricing* in those countries where pricing is influenced by the government. Gas pricing needs to consider the true cost of recovering associated gas and the true value to the national economy, considering elements such as displacement of alternative fuels, competing fuel subsidies, and premium pricing for the environmental benefits of gas over alternative fuels.
- *Support infrastructure development* by supplying the necessary site locations for onshore facilities, permits, right-of-ways, and so forth to facilitate recovering, processing, and distributing associated gas.
- *Implement the Standard* which covers administration and reporting responsibilities including:
 - An approach to implementation of gas utilization policy and this Standard;
 - An approach to administration of gas utilization policy to facilitate the efforts of key stakeholders to develop viable gas recovery plans; and
 - Reporting associated gas production, and gathering and publicly reporting flaring and venting volumes and their associated GHG emissions.

8.3 Timeline

Recommended target dates for implementing this Standard are presented below. It is important to recognize that these dates have been recommended in the context of a voluntary guideline, based on presumed GGFR Partnership endorsement of the Standard in the first half of 2004 and the typical timeframe for project development in the oil industry. It is recognized that there will be circumstances in which these timeframes may not be met. The intent is for participating organizations to make a good faith effort toward meeting these dates when possible and, when this cannot be practically achieved, to work in good faith toward achieving the Standard's goals as soon thereafter as possible. It is recognized as well that projects to eliminate the largest volumes of flared gas will be prioritized, consistent with the focus of the standard on those sources that have the potential to make a material difference in the reduction of associated gas flaring.

Table 8.1 provides an overview of the recommended timeframe for implementing this Standard, including the initial goal, monitoring, and reporting.

Table 8.1: Recommended Timeline for Implementing the Standard

Recommended Actions	No. Years from Endorsement	Year for Existing Partners³
GGFR Steering Committee endorses the Standard		23 March 2004 ⁴
Organizations and governments adopt the endorsed Standard	1 year	1 April 2005
Implement the initial goal for flaring and venting for new projects	1 year	1 April 2005
Implement the initial goal for venting at existing facilities	2-4 year	1 January 2006-8
Organizations and governments publicly report flaring and venting (if not currently reporting)	2 years	1 April 2006
Develop Associated Gas Recovery Plan:		
Within operational project boundaries, or	2 years	1 January 2006
With expanded project boundaries	3 years	1 January 2007
Develop Country Implementation Plan	2-3 years	1 January 2006-7
Implement the initial goal for flaring and plan for existing projects (unless Plans indicate other timeframe):		
Within operational project boundaries, or	5 years	1 January 2010
With expanded project boundaries	6 years	1 January 2011

The key target dates bearing the most significance toward meeting the Standard's objectives are those for:

- Adopting the Standard by the partners;
- Initial goals for flaring and venting for new projects;
- Preparing the Associated Gas Recovery Plans for existing projects by producers;
- Preparing the Country Implementation Plans by governments; and
- Public reporting by governments and companies.

The actual timing for implementing alternatives to flaring and venting in specific instances will depend more on the outcome of the initial goal consultation process and the Plans developed by producers and governments for implementation of flaring and venting reductions.

³ These dates are based on endorsement of the Standard and will shift accordingly.

⁴ Anticipated date for endorsement of the Standard by GGFR Partnership.

8.3.1 New Projects

For new projects, the recommended target date to develop the Associated Gas Recovery Plan to meet the flaring and venting initial goals of the Global Standard is 1 April 2005, based on the Standard's endorsement by the GGFR Partnership in the first half of 2004. This timing is consistent with the concept that a new project (refer to definition in Appendix B) is in the early phases of design and approval where alternative uses for associated gas can more easily be taken into consideration and allows time to integrate the Standard into existing systems.

8.3.2 Existing Projects and Facilities

For existing projects and facilities, the recommended target dates for meeting the Standard are outlined below:

- By 1 January 2006, an Associated Gas Recovery Plan (refer to refer to Section 8.1 and Appendix D) should be in place, documenting options within the operational project boundary, describing how the Standard's initial goal and ultimate goal will be met, and indicating how measuring, reporting, and verifying flared and vented gas volume and emissions data will be approached, or:
- If no alternatives to flaring are feasible within the operational project boundary, this Associated Gas Recovery Plan should be prepared to reflect the expanded project boundary considered in the stakeholder engagement process. The Associated Gas Recovery Plan covering the expanded project boundary considered should be prepared by 1 January 2007, which allows for the time required to complete the stakeholder engagement process.
- By 1 January 2006 to 2007, a Country Implementation Plan (refer to Section 8.2) should be in place, documenting considerations and incentives for addressing barriers to flaring reductions and promoting gas commercialization. The recommended timing of the development of the plan coincides with the GGFR program that is focused on assisting countries in developing fiscal and legal frameworks to encourage associated gas utilization and producers developing Associated Gas Recovery Plans.
- The recommended timeframe to meet the initial goal for venting is 1 January 2006-2008, recognizing that flexibility is required to accommodate project-specific circumstances and to allow venting reduction modifications to coincide with plant shutdowns and major maintenance scheduling.
- The recommended timeframe to implement the initial goal for flaring within the operational project boundary is 1 January 2010. If the Associated Gas Recovery Plan demonstrates that production will cease before 1 January 2010, no further venting or flaring reduction measures will be needed.
- The recommended timeframe to implement the initial goal for flaring within an expanded project boundary is 1 January 2011. This date is adjusted to reflect the need for an implementation leadtime of four years from the time the expanded Associated Gas Recovery Plan is prepared.

8.4 New Partners and Acquisitions

Parties joining GGFR, new acquisitions by existing GGFR Partners, or other parties that agree to adopt the Standard after its endorsement should strive to meet the Standard's goals within the timeframes denoted in the column of Table 8.1 denoted as "No. years from Endorsement." Thus, new partners and new acquisitions will have the same number of years to meet the Standard as existing partners.

9 Monitoring and Transparency

The Standard's monitoring and transparency element is intended to provide feedback to a broad range of stakeholders on the Standard's implementation and performance. It aims to provide credibility and robustness to the Standard while encouraging organizations to self-regulate their flaring and venting activities.

This section of the Standard has been designed to allow companies and countries to align and integrate these recommendations into their existing systems and assurance processes. Topics for which guidance is provided below include:

- Measuring and estimating associated gas volumes flared and vented;
- Public reporting of associated gas volumes flared and vented and the associated GHG emissions; and
- Verifying the reported data.

9.1 Measurement and Estimations

The key focus of this Standard is to effectively reduce flared and vented gas volumes globally. As such, accurate monitoring of flared and vented gas volumes is an important part of the prioritization and management of these volumes going forward. However, it is recognized that installing metering devices on flare systems in existing operations, especially those where significant flaring reductions will be occurring in the near term, is a lower priority.

9.1.1 Flaring and Venting Gas Volumes

For existing projects and facilities, flared and vented gas volumes should, at a minimum, be estimated through sound engineering mass and energy balance calculations. It is recommended for new projects and large existing flaring sources that flare volumes be more accurately measured through metering, where possible. This recommendation is consistent with the movement toward implementing best practice (Section 9.1.2) as part of continual improvement.

It should be noted that reduction projects eligible under the Clean Development Mechanism (CDM) would likely require monitoring at a greater accuracy level consistent with metering of flared volumetric flows and the periodic analysis of gas composition or direct measurement of heating value used in the quantification of greenhouse gas emissions reductions.

9.1.2 Best Practice Measurement of Flared Gas Volume

To be consistent with best practice, the total volume of gas sent to the flare(s) should be continuously metered either at each of the sources or at the flare headers, to determine the annual volumetric flow to the flare. At a minimum, flow measurement devices used to determine flare gas volumes should have an accuracy of +/- 5 percent⁵ over the anticipated range of flow rates.

⁵ *Regulations Relating to Measurement of Petroleum for Fiscal Purposes and for Calculation of CO₂ Tax*, 1 November 2001, The Norwegian Petroleum Directorate (NPD).

As discussed previously, it is recommended that flare volumes for new projects and large existing projects be measured more accurately, where possible.

9.1.3 Greenhouse Gas Emissions Estimates

The oil and gas industry, through the American Petroleum Institute (API), has developed an industrywide methodology guideline for GHG emissions estimation. This guideline is undergoing adoption internationally as industry best practice and forms the basis for developing many of the GGFR company Partners' GHG emission inventories.

It is therefore recommended that greenhouse gas emissions from associated gas flaring and venting activities be estimated based on the API's *Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Gas Industry*.

9.2 Volume and Emissions Data Reporting

To monitor the performance of the Standard and enhance the transparency of information on the gas volumes flared and vented from crude oil production and the associated greenhouse gas emissions, data should be reported publicly by the country governments.

Currently, the majority of operators annually report associated gas volumes flared to either the country government or national oil company on an operational control basis as a minimum requirement. It is recommended that this reporting be expanded to incorporate associated gas volumes vented and the greenhouse gas emissions associated with flared and vented gas, including early production activities.

To improve reporting continually over the longer term, it is recommended that companies expand their reporting to incorporate flaring and venting data on an equity share basis to the country government. It is recognized that equity share data will be less reliable than data from facilities under operational control; however, this approach is consistent with emerging greenhouse gas accounting and reporting best practices, which most organizations have implemented or are currently implementing.

Methods used for reporting emissions on an operational control and equity share accounting basis should be consistent with *IPIECA Petroleum Industries Guidelines for Reporting Greenhouse Gas Emissions—Establishing Organizational Boundaries Section*.

9.2.1 Public Reporting by Governments

Governments have an important role in facilitating and gathering information on gas flared and vented on a country basis. The flared and vented volumes of associated gas, and corresponding greenhouse gas emissions, should be reported annually by both international and national oil companies to the governments beginning in 2006.

It is recommended that governments implement a reporting tool⁶ that allows oil companies to report their flaring and venting data on an operational control basis initially, and in the future, on an equity share basis as well, directly into a data entry sheet. This data should be made publicly available, for example by means of the government website, where available.

⁶ For example, a simple spreadsheet developed by GGFR, which can be found at <http://www.worldbank.org/ggfr>.

9.2.2 Public Reporting by Oil Companies

To minimize duplication and assist the government in managing the public reporting of country flaring and venting data, it is recommended that both national and international oil companies report flaring and venting data to the government, via the government's reporting tool on an annual basis.

Companies are also encouraged to publicly report flaring and venting information through their existing reporting and disclosure mechanisms, such as annual environmental reports, GHG emissions reporting systems, or posting on a company website.

Reporting historical and current data is recommended. In addition, consideration should be given to providing forecasts for flaring and venting volumes, based on the Associated Gas Recovery Plans.

9.2.3 Recommended Reported Information Summary

It is recommended that the following information be reported:

General Information:

- Company name, address, and contact details
- Fields within the country over which the organization has operational control and equity interest (%)

Flaring volumes—total quantity within country boundaries, based initially on an operational control basis and in the future also on an equity share basis:

- Associated gas flared (10^6 standard m^3) annual volume
- Associated gas flared per production (m^3/boe) annual volume
- Annual GHG emissions associated with flaring
- Variance from previous year's flaring data (%)

Venting volumes—total quantity within country boundaries, based initially on an operational control basis and in the future also on an equity share basis:

- Annual volume of gas vented⁷ (10^6 standard m^3)
- Annual volume of gas vented per production (m^3/boe)
- Annual GHG emissions associated with venting
- Variance from previous year's venting data (%)

Additional reporting to be considered:

Forecasts:

- Forecast flared volumes and greenhouse gas emissions over a five-year period, capturing the anticipated reductions in flaring projected in the Associated Gas Recovery Plan.
- Forecast vented volumes and GHG emissions over a five-year period.

⁷ It is recommended that all upstream venting be reported.

9.3 Verification

The Standard's success and performance is measured through the effective reduction in flaring and venting. This performance is made available publicly through the reporting process and the recommendations presented in Section 9.2. Verifying this reported data and information would add credibility and identify opportunities for continuous improvement in the gas volumes flared and vented in association with crude oil production and their associated GHG emissions.

9.3.1 Verification of Reported Flaring and Venting Volumes and Emissions Data

The publicly reported data on flaring and venting volumes and associated greenhouse gas emissions (refer to 9.2) should undergo verification prior to reporting. It is recommended that these verification activities be integrated into existing internal company programs for greenhouse gas inventory verification or an equivalent assurance process.

If there is no well-established internal program or process for data verification, it is recommended that the publicly reported data undergo independent verification by a qualified third party on a periodic basis (for example, at three year intervals). Governments also have the option to use periodic independent verification as a tool to ensure performance.

The internal or external verifier selected for this activity should be competent and experienced in GHG emissions verification and knowledgeable of flaring and gas measurement systems.

9.3.2 Verification Guidance

It is recommended that the following areas be covered as part of verifying the reported flaring and venting volumes and the associated GHG emissions:

- **Completeness:** all flaring and venting sources covered by the Standard have been incorporated.
- **Data Accuracy:**
 - Flared gas volumes have been measured (metered or estimated);
 - Meter maintenance and calibration procedures are consistent with industry best practice;
 - Engineering mass and energy balance calculations based on good engineering practice and accurate data;
 - GHG emissions estimation methodologies consistent with API Compendium or equivalent;
 - Equity share reporting consistent with IPIECA guidelines;
 - Gas sampling and analysis procedures consistent with industry best practice; and
 - Accredited laboratories conducting analyses.
- **Consistency:** consistent with previous year's data and previous year's methodologies.

Supporting documentation is required for verification.

10 Implementation of the Standard

Implementation of the Standard refers to the processes to be undertaken to adopt the Standard and meet its intent on an ongoing basis to reduce flaring and venting of associated gas throughout the world. This process will involve dedication among GGFR Partners to work supportively and cooperatively toward ensuring that the Standard will be successful in meeting the key objectives presented in Section 3. Individually, the World Bank, oil companies, and participating country governments will each need to develop their own internal processes of implementing this gas flaring and venting Standard and integrating the Standard within their organization. The following subsections provide a recommended roadmap and processes for implementing the Standard by these entities. Other stakeholders in the oil production industry, including infrastructure owners, financing organizations, and consumers, are also encouraged to help promote adoption and implementation of this Standard for all oil development projects.

It is recognized that in order for this Standard to be effective and widely adopted, it should provide flexibility and consideration of project, company, and country specific circumstances. Accordingly, member companies and countries are encouraged to adopt alternate implementation approaches for the Standard, as needed, to achieve their flaring and venting reduction goals.

Demonstration that the Standard has been effectively implemented by GGFR Partners will be based on the completion of the Associated Gas Recovery Plans by producers and Country Implementation Plans by governments, progress toward meeting these plans, and through public reporting.

10.1 Global Gas Flaring Reduction Partnership's Role

The GGFR will be responsible for the following implementation activities:

- Conduct “rollout” workshops in member countries to demonstrate the benefits and value of adopting the Standard and provide guidance regarding the procedural and technical steps that will be needed to implement and administer the Standard.
- Provide resources for a period of two years after the Standard’s effective date to help countries and companies understand their responsibilities under the Standard and to help resolve issues related to implementation.
- Assist in preparing or reviewing Associated Gas Recovery Plans for member countries.
- Assist in preparing and facilitating the development of Country Implementation Plans for member countries.
- Develop a simple reporting tool for governments.

The voluntary Standard’s effectiveness in achieving effective flaring and venting reductions will depend critically on the active participation of all GGFR Partners to work diligently with joint venture partners, country governments, financial institutions, and other key stakeholders to promote adoption and implementation of this Standard, including the initial goals by the earliest practical date and continuing progress toward the ultimate goal over the longer term.

10.2 Implementation by Participating Oil Companies

Oil company participants in the GGFR, both international corporations and nationally owned oil companies, have the opportunity to adopt this Standard where venting or flaring of associated gas occur. Companies are encouraged to seek ways to incorporate the Standard's principles within their business systems and will have the flexibility needed to adapt these programs in any manner that will ensure progress toward meeting the Standard's initial goal and ultimate goal.

Once adopted, the company would integrate the Standard into existing business systems and implement it throughout its oil production operations globally. These operations would then develop Associated Gas Recovery Plans for those specific oil production fields, regions, or countries initially targeted under the Standard (refer to Section 8.1). It is recommended that this be integrated into the business planning process.

For new projects, Associated Gas Recovery Plans should be incorporated into the Environmental Impact Assessment and/or development plan submitted to the responsible ministry as part of the project review and approval process. For existing projects, fields, or regions, the Associated Gas Recovery Plan will be developed in consultation with key stakeholders, including the government. It should highlight those areas and barriers that should be addressed by the government in the Country Implementation Plan.

It is recommended that oil companies integrate monitoring, reporting, and verifying flaring and venting activities into their existing management systems and assurance processes. Both international and national oil companies should report their flared and vented gas volumes and associated GHG emissions to the country government via the government reporting tool. They are also strongly encouraged to publicly report this information through their existing disclosure mechanisms, such as annual environmental reports, GHG emissions reporting systems, or posting on a company website.

Oil companies adopting this Standard are encouraged to use their best efforts to influence joint venture partners and investors to adopt the Standard and its goals.

10.3 Implementation by Participating Country Governments

Country government participants in the GGFR also have the opportunity to adopt this Standard. It would be the responsibility of each country to establish a framework within an appropriate agency or ministry to support implementation and administer the Standard. It is recommended that the Standard be adopted as a voluntary approach to meet the objectives of effectively reducing associated gas flaring and venting. Where this Standard can support existing regulatory requirements, existing contracts, and operating agreements, it is encouraged that the Standard's principles be considered as a tool to support meeting and exceeding these requirements, contracts, and agreements. If the Standard contradicts existing regulations, contracts, and agreements, such regulations, contracts, and agreements will be given priority.

For new projects, the review of Associated Gas Recovery Plans should be integrated into the country's project approval processes. For existing projects, fields, or regions, the government should address the barriers to gas utilization documented in the Associated Gas Recovery Plan in the formulation of its Country Implementation Plan.

The governments will be responsible for developing the Country Implementation Plan in consultation with key stakeholders and will also have a key role in facilitating the development of associated gas utilization markets. The success of the Standard will depend on the willingness of the GGFR member countries to work proactively with the oil companies and other key stakeholders to overcome existing barriers to flaring and venting reduction opportunities.

The government also plays an important role in facilitating and compiling flaring and venting reports on a country basis and reporting this information publicly. Implementing a reporting tool would assist in efficient and effective public reporting and management of this flaring and venting information at a country level.

Governments belonging to GGFR are also encouraged to use their influence to encourage other countries with ongoing oil production activities to implement the Standard.

10.4 Implementation by the World Bank

The World Bank Group, as a key participant and sponsor of the Global Gas Flaring Reduction Partnership, will actively promote and disseminate the Global Gas Flaring and Venting Reduction Standard as a best practice initiative for all oil production operations in which the World Bank Group is involved.

Demonstration that the Standard has been effectively implemented will be based on the completion of the Associated Gas Recovery Plans (by producers), Country Implementation Plans (by governments), progress toward meeting these plans, and through public reporting.

11 Administration

Administration of this Standard refers to the ongoing roles and coordination of activities among GGFR Partners and others to ensure that the Standard is maintained and updated. Guidance is provided in Section 10 on implementing the Standard by supplementing existing World Bank project review programs and adopting and integrating the principles and goals of the Standard within government and oil company policies. Recommendations for ongoing administration of the Standard are discussed in this section in terms of the roles for:

- Reviewing and updating of the Standard; and
- Maintaining and updating the tools established to assist in monitoring the performance of the Standard.

In keeping with the voluntary nature of this Standard, the proposed roles among the Partners should be interpreted as only one of many possible approaches that would meet the administration needs of the Standard.

11.1 Participating Country Governments' Role

Wherever possible, the primary role for administering this Standard is likely to reside with the governments of the oil-producing countries. The relative permanence of national government institutions and the fact that government ministries are already intimately involved in the licensing and operation of local oil production activities are factors that favor an expansion of the ministries' existing role to include long-term oversight of flaring and venting reduction activities within each country. Guidance on administration of the Standard in cases where the government is unable to assume this role is provided in Section 11.2, Participating Oil Companies' Roles. In countries where the national oil company is delegated a regulatory function on behalf of the government, the national oil company has the same responsibility and role as the government.

It is recognized that each country will determine the appropriate ministry(ies) to administer the Standard.

The key elements of administration for country governments include:

- Review and update of the Standard in consultation with oil companies and other key stakeholders.
- Maintain and update the web-accessible reporting tools established to assist in monitoring and reporting the Standard's performance.

11.2 Participating Oil Companies' Role

As GGFR Partners, the companies are encouraged to work cooperatively with the appropriate Government ministries and, if necessary, to assist the governments in reviewing and updating the Standard and their associated management systems.

It should be recognized that the governments of some countries may elect not to assume responsibility for administering the Standard (or some aspect of it), in which case the GGFR member companies operating in such countries would need to adopt a self-administering role. Specifically, the Standard's

integration within company management systems and assurance programs is recommended to provide mechanisms for ensuring that the Standard is regularly reviewed and updated.

Appendix A: Flaring and Venting Activities Related to this Standard

Table A-1: Venting Activities Related to this Standard

Potential Sources of Venting	Targeted under Initial Goal of Standard	Targeted under Ultimate Goal of Standard	Not Covered by Standard
Continuous production venting			
Continuous venting due to lack of flaring facilities	X		
Venting of production storage tank losses from: <ul style="list-style-type: none"> Flashing Working and breathing 		X X	
Gas-driven pneumatic devices		X	
Gas-driven chemical injection pumps		X	
Gas treatment vents			X
Locally vented low pressure-rated systems—includes storage tanks or compressor ancillary systems that are typically vented locally in order to provide the lowest back-pressure possible.		X	
Noncontinuous production venting			
Catalyst/mole sieve dryers		X	
Oil well completion, treatment, stimulation, workover, and testing		X	
Surface casing gas (oil wells)		X	
Gas migration (oil wells)		X	
Operational venting—used in order to bring the pressure in specific equipment items to “atmospheric level” for example compressor seal systems, pig launchers/receivers, chemical skids, and so forth.		X	
Venting to clear vessels for personnel entry			X
Well stimulation/venting/unloading (field venting)		X	

Table A-2: Flaring Activities Subject to this Standard

Potential Sources of Flaring	Targeted under Initial Goal of Standard	Targeted under Ultimate Goal of Standard	Not Covered by Standard
Continuous production flaring			
Nonsafety flaring due to lack of processing facilities and/or marketing outlets	X		
Noncontinuous production flaring			
Compressor startups and shutdowns		X	
Well completion, treatment, stimulation, workover, and testing <ul style="list-style-type: none"> ○ Short term (≤ 30 days) ○ Long term (>30 days) 	X	X	
Early Production Facilities ⁸	X		
Surface casing gas (oil wells)			X
Gas migration (oil wells)			X
Flaring of production storage tank losses from: <ul style="list-style-type: none"> ● Flashing ● Working and breathing 		X	

⁸ Although flaring reduction for long term well testing and early production facilities may not be feasible, it is recommended that the same initial goal evaluation process be conducted in view of the potential significance of these flaring volumes.

Appendix B: Definitions

Associated Gas (AG) is gas that is produced from an oil reservoir and may apply to gas produced from a gas cap in conjunction with oil.

Availability is the probability that an item, under the combined influence of its reliability, maintainability and maintenance support, will be able to fulfill its required function over a stated period of time, or at a given point in time.

Early Production is oil and gas produced from initial wells and temporary production facilities prior to the installation of permanent production facilities. Such production is often considered to obtain a better assessment of reservoir performance than can normally be obtained from well testing.

Field is a geographical area in which a number of oil or gas wells produce from a continuous reservoir.

Flare Efficiency is a performance index determined by the ratio of hydrocarbon consumed in combustion relative to the total hydrocarbon stream released to the flare.

Fugitive Emissions are defined as unintentional leakage from piping/equipment components, storage tanks, and pump seals, including valves, flanges, and other connectors, pump seals, pressure relief valves, open-ended lines, sample/bleeder connectors, plugs, and pipe caps.

Gas Migration is a flow of gas that is detectable at the surface outside of the outermost casing string (often referred to as external migration or seepage).

Global Gas Flaring and Venting Reduction Voluntary Standard (the “Standard”) is a document, established and recommended by the GGFR, that provides guidance on how to achieve reductions in the flaring and venting of gas associated with crude oil production worldwide. The Standard includes guidance to address and implement near-term flaring and venting reductions, longer-term continuous improvement, and monitoring and transparency. The approach is intended to achieve utilization of associated gas flaring and venting reductions that go beyond prevailing practices that would otherwise occur in many countries. The voluntary framework infers that the parties supporting this Standard voluntarily choose to endorse the principles laid out in the Standard and to work in cooperation with Partners of GGFR and other key stakeholders to seek solutions to overcome barriers that prevent significant gas flaring and venting reduction.

Incremental Economics is financial performance based only on the revenues derived from the associated gas production and applied to the capital and operating expenses associated with recovery of the gas.

Integrated Economics is financial performance based on the revenues derived from total field production and applied to the total capital and operating expenses associated with production of both the gas and oil.

Key Stakeholders are the principal owners of assets, liabilities, and resources associated with the recovery and utilization of hydrocarbon reserves. These would include the producers and joint venture partners, the government, and the buyers. Infrastructure owners are also included when such infrastructure exists and is held by third parties.

Operational Project Boundary is an area of actively producing petroleum field or fields within a region that are under sole operational control or joint venture partnership.

Production flaring is any flaring associated with oil production, excluding safety flaring, that occurs because of a temporary or permanent lack of adequate gas processing facilities to meet gas production levels, including:

Continuous production flaring: Long-term flaring of gas that is associated with crude oil production and not utilized for on- or off-site energy needs, recovered for local or international gas markets, or re-injected.

Noncontinuous production flaring: Flaring of gas streams that may result from shorter-term releases, including short-term well testing, compressor startups and shutdowns, and so forth. (In normal operations, non-continuous gas volumes routed to flares are considerably lower than those related to continuous flaring.)

Project is any development or production activity designed to extract hydrocarbons from an onshore or offshore reservoir where associated gas is coproduced, along with the facilities and operational practices associated with the conduct of such activities.

Existing project is any oil production project or facility not considered a new project. This would include facilities currently in operation, as well as those development projects not yet commissioned that are in the detailed design or construction phase.

New Project is any oil production project that is in the planning and design process, prior to completion of conceptual design and associated regulatory approvals as of 1 April 2005.

Modification to an existing facility that will result in an increase in the volume of flared or vented associated gas would fall into the category of existing project.

Project Boundary Expansion refers to the process whereby the interaction of a project with other projects involving different stakeholders such as infrastructure owners and gas users in the gas chain is undertaken.

Safety flaring⁹ is disposal of gas to a contained flare system for the purpose of preventing overpressure conditions in production equipment. Gas volumes flared include those required to maintain the flare system in a safe and ready condition for uncontrolled safety releases.

Safety venting is the release of gas to a vent in the event of a fire, overpressurization or other process upset, or a release through a safety release valve to prevent the occurrence of a potentially unsafe condition.

Standard conditions for temperature and pressure are 15°C (285 K) and 101.325 kPa.

Surface Casing Vent Flow (SCVF) is the flow of gas or liquid or any combination out of the surface casing/casing annulus (often referred to as internal migration).

⁹ Includes what may be defined elsewhere as “emergency flaring/venting.”

Venting is the controlled release of unburned gas directly to the atmosphere for gas disposal or for safe facility operation. Venting excludes fugitive gas releases from piping and equipment leaks and includes gas purges.

Well testing:

Long-term well testing is any well testing with a duration longer than 30 days.

Short-term well testing is any well testing with a duration of 30 days or less.

Appendix C: Tools for Enhancing the Present Value of Benefits from Gas Recovery

Gas Producers

- *Integrate economic, environmental, and social benefits* to assist in justifying gas recovery projects.
- *Examine integrated economics* as an approach to evaluate the financial performance of a project, based on the revenues derived from total field production and applied to the total capital and operating expenses associated with production of both the gas and oil. By integrating the revenues from both the oil and gas production from the field, the potential viability of a gas recovery project may be enhanced for non-marginal production fields.
- *Expand the project boundaries* to other producers, customers, and infrastructure owners in the region: gas trading between fields and producers may be a mechanism to encourage maximum gas utilization to meet energy demands for production operations among operators in the region; associated gas supply options to gas deficient fields, electrical interconnection between fields, and so forth; transferring best practices and technology between JV partners and third-party operators in the region.
- *Investigate carbon credits* as a potential mechanism for some projects that meet the eligibility criteria, either within the Kyoto Protocol framework (for example, Clean Development Mechanism or Joint Implementation) or outside the Protocol. The additional revenue stream from the potential sale of carbon credits may assist in the economic justification of the project and potentially enhance the eligibility of the project by demonstrating project additionality.

Governments

- *Clarify contractual rights* to associated gas to maximize the potential for its exploitation. In many cases, the contractual rights to associated gas are not clearly specified. This clarification of contractual rights should be specified in such a way that oil companies are granted rights and can clearly make plans to maximize the potential for exploitation of associated gas.
- *Promote third party access to infrastructure* to further encourage associated gas recovery and utilization.
- *Consider Production Sharing Contracts (PSCs)* with cost recovery mechanisms that encourage investment in gas gathering schemes and associated infrastructure. In PSCs the contract boundary is generally drawn quite narrowly which can make it difficult to recover infrastructure costs necessary for producing and transporting associated gas. A willingness to consider a breach of the ringfence for such infrastructure investment could facilitate the development of gas recovery projects.
- *Examine cost recovery and profit sharing mechanisms* that recognize the extra costs involved in recovering associated gas. Sometimes the cost recovery provisions do not reflect the full additional costs (even in effect assuming that the associated gas is a virtually “free”

byproduct of the oil). Similarly, the profit sharing terms may overstate the true profitability of exploiting associated gas.

- *Establish reasonable gas market development periods in PSCs* to give producer adequate time to investigate and develop markets for associated gas rather than be faced with relinquishment of gas exploitation rights. In some countries there is little or no market and considerable time may be required to discover and develop them compared to the oil market situation.
- *Institute tax and royalty incentives* that recognize the costs and benefits of investment in associated gas recovery schemes. Such benefits include external national benefits such as emission reductions, which may well not be reflected in the prices that the producer receives. Tools available to governments include reduced royalties on associated gas production and special tax credits for investment in emission-reducing technologies.
- *Promote associated gas pricing to reflect economic value to the economy.* In many countries the government determines gas pricing and gas buyers may be severely constrained by national government policies. Statements of national pricing policy which clearly indicate that the gas should be priced according to full national economic value, taking into account the prices of alternative fuels, the opportunities for exporting these, and the opportunities for replacing imports of alternative fuels, would provide appropriate incentives for both gas buyers and gas producers. Gas pricing should also take into account competing fuels and considerations of the environmental benefits of gas in relation to other fossil fuels.
- *Develop a national gas strategy* which includes an associated gas utilization strategy. In many countries gas utilization has developed in a piecemeal fashion, which may be suboptimal. A national gas market strategy could unveil bottlenecks and other impediments to full economic utilization of the market potential. Impediments could arise from inadequate infrastructure provision (upstream, midstream, and downstream) and lack of knowledge of all potentially viable downstream uses for the gas. A clearly defined gas market strategy could unveil more opportunities for associated gas utilization.
- *Coordinate stakeholders* to enhance opportunities for associated gas utilization. Frequently the various stakeholders – individual producers, infrastructure owners, and gas buyers – do not function in a coordinated manner. Opportunities for gas production and utilization are thus not fully exploited. A proactive government can facilitate coordination among parties, which may not have direct responsibilities for extending relationships with each other beyond historic terms. Examples are incentivizing infrastructure owners to develop imaginative ways to accept non-specification or non-standard gas for commingling at acceptable tariffs. In circumstances where infrastructure owners purchase gas they can be encouraged to do so on terms, which do not fully exploit any localized monopoly buying power, which they may have.
- *Develop local markets* for associated gas through facilitating and providing a closeby outlet for associated gas, such as power generation.

Commercial and Industrial Customers

- *Negotiate long-term contracts* for associated gas supply to reflect legitimate needs of producers for volumes determined by total hydrocarbon production. In particular gas buyers should be prepared to conclude agreements to accept gas involving relatively low swing factors to be consistent with desired production profits for oil. Gas buyers should also be prepared to conclude purchase agreements for relatively small volumes of gas that might be difficult to market. Field depletion based contracts will generally be attractive to producers of associated gas.
- *Adjust associated gas pricing* to reflect the economic value of gas to the economy. The pricing principles should relate the value of gas to that of alternative fuels taking into account the opportunities for either exporting these or substituting local gas for imported fuels. Appropriate pricing should also reflect the environmental benefits of gas utilization compared to some other fuels such as coal and fuel oil.
- *Negotiate take or pay contracts* up to levels that reduce the downside risks for producers. Where the recovery of associated gas is perceived to be financially risky, take or pay contracts, especially when based on field depletion rather than fixed volumes, significantly reduce the market risk.
- *Provide payment guarantees* for associated gas to encourage investment in gas recovery facilities. When a gas recovery project is financially marginal the provision of payment guarantees by buyers can reduce the market risks such as to induce the necessary investment.

Gas Infrastructure Owners

- *Examine capital investment and operating cost requirements* for new associated gas utilization of existing infrastructure.
- *Prioritize the purchase of new associated gas supply* to fill commitments under existing gas contracts.
- *Transport new associated gas owned by third parties* to recover operating costs plus a reasonable operating fee through tariff assessments.
- *Participate in infrastructure expansion projects* by collecting tariffs on transporting third-party gas volumes for recovery of capital, operating costs, and a reasonable operating fee.
- *Allow third party ownership of infrastructure* through participation in capital investment required by expansion.

Appendix D: Outline of Associated Gas Recovery Plan

The below outline of the Associated Gas Recovery Plan is provided as guidance for organizations developing plans.

1. Description of Oil Production Field(s) and Facilities Addressed in this Plan

- 1.1 Field(s) operator and partners
- 1.2 Planned or actual time sequence of field developments
- 1.3 Additional description if plan is a joint submittal or addresses associated gas from multiple fields
- 1.4 Historical, current and forecast associated gas flaring and venting of the field(s) and gas-to-oil ratio of field(s)

2. Proposed Approach to Address the Standard's Initial Goal:

- 2.1 The approaches and viability of eliminating or reducing flaring and venting:
 - Within the operational project boundary; or
 - Within an expanded operational project boundary.
- 2.2 Description and outcomes of stakeholder engagement process undertaken to eliminate or avoid flaring and venting including:
 - Alternatives considered
 - Stakeholders consulted
 - Barriers to alternatives for associated gas utilization
 - Outcomes of the process
- 2.3 The activities and timing for implementation of the feasible alternative to flaring, or rationale if no alternatives are feasible
- 2.4 Key barriers and rationale for continuing venting or flaring (if applicable)
- 2.5 The approach that will be followed in the design of flaring systems and their operation

3. Proposed Approach to the Standard's Ultimate Goal

- 3.1 Periodic revaluation process for nonviable alternatives to flaring and venting
- 3.2 Identification and evaluation of new reduction initiatives and new technologies

4. Approach to measuring, reporting, and verifying

- 4.1 The approaches for measuring, reporting, and verifying.

Appendix E: Reference Documents

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Publicly available promotional material and private communication: John Zink, Panametrics Inc., Argo Flare Services Ltd. and Zeeco.

Confidential internal company policies and standards for flaring and venting.

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