Guidelines:
Flaring, Venting Reduction, and Fugitive Emissions
Updated November 12, 2019

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Authority

Yukon *Oil and Gas Act* (YOGA)
***Oil and Gas Drilling and Production Regulations* (OGDPR)**
***Oil and Gas Licence Administration Regulations* (OGLAR)**

Flaring, venting, and fugitive emissions related to oil and gas activities are regulated by the Yukon *Oil and Gas Act* (YOGA), and its regulations including in particular, the *Oil and Gas Drilling and Production Regulations* (OGDPR).

Licensees are required to comply with all legislation pertaining to the licensed activity. These activities may also be regulated by other departments of the Yukon government.

Contact Information

Hand Delivery Courier
Chief Operations Officer
Government of Yukon
Energy, Mines and Resources
Oil & Gas Resources
Suite 400, 211 Main Street
4th Floor Shopper's Plaza

Mail
Box 2703, Whitehorse
Yukon, Y1A 2C6

Fax/Phone
Fax: (867) 393-6262
Phn: (867) 667-3427
1.800.661.0408 ext 7042

E-mail
oilandgas-COO@gov.yk.ca

The *Air Emissions Regulations* (under the Yukon *Environment Act*) applies to activities covered in these Guidelines. According to the *Air Emissions Regulations*, Schedule 1, S.2, these activities include

> "Production and exploration of oil and natural gas, including combustion products of flaring or burning petroleum and the release of petroleum vapours, but not including the release of combustion products or vapours that may occur during emergency flaring or burning."

If a licensee is undertaking any of the above listed activities, contact the Environmental Programs Branch (envprot@gov.yk.ca / (867) 667-5683) for more information or to obtain any necessary permits.

Companion documents

The Yukon government has prepared a library of guidelines pertaining to oil and gas activity. More information can be found by visiting yukonoilandgas.com, and navigating to http://www.emr.gov.yk.ca/oilandgas/formsandfees.html.

More guidelines and forms can be found through the Rights and Royalties links: http://www.emr.gov.yk.ca/oilandgas/guidelines_forms.html.

For more information on the Yukon government's regulatory framework, visit: http://www.emr.gov.yk.ca/oilandgas/regulatory-framework-for-oil-and-gas-development.html. A useful publication available through the regulatory framework URL is *The Power to Protect: Yukon's oil and gas regulatory framework.*

PREFACE

The *Flaring, Venting Reduction, and Fugitive Emissions Guidelines* (these Guidelines) provide Yukon's regulatory requirements and guidance for flaring, incinerating, venting, and fugitive emissions relating to oil and gas activities. It also covers procedural information for flare approval requests; dispersion modelling; and the measurement and reporting of flared, incinerated and vented gas, and fugitive emissions. These Guidelines apply to these activities at well sites, facilities, and pipelines regulated under the YOGA and its regulations. In particular, Sections 127 and 128 of the OGDPR apply.

Scope

The primary purpose of these Guidelines is to present an overview of the requirements and processes associated with flaring, venting, and fugitive emissions in relation to oil and gas activities. While references are made to other regulatory bodies and legislation, applicants and licensees are advised to work directly with those authorities. It is the responsibility of the applicant or licensee to know and uphold all its legal responsibilities.

Throughout these Guidelines, the term "flaring" refers to the combustion of gas in a flare stack or an incinerator unless otherwise specified. Gas combusted in an incinerator is considered to be "flared".

The OGRB recognizes that evolving technologies and practices may not be addressed by these Guidelines. Proposed solutions that meet the goals set out in these Guidelines and encompass innovative ideas, practices, and technologies will be considered.

How to use these Guidelines

Requirements and recommended practices are numbered sequentially within each section and subsection throughout these Guidelines. Use of the word, "must" indicates a requirement for which compliance is required and may be subject to enforcement. Best practices are indicated with the words, "recommends", "should", and "expected".

Acknowledgements
Most of the information in these Guidelines is taken from the BC Oil and Gas Commission's (BCOGC) publication: *Flaring and Venting Reduction Guideline, Version 5.1: May 2018.* Information was modified to align with Yukon oil and gas legislation. The Government of Yukon wishes to acknowledge and thank the BC Oil and Gas Commission for granting permission to use this content.

Some of the graphics derived from BCOGC are based on information obtained from the Clean Air Strategic Alliance (CASA). The Yukon government also wishes to thank CASA for permission to use this content.

RETENTION OF RECORDS

OGLAR section 17

From time to time, the Oil and Gas Resources branch may require licensees to provide documentation regarding their operations. The *Oil and Gas Licence Administration Regulations* provide instructions regarding the retention of records.

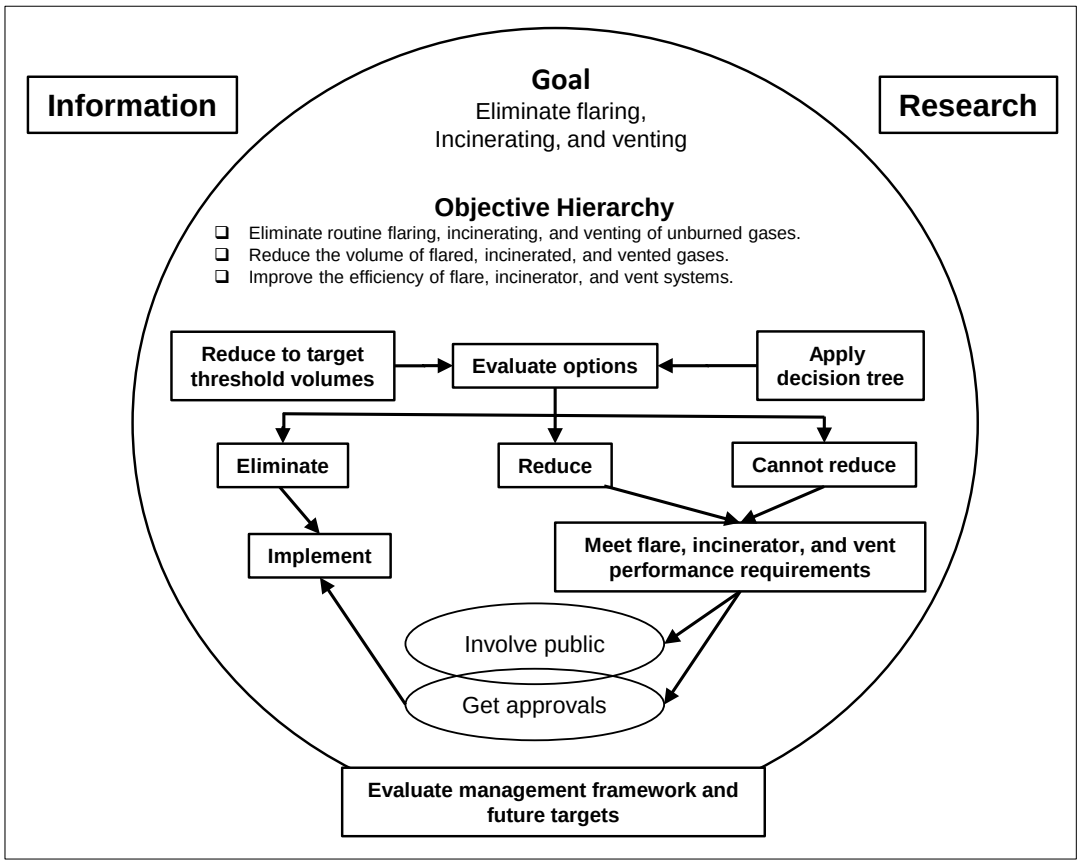
ADDITIONAL GUIDANCE

Flaring and Venting Management Hierarchy and Framework
A wide range of energy development activities and operations involve flaring and venting. These include:

- oil and gas well drilling, completion, and testing;
- oil production (solution gas);
- gas production;
- planned non-routine depressurization of processing equipment and gas pipelines for maintenance;
- un-planned non-routine depressurization of process equipment and gas pipelines due to process upsets or emergency and;
- drilling waste management facilities.

The OGRB has adopted the Clean Air Strategic Alliance's (CASA) objective hierarchy and framework for management of all sources of gas flaring and venting (Figure 1.1).

Figure 1.1: Gas Flaring / Venting Management Framework



Source: Adapted from Clean Air Strategic Alliance (CASA)

In accordance with the objective hierarchy, operators must evaluate the following three options:

- Can flaring and venting be eliminated?
- Can flaring and venting be reduced?
- Will flaring and venting meet performance standards?

CHAPTER 1: SOLUTION GAS MANAGEMENT—OIL FACILITY

An objective of the Oil and Gas Resources branch is to have the upstream petroleum industry reduce the volume of solution gas that is flared or vented. The branch, in consultation with stakeholders, will monitor progress to determine the need for additional requirements to facilitate solution gas conservation.

Conservation is defined as the recovery and redirection of gas—that would otherwise be vented or flared at an oil or gas facility—for other useful consumption including: fuel for production facilities, power generation, sales, and beneficial injection into an oil or gas pool.

Conservation opportunities are evaluated as economic or uneconomic based on the criteria listed in Section 1.7 Economic Evaluation of Gas Conservation.

1.1 Solution Gas Venting Reduction

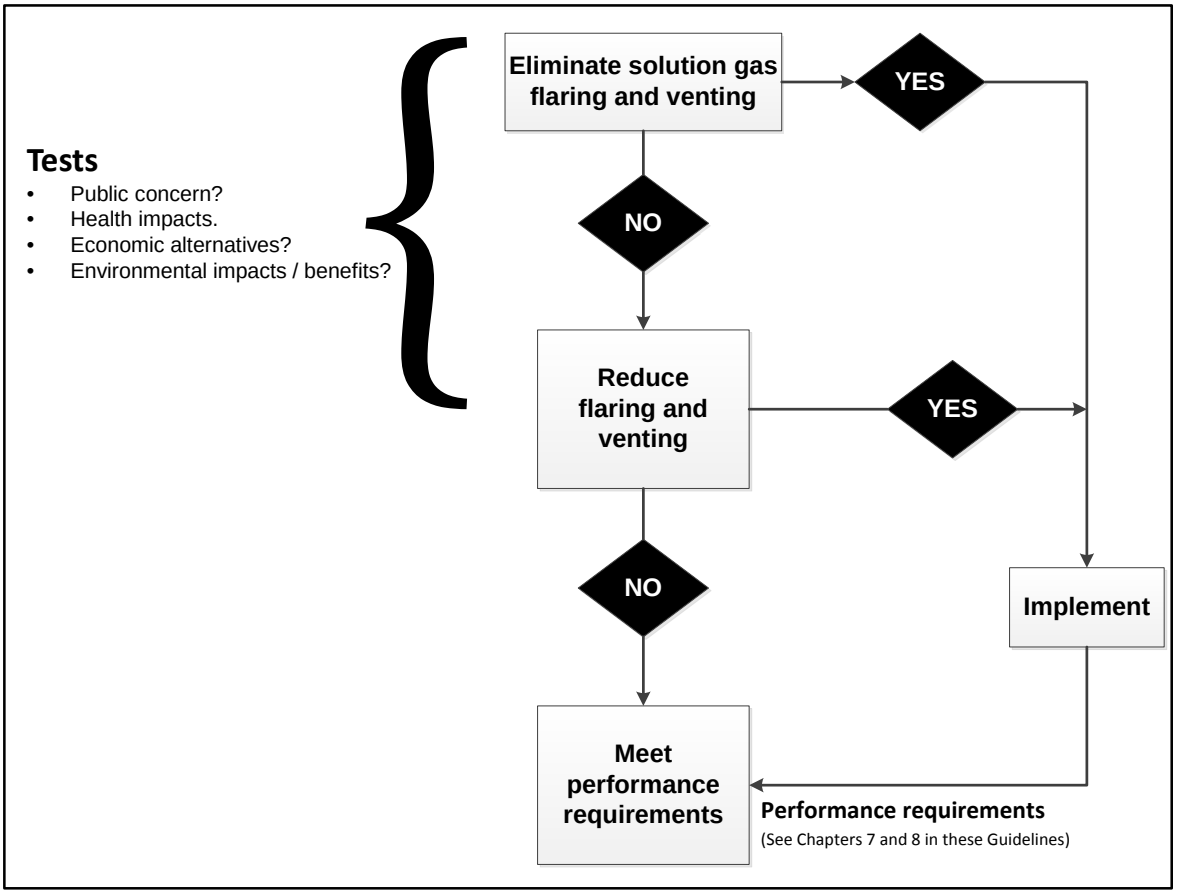
Venting is not an acceptable alternative to flaring. If gas volumes are sufficient to sustain stable combustion, the gas must be burned or conserved (see Section 7.1). If venting is the only feasible alternative, it must meet the requirements set out in Chapter 7 of these Guidelines.

1.2 Solution Gas Flaring and Venting Decision Tree

The OGRB adopted the Gas Flaring/Venting Management Framework (Figure 1.1) and endorses the Solution Gas Flaring/Venting Decision Tree Process (Figure 1.2). Both are adapted from the CASA-approved *Management of Routine Solution Gas Flaring in Alberta* report and recommendations (1998)[1]. Licensees must apply the decision tree to all flares and vents greater than 900m^3/day and be able to demonstrate how each appropriate element of the decision tree was considered and implemented.

[1] *Management of Routine Solution Fas flaring in Alberta* can be found at: http://www.casahome.org/uploads/source/PDF/1998_Management_of_Routine_Solution_Gas_Flaring_-FPT.pdf

Figure 1.2: Solution Gas Flaring / Venting Decision Tree



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 11. Adapted from Clean Air Strategic Alliance (CASA).

1.3 Conservation at Oil Facilities

OGDPR section 24, 133

In general, for oil sites[2], solution gas flaring cannot be extended beyond the period required to produce the test period allowable set out in Section 133 of the *Oil and Gas Drilling and Production Regulations.*

It is expected that the actual flaring duration will not extend beyond the time required to obtain data for economic evaluation and for sizing conservation equipment. Any flaring for testing, cleanup, and completions must not exceed a total of 24 hours (see Section 2.3 for further details and extensions to time limits).

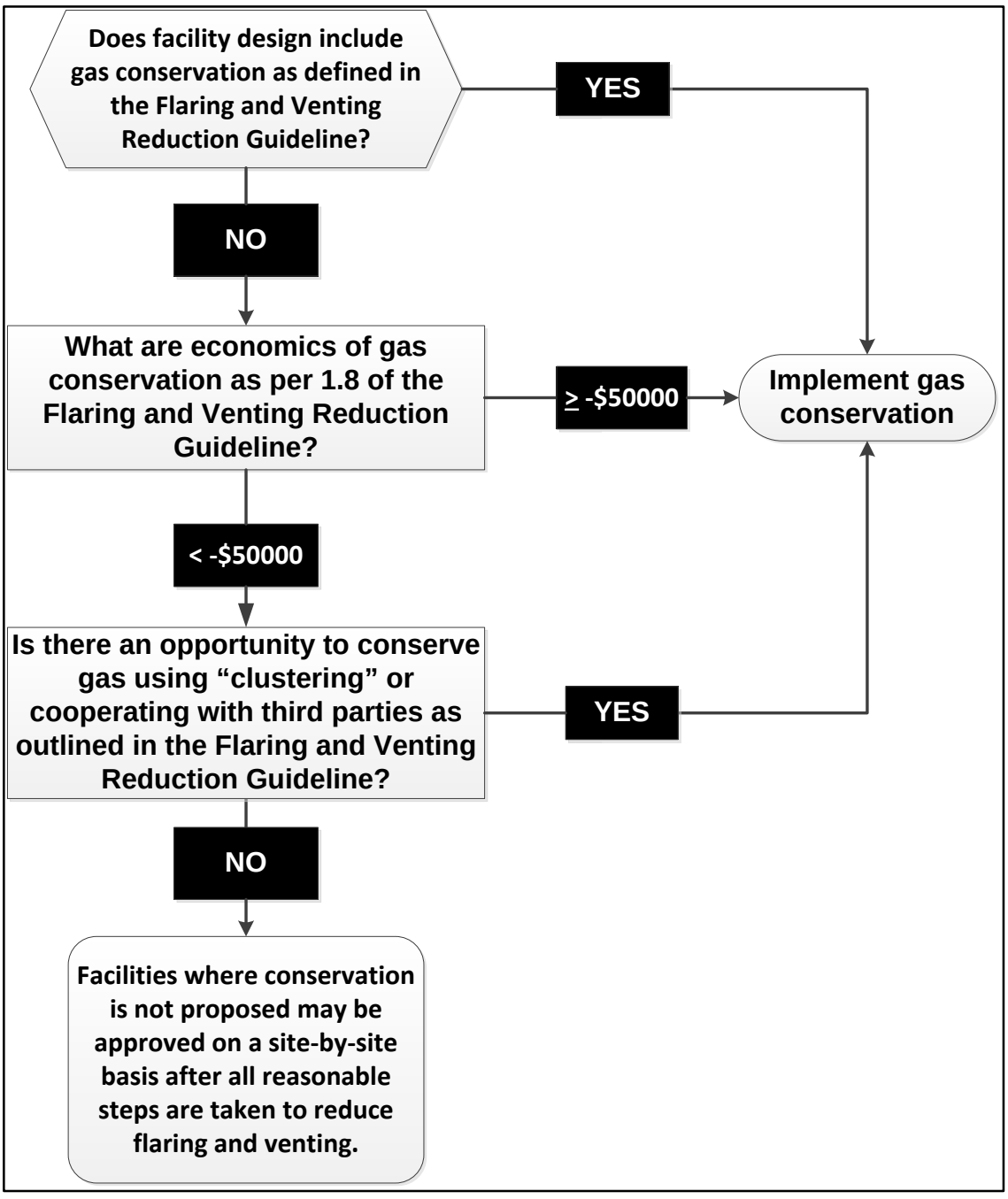
The OGRB expects that conservation will be implemented at all oil facilities however sites where conservation is not practical or economic (as evaluated in accordance with Section 1.7), may be approved by the OGRB on a site-by-site basis. Refer to Figure 1.3 for an Oil Facility Gas Conservation Decision Tree.

If the Net Present Value (NPV) of the gas conservation project is greater than -$50,000 CAD, the wells should be shut in until conservation is implemented.

If gas is not conserved at an oil facility and the flare is expected to be visible from a populated area, the use of incineration should be considered during the facility application process (see Chapter 9 Incineration Evaluation).

[2] A site is defined as a single-surface lease (pads counted as one lease) where gas is flared or vented.

Figure 1.3: Oil Facility Gas Conservation Decision Tree



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 13.

1.4 Clustering

Clustering is defined as the practice of gathering the solution gas from several flares or vents at a common point for conservation.

Solution gas may be economic to conserve in some areas if licensees coordinate their efforts in an efficient, cooperative process to take advantage of combined gas volumes and economies of scale. Furthermore, solution gas conservation economics (Section 1.7) are enhanced if conservation is incorporated into the initial planning of larger multi-well projects.

1) Licensees of production facilities within 3 kilometers of each other or other appropriate oil and gas facilities (including pipelines) should jointly consider clustering when evaluating solution gas conservation economics. The OGRB may suspend production in the area under consideration until the economic assessment is complete. The OGRB recommends that:
   a. Licensees exchange production data and jointly consider clustering of solution gas production or regional gas conservation systems and;
   b. The licensees with the largest flare and vent volumes take the lead in coordinating the evaluation of conservation economics for the area.
2) Licensees of multi-well oil developments should assess conservation on the basis of a project or development area regardless of distances. Evaluations should address all potential gas vent and flare sources associated with the multi-well development.
   a. Licensees should incorporate provisions for conservation at all stages of project development to optimize the opportunity for economic conservation of solution gas.
   b. Applications for multi-well oil developments may require a summary of the gas conservation evaluation and a description of the licensee's related project plans.

1.5 Power Generation

Power generation, using otherwise flared or vented gas, is an alternative for conserving solution gas.

1.6 Consultation and Notification

Public consultation and notification requirements for routine flaring activities are done prior to the submission of well or facility licence applications.

1.7 Economic Evaluation of Gas Conservation

Methods of conservation include pipeline to sales, lease fuel, power generation, pressure maintenance, or any other alternative method that may become available.

Conservation economics should be updated every 12 months for any sites flaring or venting combined volumes greater than 900 m^3/day and not conserving.

1.7.1 Economic Evaluation Criteria

Economic evaluations of gas conservation should use the criteria listed below. Licensees should consider the most economically feasible option in providing detailed economics. Specific OGRB economic evaluation submission requirements are listed in Subsection 1.7.2 Economic Evaluation Audit Requirements.

1) Evaluations should be completed on a before-tax basis, and should exclude contingency and overhead costs.

2) Price forecasts used in the evaluation of gas conservation projects (gas gathered, processed, and sold to market) should use the most recent Sproule Associates[3] Limited Natural Gas Price Forecasts, Various Trading Points table. Natural gas prices should be obtained from the "BC West Coast – Station 2" column ($Cdn/MMBtu). Condensate prices should be obtained from the Natural Gas Liquids Price Forecasts and Inflation and Exchange Rates table in the "Edmonton Pentanes Plus" column ($Cdn/bbl).

3) Price forecasts for power generation projects should reflect the price offered in the most recent Yukon Energy[4] Company data. The power price should be escalated at the long-term inflation rate (see item 8 in this list). Alternatively, the cost of the power displaced at the site may be used.

[3] See: https://sproule.com/sproule-price-forecasts. (URL current at time of writing.)
[4] https://yukonenergy.ca/

4) Licensees should have information to support the remaining reserves calculation and the production forecast (including planned drilling programs and pressure maintenance schemes).

5) Licensees should have a detailed breakdown of capital costs showing equipment, material, installation, and engineering costs. Capital costs should be approved-for-expenditure quality numbers and should be based on selection of appropriate technology. Any capital costs incurred prior to the initiation of the project (sunk costs) should not be included in the analysis; only future capital costs related to conservation may be included.

6) For new flares, if there are capital cost savings resulting from implementing gas conservation, such as any equipment that would otherwise be required, they should be considered in the conservation economic evaluation and subtracted from the overall cost of the conservation infrastructure in evaluating the economics of solution gas tie-in.

7) Salvage value of gas conservation infrastructure should be included as project revenue in the year the value would be realized (e.g., transfer of a gas compressor from one conservation project at the end of that project's life to another conservation project). The salvage value should be a reasonable market value estimate of the equipment and not a depreciated value from a taxation perspective.

8) The incremental annual operating costs for the gas conservation project, including gas gathering and processing fees, are to be assumed as up to 10 percent of the initial capital cost of installing the conservation facilities. If the gas contains 1 mole percent hydrogen sulphide (H_2S) or more, the incremental annual operating costs for the project are assumed to be up to 20 percent of the capital cost to install the conservation facilities.

9) The economic evaluation should account for any cost savings, such as carbon tax, reduced trucking, equipment rental, and licensee costs resulting from the conservation project.

10) The incremental annual operating costs for power generation projects are to be assumed as up to 10 percent of the initial capital cost of installing the generation facilities. Standby fees may be calculated in addition to this 10 percent allowance.

11) The inflation rate should be set to the Bank of Canada long-term inflation rate target of 2 percent unless the licensee can justify the use of a different inflation rate.

12) The discount rate should be equal to the prime lending rate of the Bank of Canada on loans payable in Canadian dollars plus 3 percent, based on the month preceding the month during which the evaluation is conducted. This rate may be revised if the cost of capital for the oil and gas industry changes significantly.

13) The conservation economics should be evaluated on a royalties-in-basis (paying royalties) for incremental gas and gas by-products that would otherwise be flared or vented.

14) A gas conservation project is considered economic, and the gas should be conserved, if the economics of gas conservation generates an NPV before-tax greater than -$50,000 CAD.

    a. The NPV is defined as the sum of discounted, annual, before-tax cash flows for the economic life of the solution gas conservation project, where each annual before-tax cash flow is net of that year's conserving project capital investment, if any.

    b. The economic life of a conservation project is defined as the period from the start of the project to the time when annual expenses exceed annual revenue. Note that Section 1.3 Conservation at Oil Facilities, provides a process whereby operators may apply to discontinue conservation if annual expenses exceed annual revenue.

15) If a gas conservation project has an NPV less than -$50,000 CAD and is therefore considered uneconomic on its initial evaluation, the project economics should be re-evaluated annually using updated prices, costs and forecasts.

1.7.2 Economic Evaluation Audit Requirements

Economic evaluation packages must be submitted to the OGRB upon request and should contain the following information in International System of Units (SI):

- Detailed capital and operating cost schedule as set out in Subsections 1.7.1(5) and 1.7.1(6).
- Oil and gas reserves calculations and supporting information (including a discussion of planned drilling programs and pressure maintenance schemes).
- A production forecast for both the oil and gas streams and the economic limit (date and production rates) of the project (including planned drilling programs and pressure maintenance schemes).
- A copy of the gas analysis from the project or a representative analog complete with gas heating value and gas liquid yields.
- Documentation of alternatives that were considered in order to eliminate or reduce flaring or venting, how they were evaluated, and the outcome of the evaluation.

1.8 Non-routine Flaring and Venting at Solution Gas Conserving Facilities

Licensees must minimize non-routine flaring and venting during upsets and outages of solution gas conserving facilities.

1.8.1 Limitations on Non-Routine Flaring and Venting During Solution Gas Conserving Facility Outages

1) Production operations must be managed to control non-routine flaring and venting of normally conserved solution gas in accordance with Table 1.1 Requirements for non-routine flaring and venting during solution gas conserving facility outage.

2) Table 1.1 does not apply to non-associated gas (the percentage cutbacks listed in Table 1.1 apply to solution gas only). All non-associated gas must be shut-in during facility outages.

3) Licensees must notify as required in Chapter 5 Notifications and Requirements.

4) If there is a restriction to plant inlet, solution gas must be processed on a priority basis in relation to non-associated gas in order to minimize unnecessary flaring of solution gas.

5) The OGRB recommends that wells with the highest GORs be shut-in first during facility outages and cutbacks.

6) Provided the overall required percentage reduction in solution gas production is achieved, it is not necessary to implement equal reductions at all locations upstream of the conserving facility outage.

7) When multiple licensees are involved, they may determine how best to implement the overall required production reductions. If agreement cannot be reached, each licensee must implement production reductions as specified in Table 1.1.

Table 1.1: Requirements for non-routine flaring and venting during solution gas conserving facility outage.

Shutdown Category	Duration	Operational Requirements
Partial equipment outages	< 5 days	Shut-in of production is not required for equipment outages lasting less than 5 days and involving small volumes of gas (e.g. storage tank vapour recovery unit repair). This allowance is limited to a maximum of 2 10^3 m^3/day, subject to limitations on venting, as defined in Chapter 7 Venting and Fugitive Emissions Management Requirements.
Planned	< 4 hours	All reasonable efforts must be made to reduce inlet gas volumes for batteries and solution gas plants by 50% of the average daily solution gas production measured over the preceding 30-day period.
	> 4 hours	Inlet gas volumes for batteries and solution gas plants must be reduced by 75% of the average daily solution gas production measured over the preceding 30-day period and meet the following requirements: Solution gas must not be flared from wells that have an H_2S content greater than 5 mole percent. Production may be sustained at rates to provide sufficient throughput to keep equipment operating safely and within minimum design turndown range. It is recommended that operators notify individuals who have identified themselves to the licensee as being sensitive or interested regarding emissions from the facility. Residents and the OGRB must be notified 24 hours prior to the planned event by in accordance with Chapter 5.

Shutdown Category	Duration	Operational Requirements
Emergency or	< 4 hours	No reduction in plant inlet gas volumes is required.
Plant upset	> 4 hours	Licensees must reduce inlet gas volumes for batteries and solution gas plants by 75% of the average daily solution gas production measured over the preceding 30-day period and must meet the following requirements: Solution gas must not be flared from wells that have an H_2S content greater than 5 mole percent. Production may be sustained at rates to provide sufficient throughput to keep equipment operating safely and within minimum design turndown range. It is recommended that operators notify individuals who have identified themselves to the licensee as being sensitive or interested regarding emissions from the facility. Residents and the OGRB must be notified within 24 hours of the unplanned flaring event in accordance with Chapter 5 Notification Requirements.
Repeat non-routine flaring		Licensees must investigate the causes of repeat non-routine flaring or venting and take steps necessary to eliminate or reduce the frequency of such incidents.
Notwithstanding solution gas reduction requirements listed in Table 1.1, if a sour or acid gas flare or incinerator stack is not designed to meet the Yukon *Air Emissions Regulations* for sulphur dioxide (SO_2) under high flow rate conditions, action must be taken immediately to reduce gas to a rate compliant with the Regulations (see Chapter 6 Performance Requirements). Emergency shutdowns or plant upsets are unplanned events at the battery site or at facilities downstream of the battery that cause non-routine flaring at the battery. Repeat non-routine flares are defined as recurring events of similar cause at a conserving facility during a 30-day period.		

Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 21.

1.8.2 Planned Shutdown (Turnaround) Considerations

Licensees must evaluate and implement appropriate measures to reduce solution gas flaring and venting during a gas plant turnaround or planned shutdown. Alternatives that minimize impacts of planned shutdowns include:

- Delivering solution gas to a nearby gas plant that is not on turnaround;
- Scheduling maintenance at related oil facilities to coincide with the gas plant turnaround;
- Injecting solution gas into the gas cap of an oil pool or into a gas reservoir (requires prior approval) and producing it back when the gas plant is back on stream; and
- Communicating with well, battery, and gas plant licensees to ensure that non-routine solution gas flaring and venting are minimized.

1.8.3 Alternatives to Solution Gas Shut-in Requirements

The OGRB will consider alternatives to the shut-in requirements listed in these Guidelines for solution gas. Proposals will only be approved if the licensee can provide an appropriate rationale stating why shutting-in is impractical. In these special cases, the licensee must consult with the OGRB about alternatives prior to implementation.

Licensees must plan for outages. If an alternative to Table 1.1 is justified, licensees must submit a written request to the OGRB explaining the alternative requested and giving supporting reasons for the request. Contact with the OGRB must not be deferred until an actual outage occurs. Licensees should submit the written request to the OGRB a minimum of 30 days prior to a planned shutdown.

1.9 Approvals and Notifications for Non-Conserving Facilities

Specific approval is not required for non-routine flaring at facilities for reasons including maintenance and emergencies. However, limitations on non-routine flaring may be specified in the facility licence.
Approval for flaring for other purposes must be stated in the facility licence. Licensees must notify residents and the OGRB of non-routine flaring at facilities as described in Chapter 5 Notification Requirements.

1.10 Solution Gas Reporting Requirements and Data Access

1.10.1 Solution gas Reporting Requirements

Flared, incinerated and vented solution gas must be reported as per the *Oil and Gas Drilling and Production Regulations,* Part 13 Records and Reports. Licensees must report all new oil well production, including the test period.

1.10.2 Data Access

If flaring, venting or fugitive emission data is required, contact the COO directly. If permitted by legislation, the information will be provided.

1.10.3 Cooperating with Third Parties

The OGRB recommends that Licensees cooperate with qualified third parties attempting to conserve solution gas through open market or clustering efforts by providing timely, non-confidential information such as gas analyses, flared and vented volumes, pressures, and other relevant data, (also see Section 1.4, Clustering).

In cases where conservation is determined to be uneconomic, but a third-party is able to conserve the gas, the OGRB recommends that licensees either conserve the gas or make the gas available at the lease boundary at no charge within three months of a request for the gas. It would be understood that this gas may be provided without processing or compression, and the third-party organization must not have an impact on the upstream operations.

Any third party making data requests to operators must be technically qualified and have a reasonable expectation of proceeding with the gas conservation project. Third parties must also comply with all relevant requirements as set out by OGRB.

CHAPTER 2: WELL FLARING

This chapter applies to temporary flaring activities at wells. These activities include well testing, well cleanup and well maintenance/servicing.

Venting is not an acceptable alternative to flaring. If gas is not conserved and gas volumes are sufficient to sustain stable combustion, the gas must be burned. If venting is the only feasible alternative, it must meet the requirements specified in Chapter 7 Venting and Fugitive Emissions Management Requirements.

2.1 Temporary Flaring Decision Tree

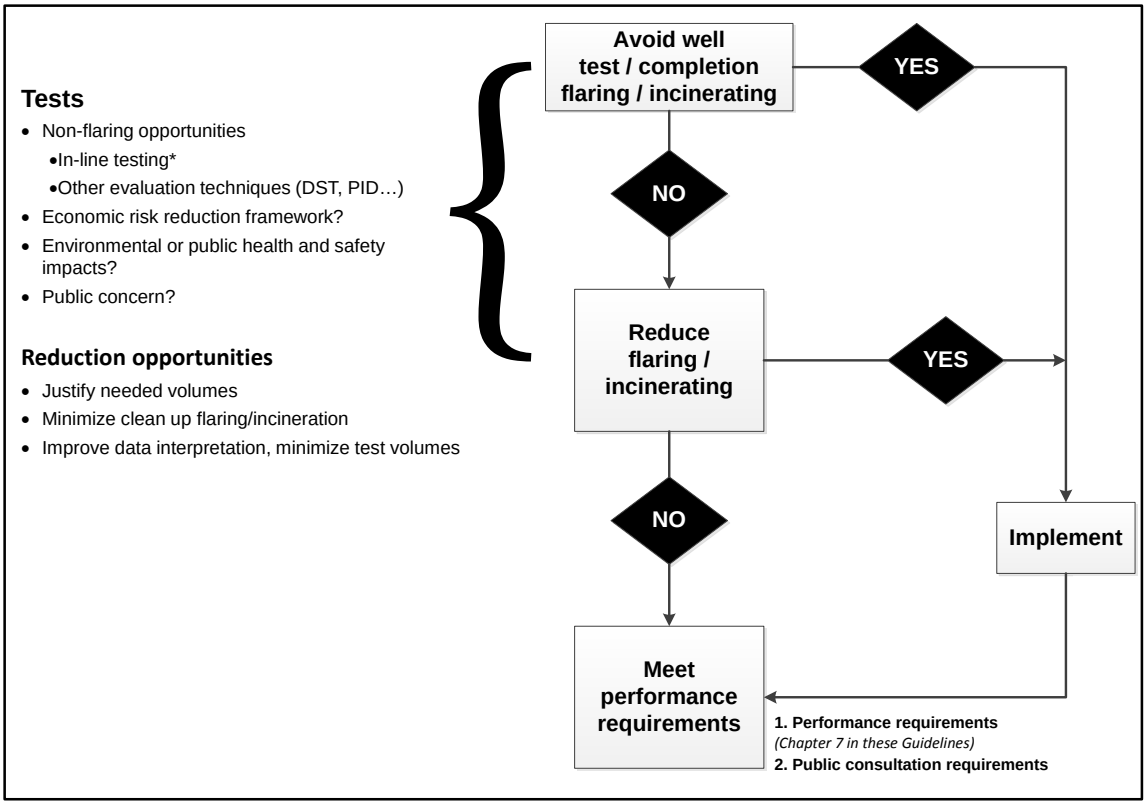
Licensees should use the Temporary Flaring Decision Tree Process (Figure 2.1) to evaluate all opportunities to eliminate or reduce flaring, regardless of volume.

1) Licensees must evaluate opportunities to use existing gas gathering systems prior to commencing temporary maintenance, well cleanup, or testing operations; that is, in-line testing.

2) Unless exempted by the OGRB, in-line testing is mandatory for all wells on private land; and wells on Crown land within 1.25 km of a residence and 3.0 km of a suitable pipeline.

3) If in-line testing is not possible, licensees must design completions and well testing programs to minimize emissions while ensuring a technically-sound well completion, and acquisition of sufficient reservoir and productivity information to inform decisions about future development. Yukon's *Oil and Gas Drilling and Production Regulations* should be consulted for details on the minimum pressure and deliverability requirements for well testing; and the recommended practices required to ensure that appropriate information is obtained for conservation and pool management purposes.

Figure 2.1: Temporary Flaring Decision Tree (adapted from CASA)



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 26. Adapted from Clean Air Strategic Alliance (CASA).

2.2 Flaring Impact Reduction

Licensees must make reasonable efforts to reduce the impacts of temporary flaring near populated areas. Effort should be made to:

- Reduce noise;
- Flare during daylight hours; and
- Use incineration where appropriate. (See Chapter 9 Incineration Evaluation).

Subject to safety and air quality considerations, the OGRB may require the use of incineration as a condition of a well licence; based on the input derived from public consultation.

2.3 Oil and Gas Well Test Flaring and Venting Duration Limits

OGDPR section 127(3)(a)
OGLAR section 17

1) The **duration limits** for flaring and venting are set as follows:

   a. Crude oil wells-24 hours.

   b. Gas wells-24 hours.

   Criteria for duration limitations are:

   - applied per zone and
   - are non-consecutive;
   - shut-in time is not included.

   Time periods include:

   - include cleanup,
   - completion, and
   - testing operations:

2) Extensions to the time limits for crude oil wells (1a) are allowed if:

   a. cleanup of the wellbore is not complete; or

   b. there have been mechanical problems with the well.

3) Extensions to the time limits for gas wells (1b) are allowed if:

   a. cleanup of the wellbore is not complete;

   b. stabilized flow has not been reached; or

   c. there have been mechanical problems with the well.

4) The licensee must document reasons for extension and keep the information on file for audit by the OGRB when requested. Records must be retained in compliance with the OGLAR section 17. The Licence holder is not required to obtain permission to extend the flaring/venting beyond the specified time limit listed in 1(b) if the reason matches those listed in 3 (a) or (b), but must provide advance notification to the OGRB as soon as the Licence holder recognizes that the time limit will be exceeded.

2.4 Temporary Flaring Approval for Well Testing

OGDPR Section 127

The OGDPR authorizes flaring at wells under the following circumstances:

- If the flaring is related to drilling operations.
- If the flaring is necessary for emergency purposes.
- If it is in accordance with the well licence.

Flaring for purposes of well testing requires approval in the pertinent well licence. Approval to flare may be requested at the time of well licence application or by amending the well licence.

Requested volumes, rates, and/or conditions may not be granted by the OGRB. Before a decision is rendered, consideration will be given to:

- the technical justification for the flaring request,
- proposed total volumes,
- potential to exceed the Yukon Ambient Air Quality Standards,
- proximity of residences, and
- results of consultation.

2.5 Ambient Air Quality Evaluation

1) Licensees must evaluate impacts of gas flaring on ambient air quality if it is proposed to burn gas containing ≥ 1 mole percent H_2S or one tonne per day of sulphur emission rate during the event. See 6.10 Dispersion Modelling Requirements for more information.

2) Modelling does not need to be submitted at the time of well licence application, however, modelling must be completed prior to flaring.

3) For gas flaring ≥1 mole percent H_2S and <5 mole percent H_2S, licensees must retain, for one year after the flaring event, information on dispersion assessments. This information must be provided to the OGRB upon request.

4) For gas flaring ≥5 mole percent H_2S, licensees must submit the dispersion modelling to the OGRB.

Depending on the results of dispersion modelling, the OGRB may impose conditions. These conditions may include, but are not limited to: air quality monitoring; meteorological monitoring with shutdown criteria and stack height; flow rate; and gas composition requirements.

2.6 Site Specific Requirements Related to Well Flaring

1) Flares and incinerators must comply with design and operation requirements defined in Chapter 6 Performance Requirements.

2) Flares and incinerators must not be operated outside design operating ranges as specified by a professional engineer licensed or registered in Yukon.

3) Licensees must determine the H_2S content of flared or incinerated gas using Tutweiller or gas chromatography methods as soon as practical after commencement of operations if gas analysis has not been obtained within the preceding 12 months.

4) If the H_2S content in the gas is found to exceed 5 mole percent H_2S and dispersion modelling was not submitted with flaring application or if the H_2S content of the gas exceeds the maximum value listed in the related licence conditions, operations must be suspended until the OGRB has approved the resumption of operations.

5) Both high and low-pressure gas-liquid separation stages should be used for sour gas to minimize vapour released from produced hydrocarbon liquid and sour water storage.

6) Liquid storage must be designed to prevent the escape of sour gas to the environment. (For additional detail see ENFORM,

Industry Recommended Practice (IRP) Volume 4: Well Testing and Fluid Handling[5].)

7) Tanks and equipment used for temporary flaring operations must be provided with secondary containment, when required.

8) For compliance purposes, flaring commences when there is burnable gas at surface. The total flared volume does not include completion fluid (i.e. CO_2) that is flowed back from the well, or fuel gas that is added to improve the heating value of the flared gas.

2.7 Temporary Pipelines and Facilities for In-Line Tests

To facilitate conservation, the licensee may install temporary equipment such as a compressor or a temporary surface pipeline as long as the equipment is listed in the original licence application.

2.8 Notification Requirements

Prior to flaring, licensees must notify the OGRB and all residents and administrators of incorporated centers in accordance with Chapter 5 Notification Requirements.

2.9 Reported Flare Volumes

OGDPR Part 13 Records and Reports

- Well test results must be submitted in accordance with the requirements of the *Oil and Gas Drilling and Production Regulations*, Part 13 Records and Reports.
- This information must include the volume of gas produced to flare, vent or pipeline; as well as all analyses from samples gathered at the wellhead; and must be submitted to the OGRB.

[5] This document, as well as future revisions and additions, is available from: Enform Canada 5055 – 11 Street NE Calgary, AB T2E 8N4 Phone: 403.516.8000 Fax: 403.516.8166 Website: www.enform.ca.

CHAPTER 3: NATURAL GAS FACILITY FLARING AND VENTING

This Chapter addresses flaring and venting at natural gas facilities such as processing plants, LNG facilities, compressor stations and dehydrator facilities.

3.1 Gas Production Facility and Gas Processing Plant Flaring and Venting Decision Tree

Licensees should use the decision tree analysis shown in Figure 3.1 to evaluate all new and existing facility flaring and venting regardless of volume except for intermittent small sources (less than 100 m^3 per month), such as pig trap depressurization. Subject to safety and environmental considerations, licensees must conserve all gas that is economic to conserve (the net present value of conservation is greater than $0 using the economic evaluation criteria in Section 1.7 of this Guideline).

Licensees must document alternatives that were considered in order to eliminate or reduce flaring and/or venting, how they were evaluated, and the outcome of the evaluation.

- Licensees should refer to the Canadian Association of Petroleum Producers (CAPP) Best Management Practices, Facility Flare Reduction[6] for methods to document, evaluate and reduce sources of flaring.
- Licensees must make reasonable efforts to address concerns or objections of residents related to facility flaring.
- Flare, incinerator, and vent systems must be designed and operated in compliance with Chapters 6 and 7 of these Guidelines, applying good engineering practice, and relevant safety codes and regulations.
- For new facilities, the use of incineration must be considered during the facility licence application process for continuous flares (other than purge and pilot gas) if the flare is expected to be visible from a populated area (see Chapter 9 of these Guidelines).

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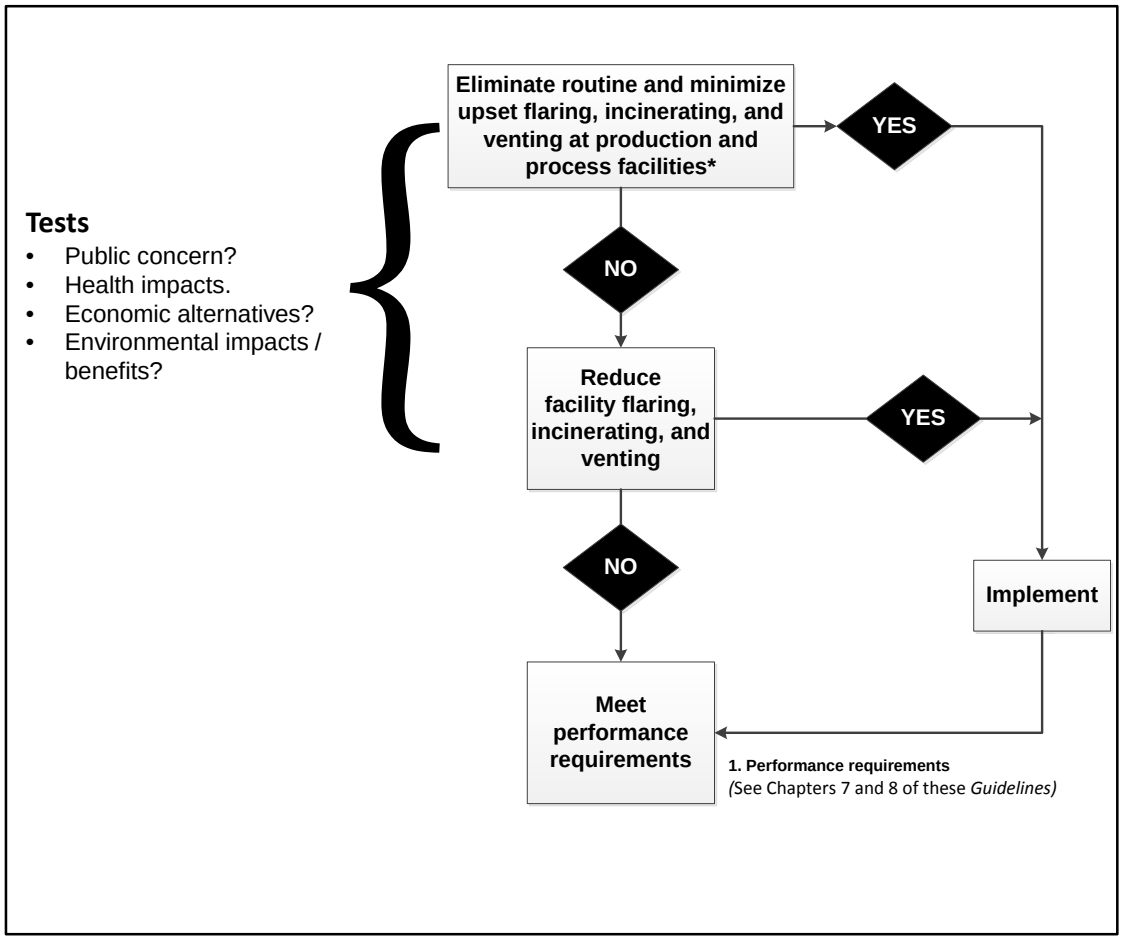
6 For Information on how to order this BMP, email publications@capp.ca. For download, visit the CAPP website: https://www.capp.ca/, and search on the publication title. Publication 2006-0018. Published Dec 2006, 47 p. Author: Tom Michelussi, Altus Environmental Engineering Ltd.

Figure 3.1: Facility Flaring and Venting Decision Tree (adapted from CASA)



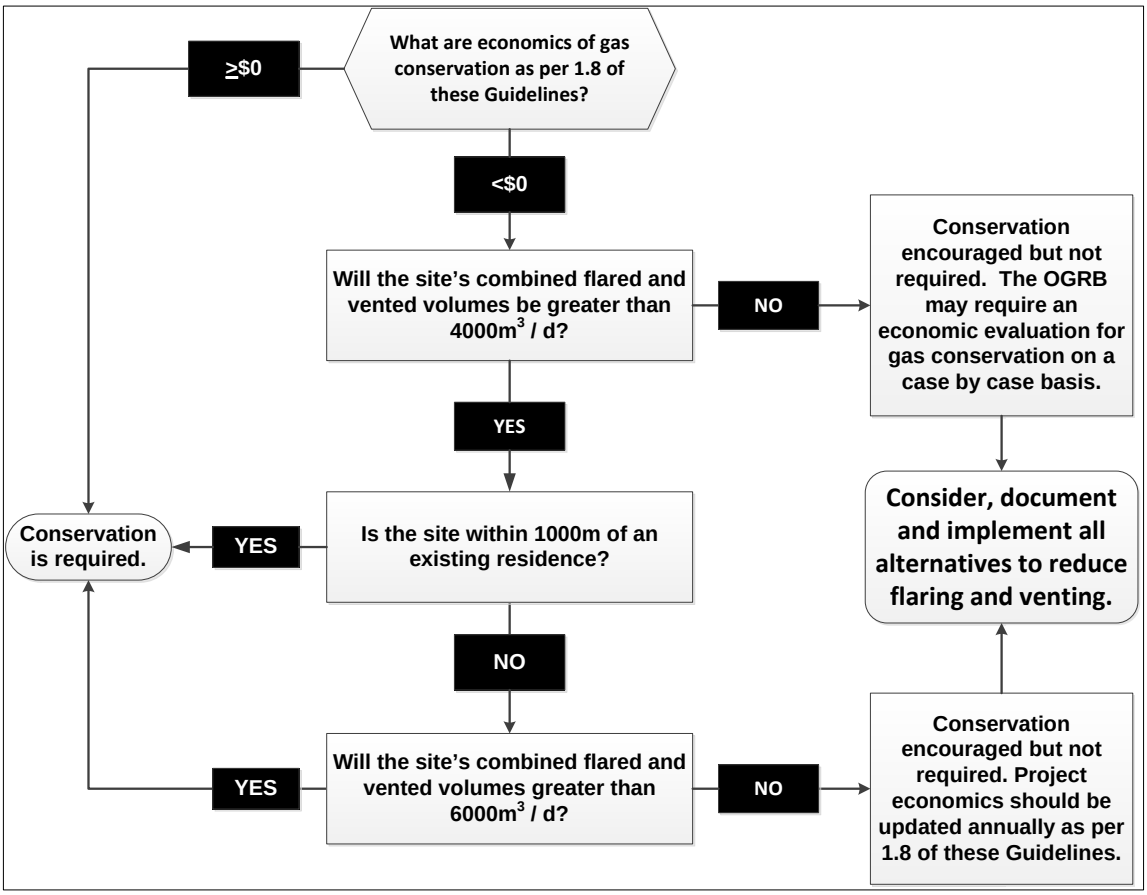
Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 33. Adapted from the Clean Air Strategic Alliance (CASA).

3.2 Conservation at Gas Facilities

These requirements apply to all new and existing natural gas facilities. Flaring and incineration volumes in this section do not include fuel gas used for pilots or flare system purge.

1) Licensees should conserve gas at natural gas facilities where:
   a. Conservation economics produce an NPV greater than $0 (using the economic evaluation criteria in Section 1.7 Economic Evaluation Criteria).
   b. Flared volumes are greater than 4000 m^3/day per site and the flare is within 1000 m of an existing residence.
      i. If a new residence is constructed or relocated within 1000 m of an existing facility gas flare, licensees should provide information about the flaring operation to the new residents.
2) For any sites flaring or venting combined volumes greater than 4000 m^3/day and not conserving, a review of conservation economics should be done at least once every 12 months using the criteria in Section 1.7 in these Guidelines.
3) New sites flaring or venting combined volumes greater than 6000 m^3/day should implement gas conservation. However, sites where conservation is not practical or economic (as evaluated in accordance with Section 1.7 of these Guidelines), may be approved by the OGRB on a site by site basis.
4) The OGRB may require additional conservation evaluations at non-conserving facilities when necessary.
5) Conservation is subject to safety and environmental concerns.
6) The OGRB may consider conservation alternatives for temporary, remote, or exceptional natural gas facilities.
7) Conserving facilities should be designed for 95 per cent conservation with a minimum operating level of 95 per cent.
8) Licensees must obtain approval from the OGRB to discontinue conservation implemented at any facility and:
   a. Complete a decision tree to evaluate alternatives to discontinuing conservation;
   b. Provide information on annual operating expenses and revenues;
   c. Notify as required by Chapter 5 Notification Requirements; and
   d. Submit a facility amendment application.

Figure 3.2: Gas Facility Conservation Decision Tree



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 35.

3.3 Measurement

1) Flare measurement and estimation at existing facilities must be in accordance with Chapter 10 Measurement and Reporting of these Guidelines.

2) If significant deficiencies in the documentation and reporting of flared volumes at a facility are identified, the OGRB may order the installation of a flare meter.

3) In addition to the requirements in Chapter 10, a flare meter must be considered at all new gas processing plants and gas compressor stations that have an inlet capacity ≥ 300 10^3 m^3/day.

4) The OGRB may require flare meter installation at existing facilities that are undergoing significant modification.

5) Flare meters must be capable of providing reliable and accurate measurement under the range of flow conditions and gas compositions expected within the gas stream. Refer to the Global Gas Flaring Reduction Partnership Guidelines on Flare and Vent Measurement for more information regarding the selection of a suitable flare meter.

3.4 Approvals and Notification

1) Specific approval is not required for non-routine flaring at facilities including maintenance and emergencies. Limitations on non-routine flaring may be specified in the facility licence.

2) Flaring for purposes other than those specified in 1) must be approved in the facility licence.

3) Licensees must notify residents and the OGRB of non-routine flaring at facilities as described in Chapter 5 Notification Requirements of these Guidelines.

3.5 Reporting

OGDPR Part 13

1) All monthly flared, incinerated, and vented volumes must be reported as per Part 13 0f the OGDPR, and

2) Gas burned in an incinerator must be reported as flared. Fuel gas burned in an incinerator must be reported as fuel gas.

3) Gas flared or vented at gas facilities must be reported at the location where the flaring or venting took place.

4) Fuel gas that is flared or vented (e.g. flare pilot gas, purge gas, storage tank blanket gas) must be reported as either flared or vented gas, not fuel gas. This does not include fuel gas added to flare or incinerator streams in order to meet minimum heating value requirements.

3.6 Frequent Non-Routine Flaring / Venting

1) Licensees must make reasonable efforts to investigate and correct causes of repeat non-routine flaring, incinerating, and venting.

2) Gas processing plants should not exceed six major non-routine flaring events in any consecutive (rolling) six-month period (6-in-6).

3) Major flaring events are defined in Table 3.1.

Table 3.1: Major Flaring Event Definition

Approved inlet capacity	Major flaring event definition*
>500 10^3m^3 / d	100 10^3m^3 or more
150 – 500 10^3m^3 / d	20% of design daily inlet or more
< 150 10^3m^3 / d	30 10^3m^3 or more

*The definition of a flaring event includes situations where:

1) Volumes greater than or equal to those specified in the table are flared in any single day. Each day that specified flared volumes are exceeded is considered to be a separate, individual event; or

2) Volumes greater than or equal to those specified in the table are flared in one contiguous period spanning more than one day (for example, flaring for four days at a continuous rate of 25 10^3m^3 / d is considered one event).

Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 37.

- Licensees must log and monitor non-routine flaring events, as required in Section 10.4 Flaring and Venting Records of these Guidelines.
- Major flaring events must be flagged. Should a sixth major flaring event occur within any consecutive (rolling) six-month period, licensees must submit a "Written Exceedance Report" within 30 days of the occurrence of the sixth flaring event.

3.6.1 Written Exceedance Report

- The report must provide data on all flaring events (volume and duration) for the consecutive (rolling) six-month period in question and their possible causes.
- The report must also propose a plan and corresponding timeline for implementing corrective actions to ensure that frequent major non-routine flaring does not recur.
- Licensees must expedite schedules for implementing the corrective actions.
- After the planned implementation date, the OGRB may take enforcement action if another exceedance of the 6-in-6 criterion occurs within 24 months.

3.7 Gas Facility Outage Flaring / Venting

- Licensees must comply with the solution gas reduction limitations found in Section 1.8 Non-Routing Flaring and Venting at Solution Gas Conserving Facilities during facility outages.
- All non-associated gas must be shut in during facility outages.
- If multiple flare stacks are available, licensees should use the flare stack that is most efficient and capable of providing the best dispersion.
- The OGRB recommends that solution gas be processed on a priority basis in relation to non-associated gas.

CHAPTER 4: PIPELINE FLARING AND VENTING

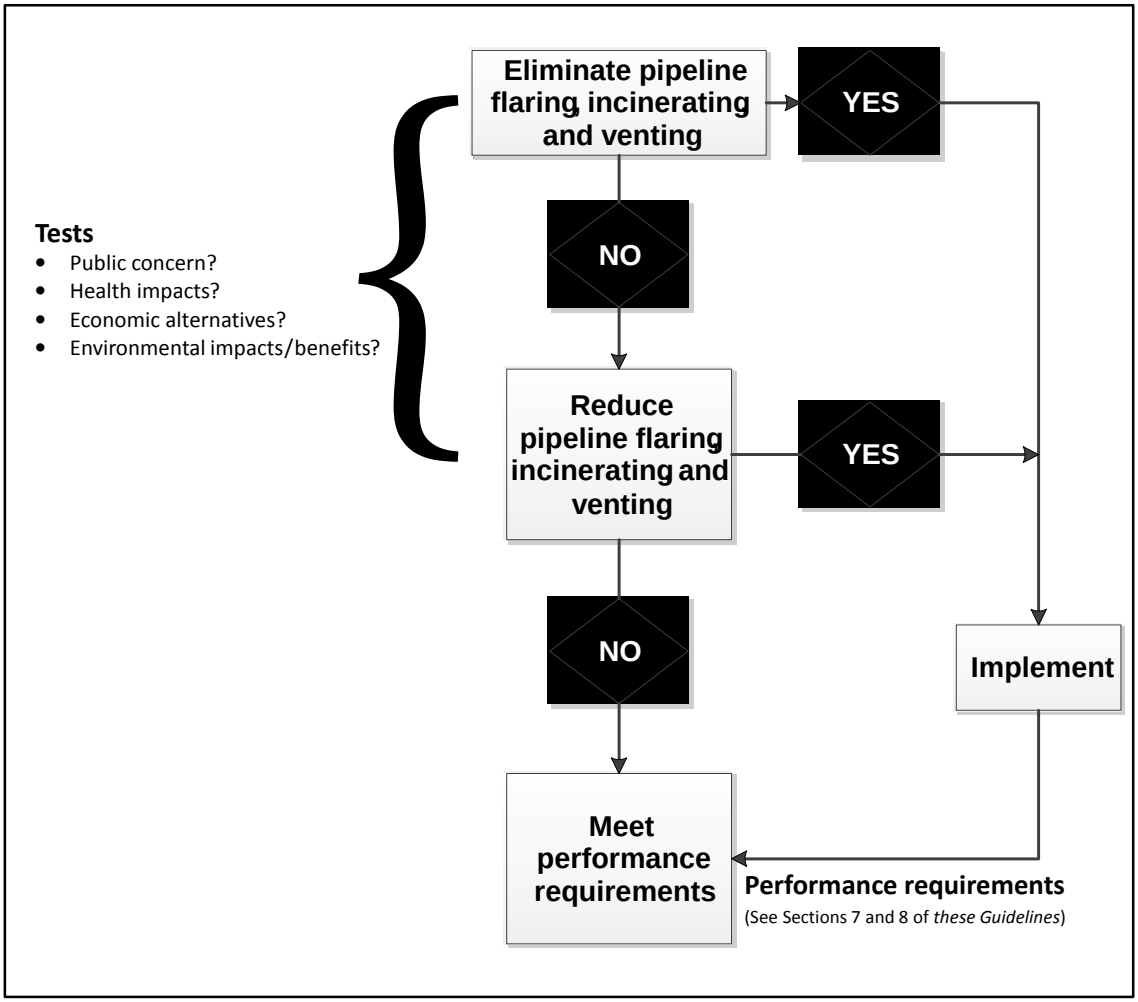
This chapter addresses disposal of gases from gas gathering and transmission lines by flaring and venting. Sources of natural gas flaring or venting include non-routine flaring and venting for pipeline depressurization for maintenance, and process upsets or emergency depressurization for safety reasons.

4.1 Pipeline Systems Flaring and Venting Decision Tree

- Licensees should use the decision tree analysis shown in Figure 4.1 to evaluate all new and existing pipeline systems including compression station flares, incinerators, and vents. These evaluations should be updated prior to any planned flaring or venting events.
- Licensees should document their evaluation process including: alternatives considered for the elimination or reduction of flaring and venting; how these alternatives were evaluated; and the outcome of the evaluation.
- Licensees should assess opportunities to eliminate or reduce flaring and venting of gas due to frequent maintenance or facility outages.
- Licensees should investigate and correct repeat events at gas pipelines and related facilities (e.g. compressor stations).
- Licensees should address public complaints and concerns related to pipeline facility flaring or venting and document and retain records of discussions with the public. These records should be reported to the OGRB on a frequent, regular basis.
- Licensees should investigate and implement feasible measures to conserve gas from the depressurization of pipeline systems.
- Licensees must ensure that flares, incinerators, and vents are designed and operated in compliance with Chapters 6 and 7 of these Guidelines; conforming to good engineering practices and all relevant safety codes and regulations.
- The economic evaluation in Section 1.7 of these Guidelines is not applicable for evaluating conservation of gas from non-routine pipeline depressurization. However, licensees should evaluate the conservation of gas from planned non-routine pipeline depressurization having regard for the value of gas, costs of conserving the gas, and economic impacts of extending outages on downstream customers and upstream producers.

- Flaring or incinerating of gas from sweet natural gas transmission pipeline depressurization may not be practical when impacts on system customers and producers are considered. In such situations, the OGRB may allow venting of gas to reduce the duration of system outages and related impacts.

Figure 4.1: Pipeline Flaring and Venting Decision Tree (adapted from CASA)



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 40. Adapted from Clean Air Strategic Alliance (CASA).

4.2 Notification and Reporting

1) Specific approval is not required for non-routine flaring at pipelines, including maintenance and emergencies.

2) Licensees must notify residents and the OGRB of non-routine flaring of pipelines as described in Chapter 5 of these Guidelines.

3) All monthly flared, incinerated, and vented volumes must be reported separately and be submitted to the OGRB. Refer to Chapter 10 of these Guidelines for more details.

CHAPTER 5: NOTIFICATION REQUIREMENTS

Licensees must notify the OGRB and all residents and administrators of incorporated centers located within the notification radius that non-routine flaring, incinerating or venting will occur (Table 5.1).

The OGRB does not require licensees to obtain the consent of the residents within the notification radius.

Table 5.1 Notification Requirements

H_2S Contents	Flaring Event Duration or Volume	Notification Radius
Any	<4 hrs and <10 e^3m^3	None
<1%	>4 hrs or > 10 e^3m^3	1.0 km
1% < H2S < 5%		1.5 km
≥ 5%		3.0 km

Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 41.

5.1 Notification of Residents and Administrators of Incorporated Areas

1) Notification must be given a minimum of 24 hours prior to commencement of planned non-routine flaring events and within 24 hours of unplanned flaring events.

2) Licensees should consult with residents and administrators of incorporated centers to develop and implement a notification process that is mutually acceptable.

3) If a mutually acceptable notification process has not been implemented, notification must be in writing and include the following minimum information:

   a. Company name, contact persons, and telephone numbers.

   b. Location of the flaring.

   c. Duration of the event.

   d. Expected volume and rate;

   e. Information on the type of well (oil or gas) and information on H_2S content; and,

   f. OGRB contact number.

4) The OGRB recommends that licensees consider placing signage on public roads in the vicinity of temporary flaring operations indicating the operation type and contact number for inquiries.

5.2 Notification to the OGRB

Notification must be given a minimum of 24 hours prior to the commencement of planned, non-routine flaring events and within 24 hours of occurrences of unplanned flaring events.

CHAPTER 6: PERFORMANCE REQUIREMENTS

Flares and Incinerators

These requirements apply to flares and incinerators in all upstream industry oil and gas systems for the combustion of sweet, sour, and acid gas; including portable equipment used for temporary operations. Flare and incinerator systems include associated separation equipment, piping, and controls.

For the purposes of these Guidelines, the term "flaring" is used to refer to flaring and incineration. In this chapter, some requirements are specific to the type of equipment used and this is specified in each requirement.

Design and Review

Although some design or operating specifications are provided, these Guidelines are not a substitute for comprehensive engineering design codes and guidelines. These Guidelines identify minimum requirements and recommendations set by Yukon government's Oil and Gas Resources branch, but is not intended as a comprehensive design manual.

1) Licensees must ensure:
   a. A professional engineer licensed or registered in the Yukon is responsible for the design or review of flare and incinerator systems including separation; related piping; controls; and emergency shutdown.
   b. Equipment and controls design information is provided to the OGRB upon request.
2) The *Oil and Gas Drilling and Production Regulations*, API-RP-521: Guide for Pressure-Relieving and Depressuring Systems, as well as applicable fire safety codes, electrical codes, CSA standards, and mechanical engineering standards, are all necessary references for the design of gas combustion systems.
3) Licensees must comply with Yukon Boilers and Pressure Vessel safety regulations with respect to the design of pressure vessels and piping systems and the design of equipment and operating procedures.
4) Licensees must consult Yukon fire protection codes and guidelines as part of facility design.

Procedures and Documentation

5) Licensees must ensure:

   a. The specification of safe operating procedures is completed by a professional engineer licensed or registered in the Yukon.

   b. Operating procedures that define the operational limits of flare or incinerator systems are:

      i. documented;

      ii. implemented; and

      iii. meet the design requirements.

   c. Documentation is retained according to the OGLAR section 17 Retention of Records.

   d. Operating limits and procedures must be provided to the OGRB upon request.

Operation and Monitoring

6) Flare and incinerator systems must be operated within operational ranges and the type of service specified by a professional engineer licensed or registered in the Yukon.

7) If a licensee is using a flare or incinerator in a field service that has not previously been field tested, the licensee must be able to provide actual monitoring data to show that performance specifications can be met.

   a. Field testing of newly designed equipment is not allowed unless there are acceptable and redundant combustion systems to ensure that any sweet, sour, or acid gas can be properly combusted if the new equipment fails to perform as predicted; or the ability exists to shut-in if problems arise.

6.1 Conversion Efficiency

1) Flares, incinerators and other gas combustion systems, including those using sour gas as a fuel for production or process equipment, must be designed, maintained, and operated so that emissions do not:

   a. result in off-lease odours;

   b. exceed the Yukon *Air Emissions Regulations;*

   c. result in adverse impacts to public health and safety; or

   d. cause damage to vegetation.

2) Licensees must modify or replace existing flares or incinerators if operations result in off-lease odours, odour complaints, or visible emissions (e.g. black smoke).

3) If operations at a site cause, or are suspected to cause unacceptable air quality impacts, the OGRB may require the licensee to:

   a. Conduct an environmental impact assessment. The assessment may include, but is not limited to, dispersion modelling, air quality monitoring, and vegetation assessment.

   b. Take all actions the OGRB deems necessary to mitigate or eliminate the air quality impacts.

6.1.1 Heating Value and Exit Velocity for Flares

If a minimum flare heating value has been assigned in the licence, the more stringent minimum heating value will apply.

1) The combined net or lower heating value of gas, including make-up fuel gas, directed to a flare should not be less than 20 megajoules per cubic meter (MJ/m^3), except as noted below:
   a. If existing stacks have an established history of stable operation and compliance with the Yukon *Air Emissions Regulations*, licensees are allowed to maintain the current heating value provide that it is not less than 12 MJ/m^3. Licensees must be able to provide documentation that proves there is a history of stable operation and legislative compliance.
   b. If flare stacks have a history of flame failure, odour complaints, and/or of exceeding the Yukon *Air Emissions Regulations*, licensees should operate with a combined flare gas heating value of not less than 20 MJ/m^3.
2) If fuel make-up is required, it must be specified for flare stacks by a professional engineer licensed or registered in the Yukon.
   a. Equipment controls should be installed, and operating procedures should be documented to ensure minimum fuel gas make-up during routine and non-routine operating conditions.
   b. Facilities must be operated in compliance with specified minimum fuel gas make-up requirements.
3) The flare tip diameter must be properly sized for the anticipated flaring rates.
4) Equipment and controls design information must be provided to the OGRB upon request.
5) Operating limits and procedures must be provided to the OGRB upon request.

6.2 Non-routine Sour and Acid Gas Flaring Procedures

If operating procedures and controls are used to limit the magnitude and/or the duration of the event, they must be documented and the facility operated in accordance with these procedures:

- Automated shutdowns must be installed in facilities that are not staffed 24 hours/day (semi-attended).
- Staff responsible for operations must be aware of the current operating procedures and trained in following those procedures.
- Operating procedures and related dispersion evaluations must be provided to the OGRB on request.

6.3 Flare and Incinerator Spacing Requirements

OGDPR section 128

Licensees must follow good engineering and safety practices in the layout of facilities. Notwithstanding compliance with liquid separation requirements, unexpected liquid carryover to flares and incinerators can happen.

Flares and incinerators must be located an adequate distance from areas frequented by workers and from flammable liquids and sources of ignitable vapours.

Licensees must consult Yukon fire protection codes and guidelines as part of facility design.

Recommended minimum spacing distances for flares and incinerators are:

1) Fifty (50) metres from any well, treater, separator, compressor, crude oil storage tank or any other unprotected source of ignitable vapours; and
2) Eighty (80) metres from any right-of-way, easement, road, public utility, building, installation, works, place of public concourse or any reservation for national defence, except only when there may exist special circumstances that, in the opinion of the Chief Operations Officer, justify the positioning of the stack at a greater or lesser distance.

Spacing must meet the requirements of Section 128 of the *Oil and Gas Drilling and Production Regulations.*

6.4 Stack Design

OGDPR section 128

Flare stacks must meet the design requirements found in Section 128 of the *Oil and Gas Drilling and Production Regulations*. The OGRB recommends that:

- Flare and incinerator stacks be designed so that the maximum heat intensity at ground level will not exceed 4.73 kW/m², or that an equivalent level of safety can be ensured.
- The blackened area beneath a flare stack is at least 1.5 times the stack height to a minimum of 10 meters in cultivated areas, and 30 meters in forested areas, unless conditions support a lesser distance.
- Flares and incinerators located within a distance of 5 times the height of any neighbouring building have a height of at least 2.5 times the height of the highest building.
- Flares and incinerators are designed and operated to minimize fuel consumption.
- Interconnecting lines to the flare or incinerator are adequately secured.

The OGRB recognizes that lesser distances may be justified depending on the circumstances, provided that the requirements of Section 128 of the OGDPR are met (see section 6.3 Flare and Spacing Requirements). It is ultimately the responsibility of the licensee to maintain a sufficient area, given the location and the conditions under which flaring will or may occur.

Flare blackened areas must not extend past the boundary of an approved lease.

6.5 Flare Pits

Flare pits will no longer be approved.

6.6 Ignition

Flares and incinerators must have reliable systems to ensure continuous ignition of any gas that may discharge to the device.

- Unsupervised flare stacks where intermittent flaring may occur must be equipped with an adequate auto-ignition system.
- Unsupervised flare stacks where continuous flaring will occur and the H_2S content of the gas to be flared exceeds one mole percent must be equipped with a flame-out detection device with operation shut-down capability that provides an immediate alarm to the licensee.
- If repeat failures to ensure ignition of flared gas have occurred; or off-lease odours, or other impacts have resulted, the OGRB may require the installation of pilots, automatic ignition, and/or flame out detection and alarms.
- Subject to the application of good fire safety practices, manual flare and incinerator ignition may be approved for non-routine purposes where no continuous gas flow exists and no automatic relieving systems are connected to the stack.

As an alternative to maintaining a continuous flare, safe venting may be considered for approval by the OGRB:

- in situations where gas is not continuously or routinely flared and the potential exists to safely conserve gas by avoiding continuous pilots and/or purge gas; and
- a satisfactory system of controls is proposed.

6.7 Liquid Separation

Entrained liquids in a flare or incinerator stream may reduce combustion efficiency and contribute to increased emissions of total reduced sulphur compounds, hydrocarbons, and products of incomplete combustion. To protect the gas combustion system, adequate gas-liquid separation equipment must be used.

- Liquid separation equipment should be used in both temporary and permanent flare and incinerator systems.
- In accordance with good engineering practice, flare and incinerator separators should:
  - be designed to remove droplets of 300 to 600 micron diameter; and
  - be designed based on the lowest density hydrocarbon liquid that could be released to the flare or incinerator system.
- Flare and incinerator separators should be designed to have sufficient holding capacity for all liquids that may accumulate as a result of upstream operations such as hydrocarbon carryover, liquid slugs, and line condensation.
- Knockout drums should be equipped with high-level alarms and liquid level indication. High-level shutdowns should be considered where facilities have a history of liquid carryover or black smoke emissions, and where liquid streams are directed to the knockout drum for storage. Facility licensees must monitor and remove accumulated liquids in the knockout drums as necessary.
- High level alarms and liquid level indication may not be required where only manually operated and continuously attended flaring will occur.

6.8 Backflash Control

Improperly designed flare or incinerator systems may have sufficient oxygen present to support combustion. Backflash may occur when the linear velocity of the combustible mixture of gas and air in the system is lower than the flame velocity.

The licensee must take precaution to prevent backflash using appropriate engineering and operating practices, such as:

- installing flame/detonation arrestors between the point of combustion and the flare or knockout drum; or
- ensuring provision of sufficient flare header sweep gas velocities (i.e. purge or blanket gas) to prevent oxygen intrusion into the flare or incinerator system.

Check valves are not an acceptable form of backflash control.

Safe work procedures must be in place to ensure complete purging of oxygen from flare or incinerator systems prior to ignition.

The licensee must provide details about implemented backflash control to the OGRB on request.

The OGRB will consider approving temporary or maintenance flare stacks without flame/detonation arrestors or purge or blanket gas if all of the following are met:

- The flare stack is manually lit and continuously supervised;
- The flare stack has no intermittent venting connections (ie. PSVs); and
- The flare stack is not connected to any production or storage tanks.

6.9 Flare Maintenance

The licensee should develop a maintenance program for the flare stack and flare knock out, taking into consideration the type of service fluids, operating conditions, operating history, design characteristics, and other pertinent factors to ensure the equipment functions as designed.

6.10 Dispersion Modelling Requirements

The requirements applying to the combustion of sour gas in process equipment, flares and incinerators are as follows:

- Using the dispersion modelling methods outlined in this section, licensees must demonstrate that SO_2 and H_2S emissions from the burning of sour and acid gas will not result in unacceptable air quality impacts.

  Modelling is required for routine and non-routine flaring/incineration events ≥ 1 mole percent H_2S or ≥ one tonne per day of sulphur emissions, unless the event is ≤ 15 minutes and ≤ one tonne per day sulphur.

- Licensees combusting gas below one mole percent H_2S are encouraged to consider dispersion modelling as part of environmental considerations.

  Licensees may be asked to make these environmental assessments based on applications submitted to the OGRB, ensuring that ambient air quality objectives can be maintained throughout resource development.

- Dispersion modelling must be completed by qualified personnel using acceptable models and methodology.

6.10.1 Modelling Approach

An appropriate model must be selected and this choice must be defensible. The licensee must be able to demonstrate that the modelling follows accepted methodologies and standards.

The licensee must use representative input parameters (e.g. flow rate, gas composition) within the model and be prepared to provide evidence that those parameters are representative.

Screening and refined modelling for individual sources such as a permanent or temporary flare or incinerator, may be conducted by using the protocol outlined within the *British Columbia Air Quality Dispersion Modelling Guideline*[7] or the *Alberta Energy Regulator's AER User Guide, AER Flare version 2.01*[8] and associated modelling protocols. Modelling should address a full range of expected flow rate conditions and may include low, average, and maximum flow rates.

Refined modelling may be required if results of the screening model are unacceptable. This is a more complex and data-intensive level of dispersion modelling. Refined assessments more closely estimate actual air quality impacts by using site-specific meteorological data.

Routine sour flaring decisions are to be compared to the *New National Air Quality Standards for SO_2*, BC Ministry of Environment[9].

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[7] British Columbia Ministry of Environment. November 2015 (latest revision). British Columbia Air Quality Dispersion Modelling Guideline. https://www.bcogc.ca/node/13339/download. Also https://www2.gov.bc.ca/gov/content/environment/air-land-water/air.

[8] Alberta Energy Regulator (AER). 10 January 2014. AERflare User Guide: A Model for Temporary Flaring Permits, Non-Routine Flaring and Routine Flaring Air Dispersion Modelling for Sour Gas Facilities, Version 2.01. Alberta Energy Regulator. Centennial Place, Suite 1000, 250 – 5 Street SW, Calgary, Alberta T2P 0R4, Telephone: 403-297-2625, Fax: 403-297-3520, Web site: http://www.aer.ca/regulations-and-directives/directives/directive060.

[9] British Columbia Ministry of Environment. November 2016. New National Air Quality Standards for SO2. Download from: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/fs_so2_caaqs.pdf.

The source design must not result in ground-level SO_2 concentration predictions higher than those outlined in these ambient air quality objectives. If it is not practical to design flares or incinerators of sufficient height for adequate dispersion, the licensee may wish to consider:

- using an air quality management plan; developing operating procedures and process controls which prevent emission rates and durations which are predicted to exceed ambient air quality objectives, or
- the addition of fuel gas to increase heat release and plume rise.

The Alberta Risk Based Criteria (RBC), as defined in the CAPP *Sour Non-Routine Flaring Framework*[10] and accessed through the applicable modelling tools, may be applied to sour non-routine flaring scenarios. Although modelled predictions up to the RBC will be accepted, actual exceedances of the ambient air quality objectives are not accepted.

Licensees must evaluate for foliar injury and human health impacts based on ground level concentration predictions defined within these Guidelines.

Well test flares ≥ 5 mole percent H_2S must be authorized under the Yukon *Air Emissions Regulations*. To discharge air contaminants the licensee must, at least 15 days prior to commencement of well test flare or incineration of sour gas containing ≥ 5 mole percent H2S and in accordance with Section 8 of that regulation, submit dispersion modelling and details of the well test to the satisfaction of the OGRB.

[10] Canadian Association of Petroleum Producers. November 15the, 2013. Framework: Sour Non-Routine Flaring. https://www.capp.ca/~/media/capp/customer-portal/publications/237189.pdf.

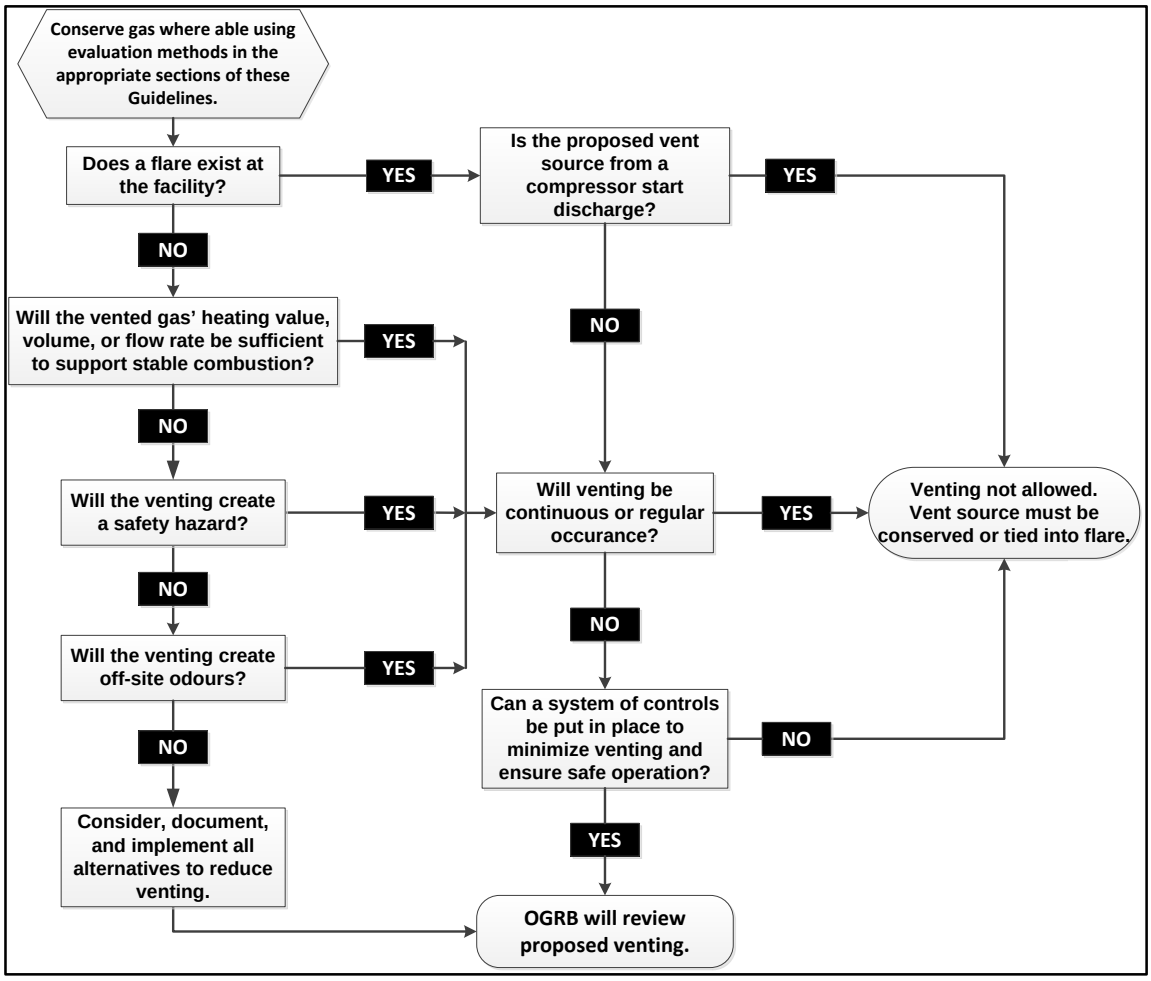
CHAPTER 7: VENTING AND FUGITIVE EMISSIONS MANAGEMENT REQUIREMENTS

Venting is not an acceptable alternative to conservation or flaring. Venting is the least preferred option and gas should be flared under all except the most exceptional circumstances.

7.1 General Requirements

- All continuous and temporary venting must be evaluated using the decision tree in the appropriate sections of these Guidelines. Vent sources at facilities must be evaluated using the Vent Evaluation Decision Tree (Figure 7.1).
- Licensees must burn all non-conserved volumes of gas if volumes and flow rates are sufficient to support stable combustion.
- Vented gas must not constitute a safety hazard.
- Venting must not result in off-site odours.
- The quantity and duration of vented gas must be minimized.
- A facility licensee must have an adequate fugitive emissions management program.

Figure 7.1 Vent Evaluation



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 53.

7.2 Limitations of Venting Gas Containing H_2S or Other Odorous Compounds

- The OGRB requires that licensees eliminate the venting of gas containing hydrogen sulphide. Wells and facilities must not use gas containing more than 20ppm hydrogen sulphide for instrumentation and/or to provide motive force for pumps.
- The OGRB recommends any pressure safety valves (PSVs) or blowdown systems be connected to a flare system where such systems are installed.
- Where it is not practical to install a flare system to flare PSV venting, the OGRB will consider a satisfactory system of controls to minimize and ensure safe PSV discharge events.

7.3 Venting of a Non-combustible Gas Mixtures

Release of inert gases such as nitrogen, carbon dioxide, and water vapour from upstream petroleum industry equipment or produced from wells may not have sufficient heating value to support combustion. These gases can be vented to the atmosphere subject to the following requirements:

- Non-combustible gas mixtures containing odorous compounds including H_2S must not be vented to the atmosphere if off-lease odours may result. Alternatives to venting such gases include flaring or incinerating with sufficient fuel gas to ensure destruction of odorous compounds, or underground disposal.
- The licensee must take precautions to protect human health, public safety, property, and the environment.
- The licensee must take precautions in fire prevention, explosion prevention, and the prevention of other impacts such as reduced visibility.
- Venting of these substances must not result in unacceptable air quality impacts.

The OGRB may require the licensee to demonstrate that non-combustible gas mixtures do not result in unacceptable air quality impacts using an acceptable dispersion modelling technique.

7.4 Surface Casing Vents

Refer to Section 86 of the OGDPR for surface casing vent requirements.

7.5 Fugitive Emissions Management

Licensees must develop and implement a program to detect and repair leaks. These programs should meet or exceed the CAPP Best Management Practice for Fugitive Emissions Management.

7.6 Compressor Start Gas Discharge

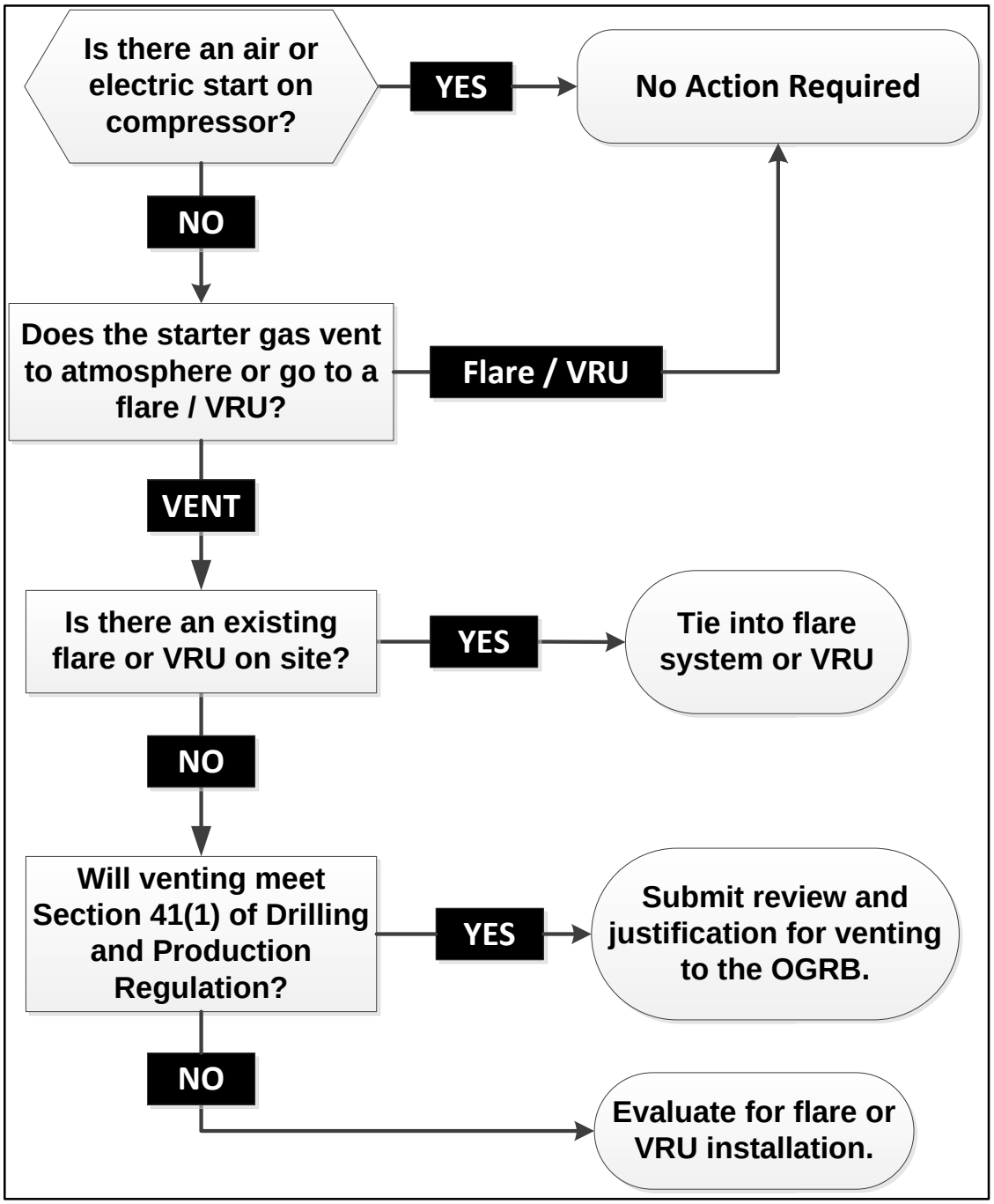
For new facility licence applications where natural gas is being utilized as the motive force to start compressors, the starter discharge vents must be connected to a flare system.

Alternatively, the gas must be conserved through an expansion vessel and a vapour recovery system if one is proposed at the facility unless there is acceptable rationale provided.

Reviews must be submitted as a separate document to the OGRB's COO upon request.

Licensees and applicants can follow the Compressor Start Gas Discharge Decision Tree (Figure 7.3) to assist in reviewing compressor start gas discharge.

Figure 7.3 Compressor Start Gas Discharge Decision Tree



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 56.

CHAPTER 8: SULPHUR RECOVERY REQUIREMENTS

Some facilities may have significant sulphur emissions originating from combustion of sour gas (by flaring, incinerating, or use as fuel gas); low-pressure produced water flash-gas; and flaring of glycol dehydrator vent gas. Appropriate pollution prevention measures must be implemented in such situations to minimize sulphur emissions associated with combustion of sour or acid gas.

Gas plants processing or discharging into the environment more than two tonnes per day of sulphur may be required to implement sulphur recovery.

CHAPTER 9: INCINERATION EVALUATION

Where incinerator evaluation is required, decisions to use an incinerator or a flare stack should consider the following:

- Air quality—including the potential to exceed air quality objectives for sulphur dioxide and the potential for black smoke emissions.
- Results of consultation with the landowner and residents within the consultation radius.
- History of public flaring concerns and historical activity levels in the area.
- Quantity and duration of flaring being proposed.
- Visibility of flare to area residents, communities and major highways.
- Noise considerations, based on the best available technology operating within manufacturers recommended flow rates. Flares and incinerators should comply with the noise limits established in the British Columbia Noise Control Best Practices Guideline[11].
- Any other relevant factors.

[11] BC Oil and Gas Commission. March 2009. British Columbia Noise Control Best Practices Guideline. https://www.bcogc.ca/node/8152/download.

9.1 Minimum Residence Time and Exit Temperatures

Any requirements regarding minimum residence time or exit temperature contained in the licence approval will take precedence over the following recommendations:

1) Incinerators should provide a minimum residence time (calculated between the top of the final burner and the stack exit) of 0.5 seconds at maximum flow rate or greater as required for complete combustion of heavier gases.
   a. Incinerators must be operated without an exposed flame.
   b. If the gas contains less than 1 mole percent H_2S and the unsupplemented heating value of the gas is 20 MJ/m^3 or greater, no minimum residence time is required.
2) Incinerators should operate with a minimum exit temperature of (measured within one stack diameter of the exit) of 600°C.
   a. For combustion of gases with greater than 1 mole percent H_2S, the facility should be designed to automatically shut down if the exit temperature of the incinerator drops below 600°C.
   b. For combustion of gases with greater than 5 mole percent H_2S, the incinerator should also be equipped with process temperature control and recording.
      i. Equipment and controls design information must be provided to the OGRB upon request.
3) Operating limits and procedures must be provided to the OGRB upon request.
4) Any licensee using incinerators must be able to provide details about the conversion efficiency of the equipment.
5) If conversion efficiency is less than 99 percent, the incinerator will be considered to operate as a flare and must meet all requirements for flares.

CHAPTER 10: MEASUREMENT AND REPORTING

The following requirements for measuring and reporting volumes of gas flared, incinerated, or vented are in addition to requirements specified in the *Oil and Gas Drilling and Production Regulations*.

1) Licensees of oil and natural gas production and processing facilities must report volumes of gas greater than or equal to 0.1 10^3m^3/month (adjusted to 101.325 kPa (absolute) and 15°C) that are flared, incinerated or vented.

2) Gas that is used for pilot, and purge or blanket gas must be reported as either flared or vented. Process gas used to operate instrumentation or as power gas to drive chemical pumps must be included as vented gas. Dilution gas is to be reported as fuel gas.

3) All flared and vented gas must be reported as follows:

Type	Reporting Criteria	Report as
Incinerated gas	An incinerator is used in place of a flare stack.	Flared gas
Acid gas	Acid gas streams at a gas plant that are incinerated or flared as part of normal operations	Shrinkage. Note: NOT to be reported as flared gas.
Fuel gas	Used to operate a flare stack for pilot purposes.	Flared gas. NOTE: NOT to be reported as fuel gas.
Dilution gas	Gas used to maintain a minimum heating value of the flared or incinerated gas.	Fuel gas. Note: The reported total flare volume MUST EXCLUDE any of these fuel volumes.

4) Fugitive emissions are considered a part of shrinkage.

   Note: Fugitive emissions are NOT to be reported as flared or vented gas.

5) Licensees must be able to demonstrate that volumes of gas are determined in an accurate and reliable manner. Licensees must have written documentation detailing the methodology used to determine flared, incinerated and vented volumes for all of their wells, pipelines and facilities, and that documentation must be readily available for review by an official.

6) The OGRB recommends that licensees meter total flare streams in larger oil batteries and gas facilities, pipeline facilities, and gas processing plants where there could be multiple connections to the flare system from sources such as process

equipment, storage tank vents, pressure-relieving valves, manual blow-downs, and emergency vent valves—even when the volume is less than 0.5 10^3m^3/d on an annual average.

7) For gas-well gas tied into an oil battery, or solution-gas tied into a gas facility, the licensee must report all flared, incinerated, or vented gas on a single production statement for the battery/facility.

10.1 Metering Requirements and Guidelines

Meters designed for expected flow conditions and range must be used to measure the following flare and vent streams:

- Continuous or non-routine flare and vent sources at all oil and gas production and processing facilities where annual average total flared, incinerated, and vented volumes per facility exceed 0.5 10^3m^3/day (excluding dilution gas). Vent sources such as compressor distance piece vents, pumps, valve controllers, and some flared sources such as pilots and purge can be estimated rather than metered.
- If all solution gas is flared or vented from production facilities, the measured produced gas (less any fuel gas use) may be used to report volumes flared or vented. In such situations, specific flare or vent gas meters are not required.
- Acid gas flared, either continuously or in emergencies, from gas sweetening systems regardless of volume.
- Any fuel gas added to acid gas to meet minimum heating value requirements or ground level ambient air concentrations where the annual average flow rate exceeds 0.5 10^3m^3/d.

Measurement uncertainty of the measured volumes must meet the criteria in Table 10.1 below.

Table 10.1: Measurement Uncertainty Requirements

Stream	Max uncertainty of Monthly Volume*	Single Point Measurement Uncertainty
Fuel gas > 500 m^3/d	5%	3%
Fuel gas < 500 m^3/d	20%	10%
Flare, incinerator or vent gas	20%	5%
Acid gas before compression		10%
Acid gas after compression		3%

Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 62

Max uncertainty of Monthly Volume

This uncertainty is applicable when the reported monthly volume is not determined solely from metered volumes. If a monthly volume is determined solely from one or more metered volume(s), then the Single Point Measurement Uncertainty requirement applies to that monthly volume.

10.2 Estimating Requirements

The OGRB will accept estimates of flared, incinerated, and vented gas if measurement is not stated as a requirement in Section 10.1 and the following conditions are met:

1) Licensees must be able to demonstrate that reliable and consistent flared, incinerated and vented gas estimating and reporting systems are in use. The OGRB recognizes CAPP's Guide for Estimation of Flaring and Venting Volumes from Upstream Oil and Gas Facilities, 2002 as containing acceptable practices for estimating.

   a. Estimating systems must account for all gas released through flaring, incinerating and venting activities at the facility (expressed to the nearest 0.1 10^3m^3/month) during routine, emergency, and maintenance operations; including depressurizing of vessels, compressors and pipelines.

   b. Volume estimates must be based on engineering calculations and be shown to meet the uncertainty requirements specified in Table 10.1.

   c. If volumes are not measured by meters, a formal system for consistently estimating and reporting these volumes must be in place.

2) Upon request, licensees must produce documentation describing estimating and reporting procedures regarding

vented and flared gas (including fuel and pilot gas); as well as related operating logs (see Section 10.4).

3) Documentation should include:

   a. simplifying assumptions,

   b. mathematical formulae,

   c. estimation methodology,

   d. details on the means used to obtain and update input data,

   e. the data handling process, and

   f. other such documents as required.

4) The OGRB may require that meters be installed where there are failures to demonstrate adequate flare or vent gas estimating and reporting systems, or if accuracy standards cannot be met.

10.3 Flared and Vented Gas Reporting

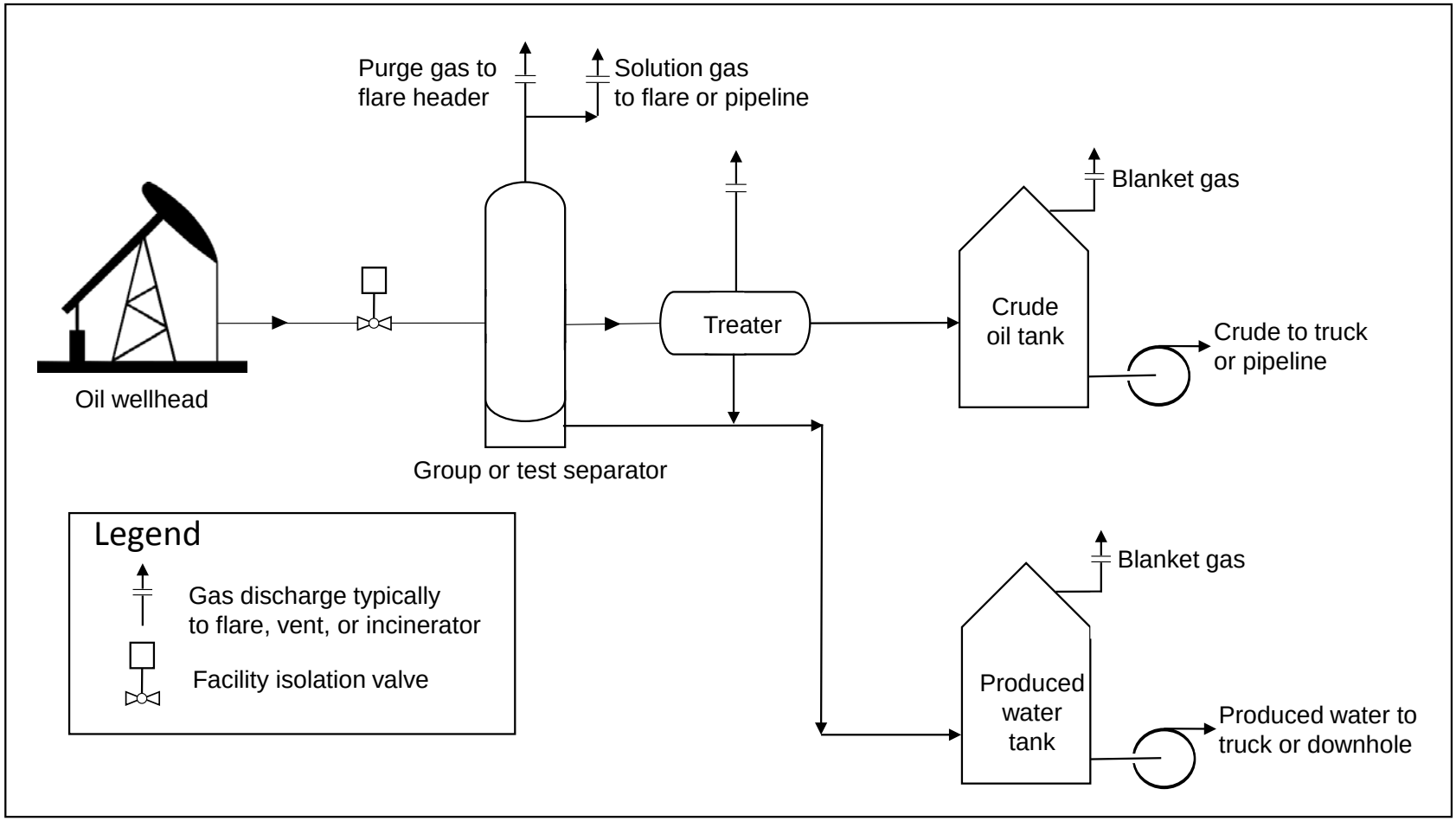
Flared and vented gas must be reported as follows:

- Flaring associated with well drilling, completions and maintenance must be reported.
- A "Well Deliverability Test Report" must be submitted for deliverability type flow tests, clean-up flows, and underbalanced drilling operations.
- All flaring and venting of gas at gas plants and associated gathering system.
- Flaring and venting from all other facilities, compressors, pipelines, and gas gathering systems.
- When well test flaring is in excess of 50 mol/kmol H_2S (5%), licensees must complete volume reporting requirements as outlined in the well test approval.
- For flaring and incineration resulting from under-balanced drilling operations, gas volumes should be reported as net volumes (i.e. gas produced minus gas injected). Similarly, flared gas rates should be representative of net gas obtained near the end of drilling operations.
- Incinerated gas must be reported as flared gas if an incinerator is used in place of a flare stack. This would not apply to acid gas streams at a gas plant that are flared or incinerated as part of normal operations. In these cases, the flared or incinerated

acid gas would be reported as acid gas shrinkage, not flared gas.

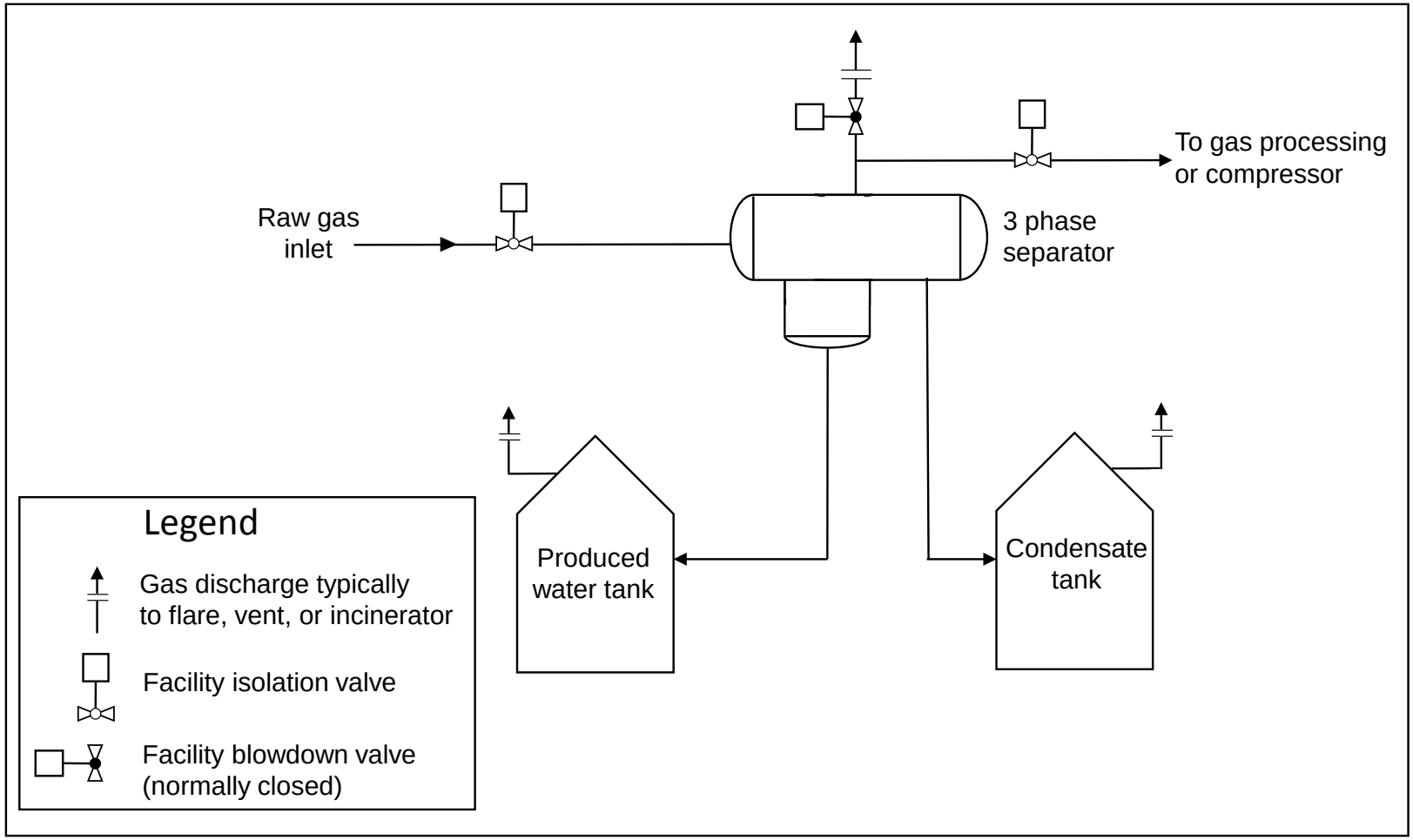
- The licensee must report all flared or vented gas at the associated reporting facility.
- It is recommended operators produce a “Quality Assurance and Control Manual” that includes policies, procedures and an execution plan to ensure measurement data is properly generated, collected and reported to the necessary parties.

Figure 10.1: Reportable Flaring Streams – Upstream Oil Battery



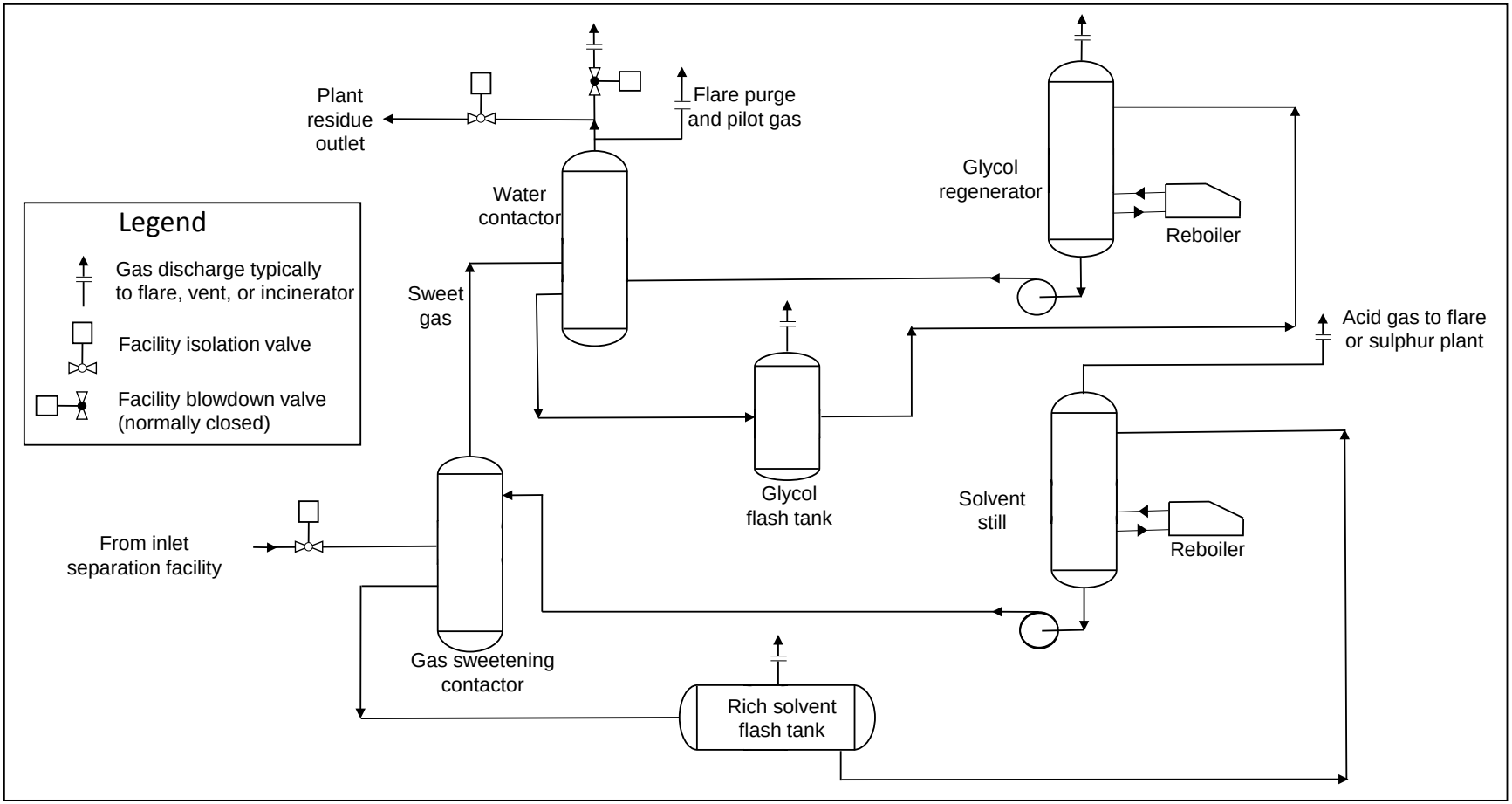
Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 64

Figure 10.2: Reportable Flaring Streams – Inlet Separation Facility



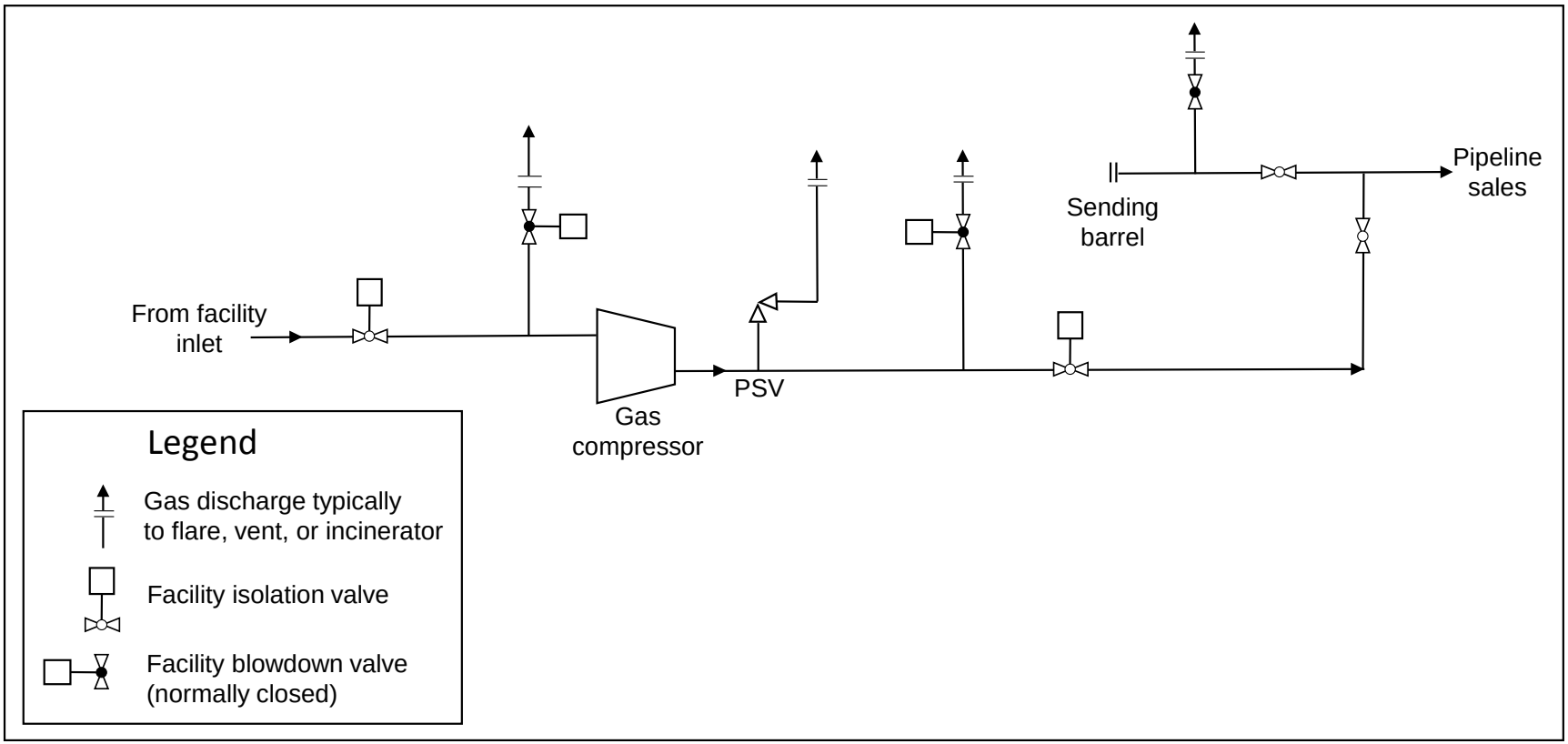
Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 64

Figure 10.3: Reportable Flaring Streams – Gas Processing Plant



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 65.

Figure 10.4: Reportable Flaring Streams – Gas Compression Facility



Source: BC Oil and Gas Commission. May 2018. Flaring and Venting Reduction Guideline Version 5.1: May 2018. p. 65.

10.4 Flaring and Venting Records (Logs)

Licensees must maintain a log of flaring and venting events and respond to public complaints.

Logs must include information on complaints related to flaring and venting events and how these complaints were investigated and addressed. In addition to the information required below, they must at a minimum include:

- Complainant name and contact information.
- Company representative assigned to investigate.
- OGRB representative contacted.
- If the complaint was resolved.

Logs must record the following:

- Each non-routine flaring and venting incident.
- The reason it occurred.
- Any changes implemented to prevent future non-routine events of a similar nature from occurring.

Logs must include:

- Date and time.
- Duration (in hours).
- Gas source or type (e.g. sour inlet gas, acid gas).
- Volume for each incident and how the volume information was derived (estimated or metered).

Logs must be signed and the name printed legibly by the facility licensee's representative and kept for a minimum of 12 months.

Flaring and venting records (logs) must be made available to the OGRB upon request for each pipeline and facility where flaring and venting occur.

Licensees may retain logs for remote or semi-attended facilities at a central location (e.g. the operator regional office) where public complaints related to the facility in question would normally be received.

DEFINITIONS

Clustering

The practice of gathering the solution gas from several flares or vents at a common point for conservation.

Conservation

The recovery and redirection of gas—that would otherwise be vented or flared at an oil or gas facility—for other useful consumption including: fuel for production facilities; power generation, sales, and beneficial injection into an oil or gas pool.

Emergency shutdowns or plant upsets

Unplanned events at the battery site or at facilities downstream of the battery that cause non-routine flaring at the battery.

NPV

The NPV is defined as a the sum of discounted, annual, before-tax cash flows for the economic life of the solution gas conservation project, where each annual before-tax cash flow is net of that year's conserving project capital investment, if any.

Repeat non-routine flares

Recurring events of similar cause at a conserving facility during a 30-day period.

Site

A single-surface lease (pads counted as one lease) where gas is flared or vented.

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