Upstream Petroleum Industry Flaring Guide

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1 Introduction

Guide 60: Upstream Petroleum Industry Flaring Requirements, introduced by Alberta Energy and Utilities Board (EUB) *Interim Directive* (ID) *99-6*, sets out Alberta requirements and expectations for upstream petroleum industry flaring. It incorporates the recommendations made to the EUB in June 1998 by the multistakeholder Clean Air Strategic Alliance (CASA) on associated or solution gas flaring,[1] as well as additional requirements to address flaring issues not covered by the CASA report.

1.1 What's New?

The following is a summary of the requirements of the management framework introduced by this guide:

- A firm provincial **solution gas** flare volume reduction schedule:
  - 15 per cent reduction from 1996 baseline by 31 December 2000 (reduce flaring to 1445 10^6m^3/year)
  - 25 per cent reduction from 1996 baseline by 31 December 2001 (reduce flaring to 1275 10^6m^3/year)
- New flare performance requirements for **all** flares, including the following compliance deadlines:
  - all new flares by 1 January 2000
  - existing solution gas flares by 31 December 2002
  - flares at other existing permanent facilities by 31 December 2004

Required evaluation of all solution gas flares by 31 December 2002 using a flaring management decision tree, including a streamlined common economic assessment process.

- Commencing 1 January 2000, the reduction of the New Oil Well Production Period (NOWPP) flare limit set out in Informational Letter (IL) 87-9[2] to 300 10^3m^3/month from 500 10^3m^3/month, implementation of a maximum gas oil ratio (GOR) criterion of 3000 m^3/m^3, above which conservation would be required, and tie-in of development wells within one month in pools where gas conservation exists.
- Personal consultation and public notification requirements for new and existing solution gas batteries

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1 Management of Routine Solution Gas Flaring in Alberta, CASA, June 1998.

2 *IL 87-9: Revised Procedures for Oil Production Allowable Controls and New Oil Well Production Period*, EUB, 1997.

- Requirements for flaring at normally conserving facilities during planned or emergency flaring, effective 1 January 2000

- Sulphur recovery requirements for facilities outside the scope of EUB *IL 88-13*[3] and the related report ERCB-*AE 88-AA*[4]

- Clarified flaring and venting reporting requirement for all facilities

Other important aspects addressed in the guide include

- Conflict resolution process to address flaring concerns

- Release of flaring and venting (S-2) data to support increased use of otherwise flared gas

- Progress towards minimizing requirements for electricity generators using otherwise flared gas

- Annual EUB reporting of industry performance

- Management framework review in 2001

The following table summarizes some key implementation and compliance dates.

Implementation and Compliance Dates		
Item	**Effective Date**	**Compliance Date**
Solution Gas Reduction Schedule		
15% from 1996 baseline	1 January 2000	31 December 2000
25% from 1996 baseline	1 January 2000	31 December 2001
Reduced NOWPP Flare Limit; GOR Limit; Development Well Tie-in	1 January 2000	1 January 2000
Flaring at Conserving Facilities	1 January 2000	1 January 2000
Evaluation of SG Flares/ Compliance with Flare Performance Requirements		
New Flares	1 January 2000	1 January 2000
Existing Solution Gas Flares	1 January 2000	31 December 2002
Other Existing Flares	1 January 2000	31 December 2004
Consultation and Notification		
New Flares – revise G-56	1 January 2000	1 January 2000
Existing SG Flares – residents within 500 m	1 January 2000	31 December 2000
Review Management Framework	31 March 2001	N/A

[3] *IL 88-13: Sulphur Recovery Guidelines Gas Processing Operations*, EUB, 1988.

[4] *Report No. ERCB – AE 88-AA: Sulphur Recovery Guidelines for Sour Gas Plants in Alberta*, EUB, 1988.

1.2 Background

Repeated concerns about flaring prompted the EUB in 1990 to support flaring research by the Alberta Research Council (ARC) to evaluate the technology used to flare gas. The ARC research[5] suggested that the destruction efficiency of flare stacks used to dispose of solution gas is not as high as originally thought, and it reported a variety of compounds of concern being emitted as a result of incomplete combustion. In concert with the research, the EUB also initiated a review of its policies respecting solution gas conservation[6] that included provision for several regional multistakeholder consultations.[7]

The Canadian Association of Petroleum Producers (CAPP) proposed that the issue of flaring be reviewed by a multistakeholder team sponsored by CASA. The team chose to focus on routine solution gas flaring, which represents about 70 per cent of the total gas flared in Alberta. The recommendations to CASA were ratified by members of industry for implementation, and the EUB received CASA's recommendations in June 1998. Since then the EUB has worked with CAPP, the Small Explorers and Producers Association of Canada (SEPAC), the Alberta Department of Resource Development (ADRD), and Alberta Environment to build on the framework recommended by CASA to improve the management of all flaring sources.

While this guide is specific to flaring, the EUB recognizes public expectations are to reduce emissions in general. In this regard, the EUB plans to streamline the collection and dissemination of relevant industry emission information in management of these substances.

1.3 Flare Management Framework

CASA recommended a policy objective hierarchy for flaring. The hierarchy can be summarized as eliminate flaring, reduce flaring, and improve the efficiency of flares. The EUB supports the objective hierarchy and believes it provides an appropriate foundation for flare management into the future.

CASA also recommended a flare management framework that strives for eventual elimination of routine solution gas flaring and includes significant short- and long-term targets for flare reductions. It recognized that in some circumstances flaring will be necessary and therefore recommended a suite of flare performance requirements. It is also recommended that the associated regulatory aspects of the recommended framework include public involvement, monitoring, and enforcement. The EUB has adopted the framework to encompass flaring in general. Figure 1 provides an overview of the management framework.

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5 *Investigations of Flare Gas Emissions in Alberta*, Alberta Research Council, November 1996.

6 *IL 96-6: Solution Gas Conservation and Emissions Reductions*, EUB, April 1996.

7 *EUB Report 97-A: Policy Review of Solution Gas Flaring and Conservation*, EUB, June 1997.

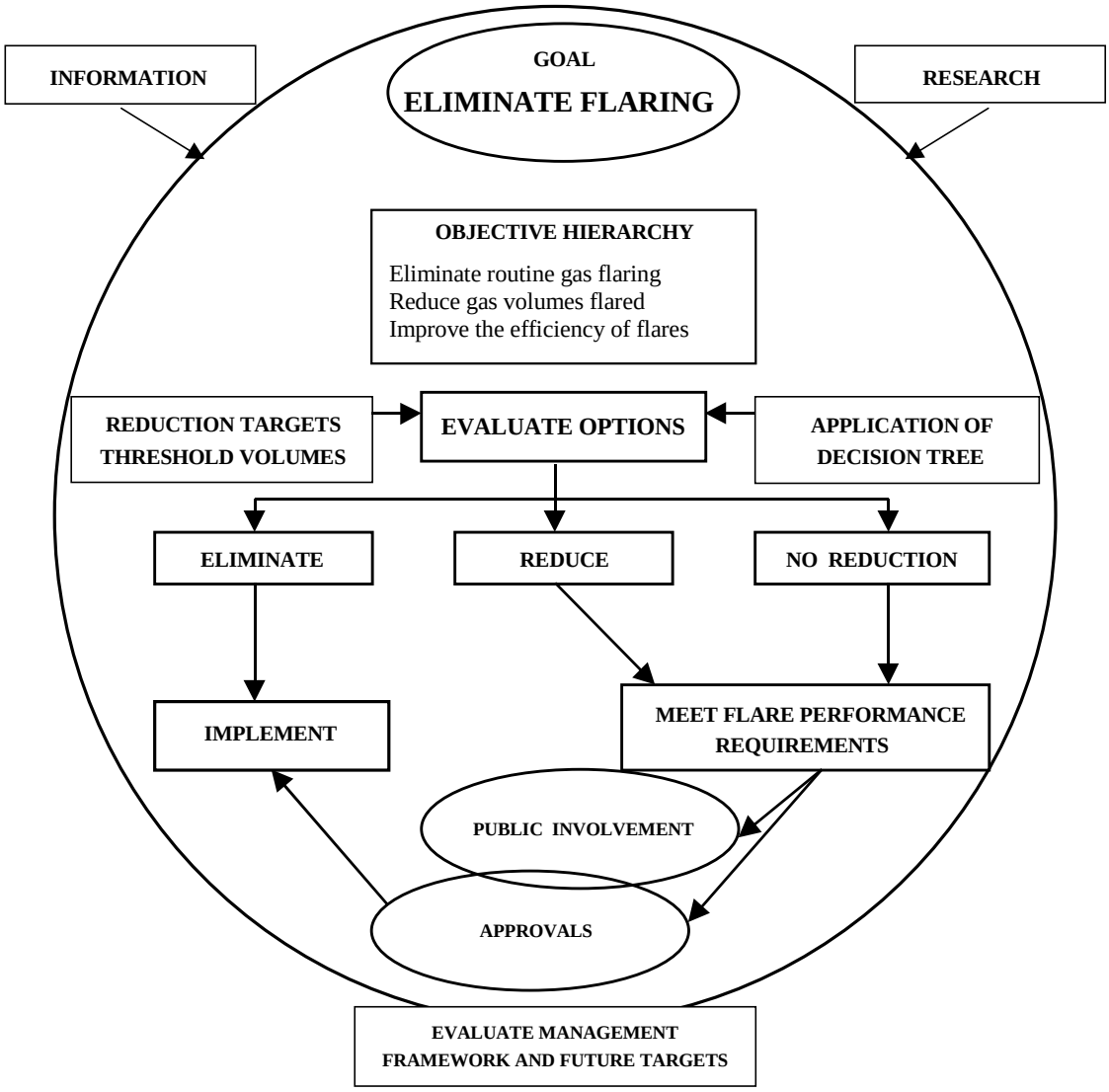

Figure 1. Flaring Management Framework

1.4 Flaring Management in Alberta

Flaring is associated with a wide range of energy activities or operations, including

- oil, oil sands/crude bitumen, and gas well drilling
- initial oil, oil sands/crude bitumen, and gas well completion or servicing clean-up flow-backs
- gas well testing to establish reserves and determine productivity

- disposal of gas associated with oil or oil sands/crude bitumen production while gas conservation is being evaluated and implemented

- non-routine gas gathering, distribution system operations, maintenance pressure relief, reduction

- non-routine processing plant upset or emergency conditions

All emissions are subject to regulatory controls. In Alberta, air quality guidelines[8] are established and set out for all facilities by Alberta Environment. For larger facilities such as sour gas plants, the administration of emission requirements is shared between Alberta Environment and the EUB. The EUB administers requirements for flaring at smaller facilities, including oil batteries.

The guidelines set out acceptable ambient levels of various substances, including hydrogen sulphide (H_2S) and sulphur dioxide (SO_2) contaminants commonly associated with oil and gas production. The limits established in the guidelines are to provide suitable levels of safety and environmental protection. The Alberta Ambient Air Quality Guidelines are listed on Alberta Environment's Web site, www.gov.ab.ca/env.

Notwithstanding the objectives of the existing air quality guidelines, acceptable ambient limits have not been established for many of the compounds measured by the ARC research. Development of ambient air guidelines is a process involving considerable scientific study and extensive consultation among the federal and provincial governments and other stakeholders.

The EUB accepts the framework recommended by CASA to reduce provincial flare emissions, coupled with improved flare performance standards as a practical approach to reduce the overall level of solution gas flaring.

1.5 Ongoing Research

CASA suggested that additional research needs to be undertaken so that Alberta can progress towards the use of practical flare efficiency standards where flaring is necessary.

The EUB notes that some of the necessary research is already under way under the auspices of the Petroleum Technology Alliance of Canada, with several federal and provincial departments participating, along with industry operators and technology suppliers. Some of the multiyear research, at a cost of about $1.4 million, is aimed at the development of an effective combustion efficiency standard for flaring, including practical means to measure combustion efficiency in the field. The development of technologies to improve flaring performance and to identify alternative uses of solution gas is also being investigated.

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8 Alberta Ambient Air Quality Guidelines, Alberta Environment, www.gov.ab.ca/env

1.6 Regulations Changes

The changes described in this guide will require some revisions to the regulations. The EUB will proceed to make the necessary changes to reflect the requirements for upstream flaring as described in this guide in due course.

IL 91-2: Sour Gas Flaring Requirements and Changes to Regulations **and** ***IL 96-6: Solution Gas Conservation and Emissions Reduction*** **are rescinded.**

1.7 Access to Production and Flaring (S-2) Data

The EUB will make flaring and venting information available to facilitate evaluation of solution gas conservation and clustering opportunities, as described in Section 2.9.2.

1.8 Future Review and Changes

CASA recommended that effectiveness of the new framework be revisited in the second quarter of 2001, particularly the reduction schedule, as well as progressing towards a flare combustion efficiency standard. The EUB supports this concept as a matter of continuous improvement and will initiate the review at that time to assess the new framework, including progress against the firm targets as well as reduction targets for subsequent years.

1.9 Definitions

Appendix 1 defines terms as used in the context of this guide.

As well, in this guide the words **required, shall,** and **must** are to be interpreted to mean that the specified action or item is a minimum regulatory requirement.

2 Solution Gas Management

2.1 Schedule of Reducing Routine Solution Gas Flaring

Through the report of the CASA flaring project team, the oil and gas industry agreed to reduce routine solution gas flaring as measured against the 1996 baseline of 1700 10^6m^3/year as follows:

- a 15 per cent reduction in aggregate annual volumes flared by 31 December 2000 (i.e., reduce solution gas flaring to 1445 10^6m^3/year)

- a 25 per cent reduction in aggregate annual volumes flared by 31 December 2001 (i.e., reduce solution gas flaring to 1275 10^6m^3/year)

If the reductions are not met, the EUB intends to impose the reductions by regulation.

Based on 1996 flare volume information, the reductions would be attained by restricting flare sizes as follows:

- No solution gas flares larger than 2500 x 10^3m^3/yr (6.8 10^3m^3/d) would be allowed by 31 December 2000.

- No solution gas flares larger than 1500 x 10^3m^3/yr (4.1 10^3m^3 /d) would be allowed by 31 December 2001.

The EUB expects that all operators, in particular those operating facilities with larger solution gas flares, will aggressively pursue other options for the management of their associated solution gas.

The EUB notes that CASA also recommended targets for reductions in solution gas flaring beyond 2001:

- 40-50 per cent reduction in volumes flared by 31 December 2003
- 60-70 per cent reduction in volumes flared by 31 December 2007

The corresponding maximum flare sizes for these reduction targets are

- 700 x 10^3m^3/yr 40 per cent
- 500 x 10^3m^3/yr 50 per cent
- 350 x 10^3m^3/yr 60 per cent
- 250 x 10^3m^3/yr 70 per cent

However, CASA agreed that it would be prudent to review these targets after the initial reductions were accomplished.

The EUB plans to revisit its flaring requirements in the second quarter of 2001.

The EUB agrees that achieving these further reductions will require vigilance and industry cooperation to reduce regional flaring and to successfully introduce alternative technologies, such as electricity generation. It also agrees that further deregulation and restructuring of the electrical industry will assist in attaining these longer-term targets. Sections 2.5.5 and 2.8 discuss these matters further.

2.2 Objective Hierarchy

CASA recommended that the EUB adopt a policy objective hierarchy to guide solution gas flare management in Alberta:

1) eliminate routine solution gas flaring
2) reduce volumes of gas flared
3) meet the flare performance standards

The EUB believes these objectives are consistent with its intent to optimize resource conservation and ensure appropriate levels of environmental protection and accepts CASA's recommendation.

2.3 Evaluation of Solution Gas Flares

As noted above, the objective for solution gas flaring management will be the elimination, reduction, and the improvement of the efficiency of flaring.

In order to accomplish these objectives, the EUB has adopted a decision tree process to be used by operators as a means for implementing the objectives for gas flaring management. The decision tree is shown in Figure 2.

Operators must use the decision tree to assess new flares.

All existing solution gas flares must be evaluated using the decision tree by 31 December 2002.

Flares with residents within 500 metres (m) must be evaluated and brought into compliance with the flare performance requirements by 31 December 2000.

An existing solution gas flare with a demonstrable life expectancy of less than three calendar years would be exempt from the need for compliance with the flare performance requirements detailed in Section 7. Operators subsequently wishing to continue operations at these facilities will be required to cease operations until the facility complies with the requirements of Section 7.

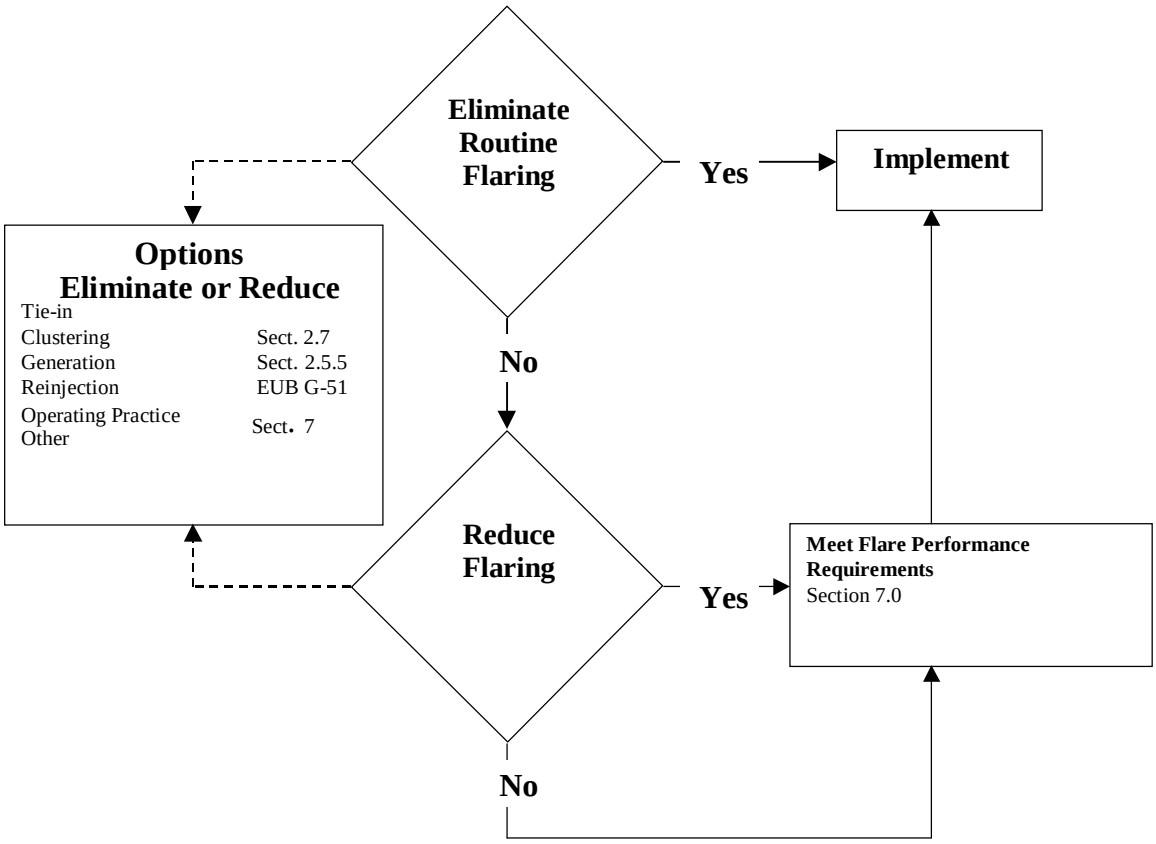

Figure 2. Flaring Management Decision Tree

Using the decision tree, an operator would first assess conservation of solution gas by tie-in to a gathering system, followed by other options such as reinjection and other economic technical options to eliminate flaring. Economic, social, and environmental factors would be considered in this evaluation.

If conservation is determined to be economic by any method using the economic decision process detailed in Section 2.4, the EUB requires that the gas be conserved.

The methods include conventional conservation projects, power generation, or any other alternative method that may become available.

If flaring cannot be eliminated, the operator would then consider alternatives for minimizing the volumes of gas that are flared, such as the generation of electricity.

Remaining flares must meet the flare performance requirements detailed in Section 7.

Venting is not considered an acceptable alternative to flaring.

In all applications and evaluations of the need to flare, the following basic questions would be applied to the assessment:

- Are there residents in proximity?
- Are there directly affected (local) residents with environmental or health concerns?
- Are there economic alternatives to flaring?
- Would clustering of flares create an economic project?
- Are the environmental impacts of eliminating or reducing flaring greater than the environmental benefits?

Section 2.4 details the economic analysis process and criteria required by the decision tree assessment.

Records of the assessments shall be available for audit by the EUB upon request.

2.4 Economic Decision Process

2.4.1 Streamlined Evaluation

In order for the results of the decision tree analysis to be consistent, it is necessary to define the parameters to be used in a streamlined economic evaluation. This will apply to the decision tree analysis of all solution gas conservation projects that may involve existing or new flares. The decision tree analysis is outlined in Section 2.3.

2.4.2 Process

The following assumptions and parameters will be used in the decision tree analysis:

1) The evaluation will be a before-tax analysis.

2) The commodity price forecasts used in evaluations of conventional gas conservation projects (gas gathered, processed, and sold to market) will be the most recently published by Dobson Resource Management. In Dobson's survey, the average nominal large consulting firms' Alberta plant gate TCGSL " blended " price (C$/MMBTU) for natural gas will be used in evaluations. TCGSL is the Transcanada Gas Services blended price at plant gate. The forecast used for natural gas liquids will be the average nominal large firms' consulting price FOB Edmonton in C$/BBL. The forecasts are available in Dobson's publication *Survey of Hydrocarbon Price Forecasts Utilized by Canadian Petroleum Consultants and Canadian Banks*, which is updated semiannually and available at a nominal cost per publication. The publication is also available in the EUB Library.

3) The power price forecast for electrical power generation projects will be the time-weighted average of the previous twelve months paid by the Alberta Power Pool for power generated or the cost of the power displaced at a site. The power price will be

escalated at the annual rate of inflation.

4) The operator will provide information to support the calculation of remaining reserves and to establish the production forecast. This would include planned drilling programs and the implementation of pressure maintenance schemes.

5) The operator will give a detailed breakdown of capital costs, showing equipment, material, installation, and engineering costs. Capital costs will be AFE (approved for expenditure) quality numbers. Capital costs incurred prior to the initiation of the solution gas project (sunk costs) will not be included in the analysis. Only future capital costs related to solution gas conservation will be included.

6) The incremental annual operating costs for the solution gas project will be equal to 10 per cent of the capital cost to initially install the facilities. The 10 per cent includes incremental expenses to operate equipment and gas transportation and gas processing fees.

7) The incremental annual operating costs for power generation projects will be equal to 10 per cent of the capital cost to initially to install the generation facilities. Standby fees would be in addition to the 10 per cent allowance.

8) The long-term inflation rate will be based on the Consumer Price Index forecast, which is available from the same table in the Dobson's Survey used for natural gas prices. A constant rate of 2.5 per cent will be used for 1999.

9) The discount rate will be equal to the prime lending rate of the Alberta Treasury Branch on loans payable in Canadian dollars plus 3 per cent based on the month preceding the month that the evaluation is conducted. The discount rate will be reviewed periodically by ADRD/EUB and will be revised if the cost of capital for the oil and gas industry changes significantly.

10) Only revenue, minus net royalties, from incremental gas and gas by-products that would otherwise be flared will be included in the economic evaluation.

11) A project will be considered economic if the incremental economics of solution gas conservation generates a net present value (NPV) greater than zero.

When evaluating flares, the economic evaluation must account for any cost savings, such as reduced trucking, equipment rental, and operator costs, resulting from the conservation project.

Should an operator determine that to eliminate flaring either by solution gas conservation or reinjection is uneconomic, a comprehensive report must be available for audit. The report must incorporate the preceding information and provide sufficient detail to allow the results to be verified.

2.5 Approvals

2.5.1 Energy Facility Development Approvals

EUB *Guide 56* details administrative and technical requirements for facilities handling solution gas. CASA recommended several modifications to the facility application process and requirements as noted in the following subsections.

With the issuance of this guide, the EUB is confident that flares will receive additional attention during the facility development approval process. The next version of *Guide 56* will specifically reference flaring requirements. The EUB is satisfied, however, that in view of the specific requirements described in this document, modification of the application form is not necessary at this time.

2.5.2 Personal Consultation and Public Notification

2.5.2.1 New Facilities

For new facilities, the personal consultation and public notification requirements specified in *Guide 56* continue to apply. The minimum personal consultation distance specified in *Guide 56* for sweet single oil wells with flares is increased to 300 m, effective 1 January 2000.

Longer distances may be necessary as a result of emergency planning or public consultation requirements. See *Guide 56*, Volume 2.

In addition to existing information requirements, information specific to flaring, including the material outlined in Section 2.5.2.3, is required for the personal consultation and public notification.

2.5.2.2 Existing Facilities

For existing solution gas flares, operators must notify residents within 500 m of existing flares of the results of the decision tree evaluation conducted for the flare by 31 December 2000.

An information package specific to flaring, including the material outlined in Section 2.5.2.3, is required for the public notification.

2.5.2.3 Information Package

The CAPP publication *Recommended Practices for Flaring of Associated and Solution Gas at Oil Production Facilities* has an information template that may be used as an informational package for this purpose; a company may also develop its own package**. As a minimum, however, all informational packages must include the following key items:**

- Definition of solution gas and information on its conservation and use
- Explanation of the flaring management decision tree process
- Information on general flare performance requirements and reduction targets
- Discussion of options available for managing solution gas and other flaring
- Results of the flaring management decision tree evaluation for the specific flaring at the site in question
- Description of specific actions the company will be taking to eliminate, reduce, or improve the efficiency of the specific flare based on the evaluation
- Description of the EUB's process for facility approvals and *Guide 56*
- Information about individual rights to object and the process for doing so
- List of industry, EUB, and government contacts

2.5.3 Conflict Resolution Process

As outlined in Section 2.3, the operator using the decision tree must evaluate all existing flares. Upon completion of the evaluation of a flare, the operator must give specific notice, including the results of the evaluation to all residents within 500 m of the flare. The notification must give clear statements of what the operator will do with the existing flare as the result of the decision tree evaluation.

In normal circumstances, operator compliance with the flare performance requirements of this guide would satisfy the EUB that health, safety, and environmental impacts have been adequately addressed. However, there may be extenuating circumstances that give rise to landowner concerns with the operation of a flare stack. In this event, if the landowner, resident, or occupant has an objection with respect to the evaluation or the proposed continued operation of the flare, the following process will be used to resolve the objection:

1) The resident will notify the operator and/or the appropriate EUB Field Centre in writing that they have an objection to the flare and the reason for the objection to the flare.

2) The person or persons filing the objection and the operator will try to resolve the matter themselves.

3) If after a reasonable time and after reasonable attempt, the objection is not resolved to the satisfaction of all parties, they may request assistance from the appropriate EUB Field Centre to facilitate further discussions with the objective of resolving the concerns. This would include a review of the evaluation conducted on the flare by the operator (in coordination with EUB Operations Group staff), full documentation of the landowner's

concerns, discussion of solutions utilized in other locations, and clarification of regulatory requirements and procedures as necessary.

4) If this process does not resolve the flare objection to the satisfaction of all parties, EUB staff will refer the objection to the Board for review.

5) The Board will review the matter. The EUB's normal procedures and rules would apply.

6) The Board will issue a decision on its review and direct a resolution.

2.5.4 Reduction to New Oil Well Production Period (NOWPP) Flaring Limits, Early-Time Flaring in Development Wells, and Flaring at High GOR Wells

Production from most new oil pools is initially governed by a maximum rate limitation (MRL). Limits to oil and solution gas production are imposed until the operator and the EUB have agreed on an optimum pool depletion strategy. Solution gas conservation is also required before oil rate limits are removed, unless the operator can show that it is uneconomic. The MRL restrictions are relaxed during the initial few months of a well's production, defined as the new oil well production period (NOWPP). During NOWPP, as described in *IL 87-9,* gas oil ratio (GOR) penalties are not applied, but there is a gas flaring limit of 500 10^3m^3/month/well. Once the optimum depletion strategy for an oil pool has been agreed to and implemented and gas conservation issues have been resolved, an oil pool usually goes on good production practice (GPP). Under GPP, oil rate restrictions and GOR penalties are removed.

In order to reduce early-time solution gas flaring from oil wells, the following policy and regulatory changes will be implemented by the EUB on 1 January 2000:

1) Development wells, completed in pools where gas conservation exists, must be tied in to the gas gathering system within one month. This should allow sufficient time for cleanup and evaluation of the well. It is unlikely that infill wells would require an evaluation period beyond a few days. Step-out wells from existing oil pools may require several more days of evaluation, but this period should not reasonably exceed one month. This requirement applies to all oil wells, whether completed in pools on GPP or in pools subject to an MRL. Operators should ensure that drilling programs in and adjacent to existing conserving pools include measures for implementing gas conservation within the one-month period or be prepared to shut in the well(s) until the gas is tied in.

2) Oil wells with a GOR greater than 3000 m^3/m^3 must be shut in until the gas is conserved. This applies to all oil wells.

3) NOWPP flare gas limits must be reduced from 500 10^3m^3/month/well to 300 10^3m^3/month/well. This applies to wells completed in oil pools subject to an MRL. Note that the above development well and GOR requirements supersede this NOWPP flaring limit. In addition, this new NOWPP flaring limit supersedes the 500 10^3m^3/month/well given in *IL 87-9*.

2.5.5 Electricity Generation Using Otherwise-Flared Gas

One of the ways to eliminate or reduce solution gas flaring is to use waste gas to generate electricity. Although a relatively new technology, micro-turbines are now available to utilize waste natural gas to generate electricity.

A review of the EUB approval process for electrical generation systems that produce less than 2.5 megawatts (MW) is currently under way and will be completed in 1999.

Depending on the generation capacity of the installed engines, approvals issued under the *Environmental Protection and Enhancement Act* (*EPEA*) by Alberta Environment may be required. Power generation facilities with capacity greater than 1.0 MW require an *EPEA* approval.

Companies will be required to report solution gas volumes used to generate electricity to the EUB Utilities Division.

Section 2.8 provides additional information respecting royalty treatment of solution gas to be used to generate electricity.

2.6 Flaring at Conserving Facilities

Non-routine solution gas flaring is any planned or emergency event that results in additional flaring beyond the normal flare volumes at a gas conserving battery. Non-routine flaring may result during upsets or maintenance and repairs at the battery or the downstream pipelines and solution gas plant. The requirements of Sections 2.6.1 and 7 apply to non-routine flaring.

The EUB notes that in certain areas of the province, local emission reduction practices already meet or exceed those detailed in this section. The EUB expects that in those specific instances the current practices would prevail, pending the future review planned for 2001.

2.6.1 General Non-Routine Flaring Requirements

Non-routine solution gas flaring at gas conserving batteries falls under three categories, listed in Table 1: Operational Requirements for Conserving Facility Flaring. The table defines operational requirements for each shutdown type as a function of flaring incident duration.

The requirement for reduction of inlet volumes for planned shutdowns will be effective 1 January 2000.

Table 1. Operational Requirements for Conserving Facility Flaring

Shutdown Category	Duration (hours)	Operational Requirements
Planned	<4	Operators will take all reasonable efforts[1] to reduce battery or solution gas plant inlet gas volumes by 50% of average daily production over the previous 30 days.
	>4	Operators will take all reasonable efforts[1] to reduce battery or solution gas plant inlet gas volumes by 75% of average daily production over the previous 30 days with the following conditions: • Solution gas may not be flared from wells that have an H_2S content greater than 10%. • Production rates will be sufficient to keep equipment operating safely and within minimum design turndown range. • Public, including residents within 500 m, interested individuals, and people sensitive to emissions at the facility, must be notified at least 24 hours before the planned flaring event. • The appropriate EUB Field Centre must be notified prior to the planned shutdown of both the shutdown and any unresolved public complaints. • The appropriate EUB Field Centre must be notified if the event meets reporting requirements identified in *IL 98-01*, Section 4.4.
Emergency[2] or Plant Upset	<4	No reduction in plant inlet is required.[1]
	>4	Operators will take all reasonable efforts[1] to reduce battery or solution gas plant inlet gas volumes by 75% of the average daily production over the previous 30 days with the following conditions: • Solution gas may not be flared from wells that have an H_2S content greater than 10%. • Production rates will be sufficient to keep equipment operating safely and within minimum design turndown range.[1] • Public, including residents within 500 m and people sensitive to flaring at the facility, must be notified as soon as practical during the flaring event. • Interested public must be notified within 24 hours of the flaring event. • The appropriate EUB Field Centre must be notified within 10 days of the flaring event of any unresolved public complaints. • The appropriate EUB Field Centre must be notified if the event meets reporting requirements identified in *IL 98-01*, Section 4.4.
Repeat Non-Routine Flaring[3]		Operators must investigate causes of repeat non-routine flaring and take steps necessary to eliminate or reduce the frequency of such incidents. • Operators must notify the EUB of unresolved public complaints regarding repeat flaring within 10 days of the complaint.

1 Notwithstanding flare gas reduction requirements listed in Table 1, if a sour or acid gas flare stack is not designed to meet Alberta Ambient Air Quality Guidelines for SO_2 as a one-hour average concentration under high rate flare conditions, then action must be taken immediately to reduce flared gas to rates such that a one-hour exceedance will not occur (see Section 7.3.4).

2 Emergency shutdowns or plant upsets are unplanned events at the battery site or at facilities downstream of the battery and causes non-routine flaring at the battery.

3 **Repeat non-routine flarings are re-occurring events of similar cause at a conserving battery during a 30-day period.**

2.6.2 Planned Shutdown (Turnaround) Considerations

A planned shutdown occurs when the operator proactively schedules maintenance and repairs at the battery or maintenance and repairs, including turnarounds, on the downstream processing facilities; this requires non-routine flaring at the battery.

Alternatives to solution gas flaring available to operators during a gas plant turnaround include

1) delivering the solution gas to a nearby gas plant that is not on turnaround

2) scheduling maintenance at the oil facilities to coincide with the gas plant turnaround

3) injecting the solution gas into the gas cap of an oil pool or into a gas reservoir and producing it back after the gas plant is back on stream — an application is required under Section 26 of the *Oil and Gas Conservation Act* and the information required varies with the proposed scheme; the issue of when royalty is paid must be raised by the operator with ADRD

4) communicating with well, battery, and gas plant operators to ensure non-routine solution gas flaring is minimized

The EUB Field Centres will consider alternatives to Table 1 where the operator can demonstrate that the shutting in of a well or a group of wells may cause permanent damage to well equipment, may cause a significant reduction in well productivity, or is impractical due to the remoteness of facilities. The operator may establish new flaring guidelines for a particular property in consultation with the EUB Field Centre.

2.6.3 Regulatory Response

The conflict resolution process described in Section 2.5.3 will be used to resolve outstanding public complaints before a planned flaring event occurs or within 30 days after the EUB is advised of an unresolved complaint due to an emergency flaring incident.

As part of facility inspections of oil batteries and solution gas plants, EUB staff will check to determine that cutbacks have been within specified guidelines, proper logs are being maintained, and the correct procedures are being used to notify residents and others, as described in Section 2.5.2.

Standard EUB enforcement processes will be utilized if operators are not taking reasonable steps to comply with this guideline.

2.7 Clustering

Clustering, or low-pressure collection, is defined as the practice of bringing several solution gas flares to a common point for conservation. Clustering may enable other technologies, such as generation of electricity, to be viable alternatives to flaring due to improved economics associated with greater volumes of available fuel gas.

2.7.1 Regional Expectations

The EUB has noticed that solution gas is sometimes flared in local areas where it could be conserved if competing operators would combine their efforts to plan a more efficient overall process and take advantage of economies of scale. The most significant impediment to this process is the tendency of operators to have regard only for their own reserves and facilities without considering the activities of others in the same region.

This narrow perspective is unacceptable to the EUB when it impacts on resource conservation or the overall amount of flaring in the area**.**

The EUB expects that if the economics of solution gas conservation can be enhanced by collaboration among companies operating in a particular area, then such cooperation will be forthcoming.

As a rule, the EUB also believes clustering of wells improves the potential for conservation and reduction of flaring. Accordingly, the EUB expects companies to develop facilities that will enhance the ultimate potential to recover the gas or reduce the flaring.

When applying the solution gas decision tree analysis, the EUB expects that operators consider if clustering of flares would create an economic project. Producers are expected to assess their own situation and to complete an area or regional assessment. It will be necessary for producers to exchange production data in order for each company to evaluate the project. The guidelines for an economic evaluation are outlined in Section 2.4.

The EUB recognizes that collaboration may lead to increased use of custom processing arrangements.

In order to facilitate the process, the EUB expects gas plant owners to negotiate reasonable gas processing fees based on the report *Joint Industry Task Force Report on Processing Fees* (JP-95)[9] and its predecessor, JP-90.

In event that commercial agreements cannot be reached, remedial action is available under the legislation upon application by an affected party.

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9 *JP-95: Joint Industry Task Force Report on Processing Fees,* Petroleum Joint Ventures Association, April 1996.

Operators producing from areas subject to existing gas conservation (GC) orders are also expected to evaluate their developments and meet the requirements of *Guide 60* if more stringent than the flare limits specified in the subject GC order.

2.7.2 Problem Areas

The EUB will be monitoring development in new oil fields and will request gas be conserved when a threshold level of reserves is reached. All operators of existing wells and any new wells drilled within a defined area will be expected to participate.

There may also be areas in the province where the EUB may decide that gas flaring will be reduced because of unique local environmental or land use sensitivities to related emissions. It is recognized that such conditions may warrant the elimination of flaring even though normal economic thresholds are not met. The EUB would expect the same level of cooperation from all producers in evaluating, installing, and fairly distributing the costs of conservation as outlined above. When it is necessary to conserve solution gas for such reasons, cost sharing for sulphur recovery at smaller facilities may be available, as outlined in Section 9.3.

It is expected that the most efficient and cost-effective methods of clustering solution gas will be used. The methods used will be technically sound and meet all pipeline and safety standards.

2.7.3 Regulatory Response

The EUB can request a producer(s) to submit information to indicate that all practical options for gas conservation have been thoroughly evaluated. If a project is economical based on the guidelines in Section 2.4 or conservation is necessary for environmental reasons, operators must conserve the gas.

The EUB may issue or revise a gas conservation (GC) order requiring all producers within a specific geographical area to conserve solution gas.

2.8 Royalty Treatment

The Alberta Government announced a program on 2 December 1998 to encourage the productive use of solution gas currently being flared. The program is summarized as follows:

- Regulatory changes will be made to provide a royalty waiver on solution gas currently being flared because it is uneconomic to conserve the gas.

- The changes are effective 1 January 1999.

- The program covers all methods of conserving or using solution gas. The generation of electricity is one of the potential productive uses for solution gas that would otherwise be flared.

- ADRD will develop criteria to ensure gas that can be economically conserved does not receive a royalty waiver.

- A review of the approval process for small-scale electrical generation installations is under way to ensure the process is simple, clear, and appropriate for the new marketplace. The review will be completed in 1999.

A separate informational letter will be issued by the ADRD to outline the details of the program and the application process.

2.9 Reporting — Data Requirements

2.9.1 S Statements

All flared and vented gas in the province is required to be reported on the S-1 and the S-2 monthly statements, as outlined in *Guide 7*,[10] Appendix 3, and as described here in Section10.1. A battery code must be obtained from the Production and Well Data Services Group of the EUB for new oil wells before any production including flaring can be reported.

The EUB is concerned with the number of oil and crude bitumen batteries that are reporting oil production with zero gas production. If wells are venting gas, this gas must be reported on the S-2 statements.

EUB business rules will be developed to ensure accuracy of flare and vented data submitted for use with existing data quality audit and enforcement protocols.

In some cases where low volumes of gas are being produced and flared, the operator may be exempt from measuring gas production (See *Guide 7,* Appendix 7). However, an operator is not exempt from providing an accurate estimate of gas production and disposition (including flared and vented gas).

2.9.2 Open Market

The CASA project team concluded that if the availability of flared or vented solution gas is made known publicly, the market may identify economic alternatives to flaring without need for government intervention.

Both regulators and individual operators need to cooperate in making available to proponents information necessary to evaluate and implement flare gas conservation or clustering projects, as discussed in Sections 2.9.2.1 and 2.9.2.2. The EUB, however, expects that parties making information requests of operators are technically qualified and have a reasonable expectation of proceeding with relevant gas conservation projects.

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[10] *Guide 7: Production Accounting Handbook,* EUB, December 1998.

Proponents of third-party flare gas conservation or utilization schemes must meet applicable EUB ownership, environmental, and safety regulations, as well as applicable technical standards and codes.

2.9.2.1 Data Required

The EUB will make available select production (S-2) data giving disposition of oil, gas, and water for crude oil and bitumen batteries, except those associated with experimental wells. Confidential information will be respected, using existing confidentiality protocols. Gas disposition information will include gas production, gas receipts, fuel gas, gas flared, gas vented, gas metering difference, and gas deliveries.

2.9.2.2 Data Access

A complete list of information that the EUB intends to release is given in Appendix 2: Monthly Battery (S-2) Information to Be Released. Electronic copies of the selected data will be made available on a monthly basis. Data will be provided for facilities with battery type codes 1-6 (oil batteries) and 12-15 (crude bitumen batteries). There will be a fee for the data, based on cost recovery for the EUB. It will be the responsibility of the interested parties to sort the data for their own needs. It is also the responsibility of the interested party to determine if the S-2 data represent a physical battery, or whether they are for a collection of single wells that are collected on paper into a single S-2 (a paper battery).

Operators of surrounding flares are expected to cooperate with qualified third parties attempting to conserve solution gas through open market or clustering efforts. Cooperation may include providing non-confidential information such as gas analysis, flared volumes, pressures, and other relevant data on a timely basis to parties studying the clustering of flared or vented gas.

Flaring data will be subject to existing S-form audit and enforcement processes.

3 Well Test Flaring

3.1 Approvals

Depending on the volume and H_2S content of gas to be flared, two separate approvals may be required.

3.1.1 Volume Criteria

Well test volumes exceeding 600 10^3m^3 require an approval from the EUB Resources Division, in accordance with *Oil and Gas Conservation* (*OGC*) *Regulation* 11.135 (1). The purpose of this criterion is to ensure appropriate conservation. The requirements set out in the *Oil and Gas Conservation Regulations* as summarized in Section 3.1.3 below must be met.

EUB *Guide 40* details minimum requirements and recommended practices for well tests to ensure appropriate information is obtained for conservation and pool management purposes. Operators are encouraged to evaluate conservation of well test gas with temporary facilities (see Section 3.3).

3.1.2 H_2S Content Criteria

Section 7.055 of the *OGC Regulations* requires that a permit be obtained to flare gas containing 50 moles of H_2S per kilomole of gas or more or for any well classified as a critical sour well. Section 15.240 summarizes the information to be submitted prior to obtaining a permit. Section 7.060 details other requirements, including required fluid analysis and public and EUB notification.

Flaring of sour gas volumes less than 600 10^3m^3 and containing less than 50 moles of H_2S per kilomole of gas may be conducted without application to or written approval from the EUB, provided the requirements set out in the *OGC Regulations* and summarized here in Section 3.1.3 are met.

See Appendix 3: Flaring Permit Application Process for the flowchart of the flare permit application process.

The requirements for acceptable air dispersion modelling of sour gas flares are listed in Section 7.4. They must be met for all well test flaring to ensure compliance with Alberta Ambient Air Quality Guidelines.

A representative of the EUB may suspend operations if it is found that an operator has not met these requirements.

3.1.3 Well Test Requirements

Flaring of gas containing less than 50 moles of H_2S per kilomole of gas may be conducted without written approval of the Board. However, the following requirements must be adhered to:

1) The technical requirements of Section 7 respecting flare stack design and operation must be met.

2) If a recent gas analysis (taken within a 12-month period) for the well is not available, an on-site H_2S analysis (conducted by Tutweiller or gas chromatography methods) must be conducted upon commencement of flaring. If the H_2S content in the gas is found to exceed 50 moles of H_2S per kilomole of gas, operations must be suspended and a written application to flare the gas must be submitted to the EUB.

3) The total volumes of gas flared, including cleanup volumes, must not exceed 600 10^3m^3 without approval.

4) Notice of flaring or cleanup must be given to the appropriate EUB Field Centre at least 24 hours in advance. Such notice must detail whom to contact in case of complaints or emergencies and provide appropriate telephone numbers.

5) Fluid volumes and fuel consumption must be recorded and reported in the normal manner on S-1, S-2, or S-8 forms.

6) Normal low-stage separation equipment is required where sour liquids are produced.

7) Liquid storage must be designed to eliminate or reduce the escape of vapours to the environment. DACC IRP 4.0[11] provides additional detailed information.

8) Identification and warning signs must be posted on lease in accordance with Section 6.020 of the *OGC Regulations*.

9) The tanks must be diked, unless prior approval has been obtained from the appropriate EUB Field Centre.

10) The equipment spacing must conform to the *OGC Regulations*.

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[11] Drilling and Completion Committee (DACC) Industry Recommended Practices (IRP), Volume 4.0, *Well Testing and Fluid Handling*, Petroleum Industry Training Service (PITS), forthcoming.

11) If any complaint is received during flaring operations, the operator must notify the appropriate EUB Field Centre immediately and then conduct an investigation. If the source and cause of the complaint cannot be determined and rectified immediately, a representative of the EUB may suspend operations.

12) For well tests, the results must be submitted in accordance with the requirements of *Guide 40* and *Guide 52*.[12]

13) For gas wells, all rural residences and administrators of any incorporated centres or hamlets within at least a 3 kilometre radius must be notified prior to the commencement of any flaring operations.

14) For gas wells, drawdowns must be restricted in accordance with the most recent edition of the EUB *Guide 3: Gas Well Testing Theory and Practice of Testing.*

15) For oil wells, if the production test period is to exceed 21 days, an application for a temporary battery must be submitted pursuant to EUB *Guide 56*.

16) For oil wells, all rural residences and the administrators of any incorporated centres or hamlets within at least a 1.5 kilometre radius must be notified prior to the commencement of any flaring operations.

3.2 Well Test Volume Criterion Review

As noted in Section 3.1, a criterion of 600 10^3m^3 is used to define well test volume approval requirements. The EUB plans to examine the continued applicability of the 600 10^3m^3 criterion to explore whether some other value or approach may be utilized to reduce well test flaring without compromising the need for reservoir information necessary for good reserves management. Audit protocols respecting compliance with the criterion will be developed with suitable enforcement actions. EUB *Guide 40* was updated in May 1999 to include emphasis and focus on minimizing flared/vented volumes, clarification of fluid analysis reporting, and well flaring information generally set out in Section 3.1.3.

3.3 Temporary Well Test Facilities

Where gathering and processing infrastructure are in close proximity, the EUB expects operators to recover well test gas as an alternative to flaring. The EUB recognizes that a temporary connection to gathering systems and possibly temporary compression or other facilities will be required to conserve well test gas. To facilitate conservation of new well test gas, the EUB will not require facility approvals for related temporary facilities, including compressors. It is noted that

[12] EUB *Guide 52: Electronic Capture of Well Test Data*, EUB, 1999.

1) Well test approvals are required, as described in Section 3.1. Applications to the EUB Resources Division for volumes exceeding 600 10^3m^3 must note the operator's intent to install temporary facilities and list the facilities to be used.

2) The temporary equipment must not be operated for more than 21 days in total. Allowance may be made for downtime during the testing period. In general, only one such test period will be approved at each site. An application, as described in EUB *Guide 56,* will be required if extended tests or multiple tests are planned that will require more that 21 days of operation for the temporary facilities.

3) Temporary surface facilities must be removed from the lease within 30 days of completion of the test.

4) Temporary facilities must meet noise control requirements defined in *ID 94-04.*[13]

5) Requirements, including public notification, as defined in Section 3.1.3, must be met.

6) Operators must have appropriate emergency response plans in place for sour wells.

7) Temporary facilities, including pipelines, must meet applicable technical standards and codes and must comply with applicable EUB, environmental, and safety regulations.

8) Notwithstanding (2) above, temporary surface flow lines (jointed or continuous) must be approved prior to operation.

9) Temporary sweetening processes, if used, must be of the zero-sulphur-emissions type. Temporary installation of regenerative sweetening processes with acid gas flaring will require a facility application, as described in EUB *Guide 56*. Under current regulations, all temporary or permanent sweetening facilities, including non-regenerative types, require Alberta Environment gas-processing plant approvals.

Operation of temporary well test compressors and related facilities for longer than 21 days requires an application, as described in EUB *Guide 56*. For further clarity, installation of temporary compressors for reasons other than testing of new wells requires an approval, as described in *Guide 56,* regardless of the duration of expected operation.

3.4 Reporting Gas Well Test Flaring

EUB *Guide 40* and Section 3.1.3 outline the reporting requirements and formats for gas well testing. The licensee/operator of the well is required to submit to the EUB all pressure and deliverability tests conducted, including those not required by *Guide 40*.

[13] EUB *ID 94-04*: *Noise Control Directive*, EUB, 1994.

All tests must be submitted within three months of completing the fieldwork. Reports must be submitted in an acceptable format, as described in *Guide 52*. Note that this format includes reporting the volume of gas produced to flare, vent, or pipeline. All gas analysis from samples gathered at the wellhead must be submitted to the EUB.

All flaring at a well site (including well tests) must also be reported on the appropriate S forms, as explained in *Guide 7*. Before production including flaring can be reported, a battery code must be obtained from the EUB Well Data Services Group, as outlined in Appendix 3 of *Guide 7*. Any produced volumes, including volumes flared or vented, must be reported on S-1 and S-2 monthly statements, as outlined in *Guide 7*.

Where any flaring or venting occurs at a well site or battery, it must be reported on the S-1 monthly production statement as gas production. Flaring must be reported on the S-2 statement as flared. Venting must be reported on the S-2 statement as vented.

4 Gas Battery Flaring

4.1 Approvals

Applications for new gas facilities must be in accordance with EUB *Guide 56*.

4.2 Flaring Requirements

The requirements of *IL 88-13* for sulphur recovery will apply, as discussed in Section 9.2. Flares at gas production facilities must be in accordance with Section 7.

4.3 Reporting

All flaring at a well site (including well tests) or battery must be reported on the appropriate S statements, as stated in *Guide 7.* Section 10.1 describes requirements for obtaining and using battery codes for reporting.

When any flaring or venting occurs at a well site or battery, it must be reported on the S-1 monthly production statement as gas production. Flaring must also be reported on the S-2 monthly disposition statement as flared. Vented gas must be reported on the S-2 as vented.

Existing data submission compliance and enforcement procedures will be applied.

5 Gas Plant Flaring

5.1 Approvals

Applications for new gas processing facilities must be in accordance with EUB *Guide 56*.

5.2 Flare Performance Requirements

Gas plant flares must be in compliance with the flare performance requirements detailed in Section 7 by 31 December 2004.

Notwithstanding the compliance deadline for compliance with the flare performance requirements detailed in Section 7, gas streams directed to continuous gas plant flares must have a minimum heating value, as defined in Section 7.3.2, effective 1 January 2000.

Short-duration emergency flaring with gas of a heating value of less than 20 MJ/m^3 may occasionally be necessary.

5.3 Gas Plant Flare Volume Limits

The EUB expects operators of gas plants to operate so that a minimum of gaseous hydrocarbons and other gases are flared. Operators must not flare gaseous hydrocarbons in excess of 1.0 per cent of the total volume of raw gas delivered to gas processing plants in the first year of operation and 0.5 per cent in subsequent years. Gas plant flares must be in accordance with Section 7. The EUB intends to review these limits.

The EUB encourages plant operators to use the flare stack that is the most efficient and is capable of providing the best dispersion when flaring solution gas. In many cases this will be the gas plant flare stack. Where operators use the gas plant flare stack, operators will be exempt from the 0.5 per cent for solution gas flared volumes when this is part of a gas plant shutdown lasting more than seven days. These solution gas volumes must be documented and provided to the EUB upon request. Note that the requirements specified in Section 2.6 will still apply.

5.4 Notification and Reporting

An EUB Field Centre is to be notified 24 hours prior to planned or within 24 hours of emergency flaring. Information to be provided includes notification date, time, location, operating company, contact name and telephone number, flaring commencement time, duration, rate, total volume, percentage H_2S, and reason for flaring.

All gas plant flaring volumes must be reported monthly on the EUB's S-20 Monthly Gas Processing Statement. The S-20 is used to record receipts and disposition of gas, including flaring. This information is summarized in the *Alberta Gas Plant Statistics*, EUB reports *ST13-A* (annual report) and *ST 13-B* (monthly report).

Flaring at sour gas plants must also be reported on the S-30 Sulphur Balance Report. When measurement does not occur on all streams, engineering estimates must be used to report any flared gas not measured. The EUB notes that a large number of gas processing plants have reported zero flaring over a calendar year.

The EUB intends to develop suitable business rules for gas plant flaring and venting data submission for use with existing data quality audit and enforcement protocols.

Upon request by EUB staff, all operators must be able to provide a documented system for flare measurement and/or flare estimation, as defined in Section 10.0. Operators must also be able to provide, upon request, information on flaring and related public complaints, as defined in Section 10.3.

The EUB will require operators, on the basis of audit and inspections, to examine flare fuel gas use in cases where it appears that fuel gas use is excessive. Currently, the EUB requires total fuel gas to be measured and reported on the S-20 statement and allows an operator to use an engineering estimate to determine the split between residue fuel gas (processed gas) and overhead fuel gas (gas from plant vessels). Excessive fuel gas use in the flare for flare pilots and purge gas can contribute significantly to fuel use.

6 Pipeline Emissions

6.1 Gas Gathering Systems

Under normal operations, there is little flaring in a gas gathering system. It is estimated that gas gathering systems represent about 2 per cent of the total flared gas in the province. Most flaring is likely to occur at compressor stations or when blowing down gas gathering systems for operational reasons. Currently, all flaring from a gas gathering system must be reported on the S-8 Monthly Gas Gathering Statement, as described in *Guide 7*. Both flared and vented gas should be reported in the flared box on the S-8.

All rural residences and the administrators of any incorporated centres or hamlets within at least a 3 kilometre radius and the EUB Field Centre must be notified at least 24 hours prior to the commencement of flaring.

Flares used at gas gathering systems must be in accordance with Section 7. The requirements of *IL 88-13* for sulphur recovery discussed in Section 9.2 apply for any continuous flaring of sour gas at gas gathering system facilities (e.g., compressor or dehydrator sites).

6.2 Sweet Natural Gas Transmission Systems

Sweet natural gas transmission companies must notify the appropriate EUB Field Centre and discuss measures that will be taken to minimize emissions when venting or flaring of its pipeline is planned.

Operators of sweet natural gas transmission pipelines will be expected to minimize vented or flared volumes of sweet natural gas by adopting practices, procedures, processes, or technologies to minimize emissions wherever feasible and practical.

Each purchaser or transporter of sweet natural gas is required to file with the EUB (*OGC Regulations*, Section 12.051), on a monthly basis, the disposition of gas, including the particulars of the disposition and delivery of all such gas. Where flaring or venting of sweet natural gas occurs, the EUB expects this disposition to be separately reported in volumes at standard conditions.

7 Flare Performance Requirements

7.1 Introduction

The EUB understands the importance and urgency of incorporating suitable flare performance standards and flare stack design requirements in this guide. These topics were discussed at length within the CASA process, and the resulting consensus on the issue of performance and design is a notable achievement. In reaching its conclusions, CASA reviewed legislative requirements and engineering design standards.

This section of the guide addresses technical requirements for flare system design and operation and applies to well test, well site (including flaring associated with cleanup and initial early productivity determination in oil wells), oil and gas battery, and process plant flares. Requirements for flare stack design, liquid separation, and flared gas measurement, as well as limitations on venting of unburned gas, are defined. This section also defines requirements for ambient air quality assessments (e.g., plume dispersion calculations) and cumulative air emissions assessments required for flaring of gas containing H_2S.

The EUB supports the use of alternatives to conventional flare technology where better combustion and dispersion can be obtained. This may include the use of enclosed flares, incinerators, or other alternative technologies.

7.2 Combustion Efficiency Performance Standards

The use of performance standards (e.g., Alberta Ambient Air Quality Guidelines), as opposed to specifying design details or types of equipment, allows greatest flexibility in achieving the desired results in a cost-effective manner. Enforcement is not hampered, since performance can be directly monitored and evaluated. Taking this approach is consistent with the regulatory direction of both the EUB and Alberta Environment. Specifying combustion efficiency or destruction efficiency would be consistent with a performance standard approach.

It is the EUB's view that achievement of combustion efficiencies of 98 per cent or better on design and operational basis would be the expected result of continuous improvement in flare technology research and flare performance standards. The EUB requires operators to demonstrate that they have assessed and incorporated appropriate flare best-management practices and new technology developments that maximize combustion efficiency in the design of new or modified flare systems.

However, the EUB and Alberta Environment, along with industry stakeholders, have reviewed the status of flare combustion efficiency with research teams investigating gas flaring. The EUB has concluded that specification of mandatory combustion efficiency standards is not practical at this time for the following two reasons:

Practical methodologies are not available for measuring flare combustion efficiency under field conditions. Thus, while it may be possible to specify required combustion efficiency, there is no practical means to monitor compliance at operating facilities.

- The relationship of combustion efficiency with design factors such as flare tip exit velocity, gas composition, crosswind velocity, and air turbulence is not yet sufficiently advanced to prescribe related design standards.

The EUB recognizes the importance of flare combustion efficiency standards to industry and public stakeholders. However, it is the EUB's view that such standards must be technically relevant and/or capable of being practically monitored in the field. Research in Alberta and elsewhere is currently focused on combustion efficiency issues. It is expected that this research will enable development and implementation of flare combustion efficiency requirements no later than the end of 2001, coincidental with the review of the management framework. Based on the direction of current flare research, it is likely that requirements will take the form of prescriptive design standards that will be related to demonstrated levels of combustion efficiency. The EUB will monitor flare research with the intent of updating this document when suitable information is available.

7.3 Flare Stack Design and Operation

Operators are expected to design, operate, and maintain flare systems to safely dispose of gas that must be released to the atmosphere. EUB minimum requirements for the design and operation of flare systems have been established and are included in the following requirements. In addition, the EUB expects that operators will use good engineering practice in the design and operation of flare systems, as outlined in the CAPP *Recommended Practices for Flaring of Associated and Solution Gas at Oil Production Facilities* and in *API Recommended Practice 521*, Section 4, "Selection of Disposal Systems."

Industry must comply with the following requirements for flare systems installed at well testing locations, well sites, oil batteries, gas batteries, and gas processing plants unless otherwise noted.

7.3.1 Ignition

A flame must be present whenever hydrocarbons or acid gases are directed to flares. Acid gas and intermittent sour gas flares are required to have reliable pilot and automatic ignition devices to ensure continuous ignition of any gas discharged to the flare.

Manual flare ignition, subject to adequate safety and forest fire prevention considerations, may be accepted for blowdown stacks or flares installed for maintenance purposes where no continuous gas flow exists or where no automatic relieving systems are connected to the stack.

7.3.2 Flame Stability and Minimum Heating Value of Continuous Acid Gas Flares

Flame stability and combustion efficiency are related to the heating value of the combined flare gas stream and to stack design parameters and features. Existing requirements, including the typically specified minimum heating value[14] for flared acid gas streams of 9 MJ/m^3 and the U.S. EPA minimum guideline for air- or steam-assisted flares of 11.2 MJ/m^3 have been reviewed in light of current research being conducted at the University of Alberta.

Initial results of this research discussed with EUB staff in early 1999 indicated that the crosswind flame stability of gases diluted with CO_2 (i.e., acid gas) was impaired if the heating value was less that 20 MJ/m^3. This initial research information was considered by EUB staff in the preparation of the review draft of this document.

Subsequent to January 1999, the University of Alberta has expanded its research on the effects of CO_2 dilution, stack diameter, exit velocity, and crosswind velocity on flare flame stability. Findings of the new research indicate that flare stability and efficiency are impaired at heating values less that 9 MJ/m^3 for CH_4-CO_2 gas mixtures. At heating values in excess of 20 MJ/m^3, however, the research suggests that most flare conditions would result in acceptable combustion under typical Alberta crosswind conditions. For CH_4-CO_2 mixtures of heating values between 12 and 20 MJ/m^3, efficient combustion can occur provided designs are based on appropriate relationships of heating value, stack diameter, exit velocity, and crosswind velocity.

It was noted that there are continuous acid gas flares operating in the 9-12 MJ/m^3 heating value range that have been stable and appear to meet Alberta Ambient Air Quality Guidelines for H_2S and SO_2 over the long term. It was further noted that an arbitrary increase of fuel make-up requirements to raise acid gas heating values to over 20 MJ/m^3 could significantly increase fuel gas consumption and costs to industry and the province, as well as greenhouse gas emissions.

On the basis of the foregoing, Alberta Environment and the EUB will allow continuous acid gas flares to be operated in the 12-20 MJ/m^3 heating value range on a conditional basis. It is the EUB's intent, however, to closely monitor research results with respect to the acceptability of approving acid gas flares to operate at less than 20 MJ/m^3 over the next 6-12 months. It is the EUB's expectation that ongoing industry research and assessment of operating acid gas flare stacks will provide the basis and justification for continuing approval of acid gas flare operation at less than 20 MJ/m^3.

The following requirements are based on current research findings and will be revised as additional research results and stack design/evaluation tools become available. The requirements become effective for all facilities 1 January 2000.

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[14] All heating values refer to the lower, or net, heating value determined on a water-free basis at 15°C and 101.325 kPa.

1) Sufficient fuel gas must be added to continuous or routinely flared sour, acid, or other low-heating-value gas streams to ensure stable and efficient combustion and to ensure compliance with Alberta Ambient Air Quality Guidelines, as well as with specific EUB and/or Alberta Environment approvals.

2) New stacks for continuous flaring of acid gas or other low-heating-value gas streams must be designed by qualified technical staff to ensure flame stability and efficient combustion.

   Stack and operating procedures must be designed so that sufficient fuel gas is added to the low-heating-value stream to ensure efficient and stable combustion.

   a) In the absence of specific engineering evaluations that consider stack diameter, heating value of the combined flare gas stream, stack exit velocity, and local wind velocities, the minimum combined heating value of the flared stream must not be less than 20 MJ/m^3.

   b) Where engineering evaluations are based on stack diameter, heating value of the combined flare gas stream, stack exit velocity, local wind velocities, and other stack design features that promote efficient and stable combustion, combined heating values of not less than 12 MJ/m^3 will be accepted for new stacks. Operators must retain related design evaluations and make them available upon request to Alberta Environment or EUB staff.

3) The review of flare stacks for continuous flaring of acid gas and other low-heating-value streams in operation prior to the implementation date of this guide must include an evaluation of flame stability, odour complaint history, and performance of the stack in meeting Alberta Ambient Air Quality Guidelines. The evaluation must include assessment of the suitable minimum combined heating value for the flare gas exiting the stack.

   a) Flare stacks with an established history of stable operation and compliance with Alberta Ambient Air Quality Guidelines will be permitted to operate with combined flare gas heating values in the 12-20 MJ/m^3 range. Operators will be expected to support claims that existing stacks have operated satisfactorily over time.

   b) Flare stacks with a history of flame failure, odour complaints, and/or Alberta Ambient Air Quality Guidelines exceedances will be required to operate with a combined flare gas heating value of not less than 20 MJ/m^3.

      Operators may be allowed to reduce the combined flare gas heating value to not less than 12 MJ/m^3 following implementation of modifications to increase flame stability and flare performance. Operators must demonstrate to the regulating authority that the engineering design of the modifications is based on evaluations

of stack diameter, heating value of the combined flare gas stream, stack exit velocity, local wind velocities, and other stack design features that promote efficient and stable combustion.

4) Flare stacks must have sufficient exit velocity or be provided with suitable features to prevent wind from extinguishing the flame of low or intermittent flows of sour or acid gases (e.g., wind guards).

5) As a guideline, most routine flares will be relatively stable if stack exit velocities are greater than 1-2 m/s and less than 18 m/s. Higher exit velocities, up to 122 m/s, may also be acceptable. The following relationships[15] for flared gas net or lower heating value (H_T in MJ/m^3) provide guidelines for the maximum flare stack exit velocity (V_{max} in m/s):

- Steam and non-assisted flares: $Log_{10}(V_{max}) = (H_T + 28.8) / 31.7$
- Air assisted flares: $V_{max} = 8.706 + 0.7084(H_T)$

7.3.3 Stack Height

1) Flares stacks must be designed so that the maximum radiant heat intensity at ground level will not exceed 4.73 kW/m^2. Unless otherwise specified, ground-level radiant heat determinations will be based on calculation procedures outlined in API Recommended Practice 521, Section 4.4.2.3, or *GPSA Engineering Data Book* (11th edition), Section 5.

2) Flare stacks located within a distance equivalent to five times the height of neighbouring third-party buildings must have a height of at least 2.5 times the height of the highest building.

3) Flare stacks for acid gas or sour gas containing more than 10 moles of H_2S per kilomole of gas must have a height of at least 12 m above ground level or such greater height as may be required by (1) above or as required to provide adequate plume dispersion to comply with Alberta Ambient Air Quality Guidelines for SO_2 and H_2S (see to Section 7.4).

7.3.4 Emergency Sour and Acid Gas Flaring Procedures

In some instances where volumes and flare rates are very large, it is not practical to design flare stacks with sufficient height and to add sufficient fuel gas to permit continuous emergency flaring in compliance with the Alberta Ambient Air Quality Guidelines at full sour raw or acid gas production rates.

If, based on evaluation procedures described in Section 7.4, a sour or acid gas emergency flare is not of sufficient height to meet the one-hour Alberta Ambient Air Quality Guidelines for SO_2 under high flow rate conditions, then operating procedures and/or automatic shutdowns must be in place to immediately curtail production and control flaring to comply with the one-hour

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[15] Title 40, *U.S. Code of Federal Regulations*, Part 60.18.

guideline. Automated shutdowns are expected to be installed in semi-attended facilities to ensure compliance with this requirement. This requirement takes precedent, as applicable, over flare reduction requirements listed in Section 2.6.1,Table 1.

7.3.5 Liquid Separation

Under no circumstances are flare pits to be used at any facilities constructed after 1 July 1996. For facilities constructed prior to this date, flaring is allowed, provided that there is no potential for produced liquids to enter the pit. Further details on the use of earthen pits are given in *IL 96-04*.[16]

Entrained liquids in flare streams are recognized to reduce combustion efficiency and contribute to increased emissions of total reduced sulphur compounds, hydrocarbons, and products of incomplete combustion. To reduce and/or eliminate these effects, the EUB requires the following:

1) If liquid hydrocarbons, water, or other liquids are present in flare gas sources, it is required that adequately designed, operated, and maintained liquids separation equipment be provided in both temporary (well test) and permanent flare systems.

2) Flare system piping and all piping related to the liquids control system must be engineered to prevent retention of liquids by ensuring that piping is sloped to drain to separators and to avoid low-point liquid traps.

3) The flare separator must be designed to provide adequate separation of liquid and large liquid particles entrained in the gas. Liquid hydrocarbons must not be flared.

4) The flare separator or knockout drum must be designed to have sufficient holding capacity for liquids that may accumulate as a result of upstream operations such as hydrocarbon carryover, liquid slugs, and line condensation. The flare separator must be designed such that the ability of the vessel to separate liquids from the gas stream is not impaired at the maximum design liquid level.

5) Design of the flare separator must ensure that no reentrainment of separated liquids will occur at maximum expected flare gas flow rates.

6) Flare separators must be provided with visual level indicators, high-level alarms, or operating procedures to ensure that the liquid retention in the vessel will not exceed the maximum design liquid level during all operating conditions.

7) A high-level alarm must be installed on flare separators or flare knockout drums where liquid streams are directed to the separator for retention or where free liquids are expected in continuously flared streams. The flare separator high-level alarm must be connected to

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16 *IL 96-04: EUB Policy Update and Clarification on the Use of Earthen Pits*, EUB, 1996.

facility alarm panels and/or semi-attended facility alarm call-out systems if the facilities are so equipped.

8) The flare system and separator or knockout drum must be designed and operated to ensure that effectiveness will be maintained under all operating scenarios and weather conditions (e.g., freeze protection is required).

9) The flare separator or knockout drum must be designed to the ASME Boiler and Pressure Vessel Code if the maximum pressure due to the flow resistance in the flare system is sufficient to trigger this requirement.

10) Flare separator or knockout drums used for liquids storage must be designed and operated to meet the requirements listed in EUB *Guide 55*[17] for above-ground or below-ground storage tanks, as appropriate.

7.3.6 Spacing Requirements

1) Flare stacks must be located at least 100 m away from an occupied residence.

2) Flares must be located, designed, and operated so that no hazard to public property will be created. Flares must be located at least 100 m away from surface improvements, with the exception of surveyed roadways.

3) Flares must be located at least 50 m away from wells or flammable liquids storage tanks and at least 25 m away from any oil or gas processing equipment.

4) The following requirements are defined in the *Forest and Prairie Protection Regulations* (AR 135/72):

   a) Areas within 30 m of flare pits must be cleared of all combustible debris.

   b) Clear, bare mineral soil surface must be maintained within 8 m of flare pits.

   c) In forest areas, flare stacks must be located at least 2.5 times stack height, or such other distance as prescribed by a forest officer, from combustible debris.

5) Information on fire bans can be obtained from the following sources:

   a) www.gov.ab.ca/env/forest/fpd/ — go to “fire control orders” for fire ban information and regions affected as per Alberta Environment

[17] EUB *Guide G-55: Storage Requirements for the Upstream Petroleum Industry*, EUB, 1995.

b) Alberta Environment — (780) 427-fire [3473]

c) local municipal districts, for their respective fire ban requirements

6) Notwithstanding the above, existing well-site equipment flare-spacing waivers are maintained.

7.3.7 Noise

Flare systems must be designed to operate in compliance with EUB *ID 94-04*. Routine and emergency flare conditions are to be considered in noise impact assessments required by the interim directive.

7.3.8 Visible Emissions

Black smoke from flares must not exceed a 40 per cent opacity average over six consecutive minutes, as specified in EPEA *Substance Release Regulations* or as specified in an EPEA approval, whichever is more stringent.

7.4 Dispersion Modelling Requirements for Sour or Acid Gas Flares

SO_2 and H_2S emissions from flaring, incineration, or combustion of sour or acid gas have potential for adverse effects. Therefore, the design and operation of stacks must consider air quality impacts of sulphur emissions from the stacks, taking into account other sulphur emission sources in the area.

Using dispersion modelling methods accepted by Alberta Environment, operators must demonstrate that SO_2 and H_2S emissions from flaring, incineration, or combustion of sour or acid gas will not result in exceedance of Alberta Ambient Air Quality Guidelines if the gas contains more than or equal to

1) 10 moles of H_2S per kilomole of gas or
2) one tonne per day of sulphur.

Operators flaring gas below the above criteria may wish to consider dispersion modelling as part of their respective environmental due diligence processes. Facilities requiring an EPEA approval may require more detailed evaluation. Alberta Environment should be consulted in these instances.

7.4.1 Definitions

1) **Screening Assessment** – This is the quickest and simplest modelling approach. Screening assessments usually provide a conservative estimate of downwind concentrations. If exceedances of the Ambient Air Quality Guidelines are predicted by a screening assessment, then a refined assessment may be necessary. Alternatively, stack design parameters may be modified until predicted ambient air quality meets the Alberta

Ambient Air Quality Guidelines.

2) **Refined Assessment** – This is a more complex and data-intensive level of modelling. Refined assessments more closely estimate actual air quality impacts by using actual meteorological data. An appropriate model should be selected, and this choice must be defensible. The applicant must demonstrate that the completed work follows accepted methodologies and standards.

7.4.2 Modelling Assumptions

Ambient air quality modelling will observe the following assumptions for screening assessments:

1) stack-specific terrain extracted from 1:50 000 topographical maps or equivalent

2) full meteorology

3) rural dispersion conditions

4) partial conversion of H_2S to SO_2

   Until such time as combustion efficiency can be reliably estimated based on design conditions, ambient air quality modelling evaluations will assume a 98 per cent molar conversion of H_2S to SO_2 (e.g., 100 moles of H_2S yields 98 moles of SO_2 plus 2 moles of H_2S, and only 98 per cent of the available combustion energy is released as heat). The EUB is closely following the current research in flaring combustion efficiency and will update this section as necessary when research results become available.

7.4.3 Individual Source Modelling Approach

1) Initial modelling can be conducted using a screening assessment. Simple terrain modelling assumptions can be used for situations where terrain elevations are less than the stack height; otherwise complex terrain modelling assumptions must be used. The selected flare design must not result in maximum hourly average ground-level SO_2 or H_2S concentrations in excess of the Alberta Ambient Air Quality Guidelines. A refined assessment can be used if the screening assessment results in an impractical stack height. Modelling should address maximum hourly flow rate conditions.

2) If the predicted maximum hourly average ground-level concentrations using the screening model are less than one-third of any of the related Alberta Ambient Air Quality Guidelines, no further modelling is required.

7.4.4 SO_2 Cumulative Emissions Assessment

If individual source model predictions exceed one-third of the Alberta Ambient Air Quality Guidelines for SO_2, the applicant is required to consider the combined effect of other sources in the area. The following steps should be followed:

1) Repeat the screening dispersion modelling using the flat terrain assumption (if necessary).

2) Identify the farthest downwind location where predictions exceed one-third of the hourly average Alberta Ambient Air Quality Guideline for SO_2 to define the radius of influence.

3) Identify all other sources of the pollutant located within this radius of influence (if there are no other sources of the pollutant within the radius, no further modelling is required).

4) Quantify the emissions of the pollutant from these other sources and obtain all necessary input data, such as stack height and other parameters (the EUB expects that operators share related data on a timely basis). Maximum hourly flare flow rate conditions must be used for all sources in the radius of influence.

5) As a screening approach, perform separate flat terrain screening model runs for each of the sources within the radius of influence.

6) If the sum of the predicted maximum ground-level concentrations for all sources, regardless of location, is less than the Alberta Ambient Air Quality Guideline for SO_2, no further modelling is required.

7) If the sum exceeds the Alberta Ambient Air Quality Guideline, a refined modelling approach will be required to prove that the guideline is not exceeded and to determine the appropriate stack heights required to meet the guideline. All refined modelling must follow the methods outlined in Alberta Environment's Draft Air Quality Model Guidelines.

Note that the flat terrain assumption is used to simplify the cumulative emissions assessment only. Where complex terrain exists, the final stack height for the source under consideration will be the greater of those determined by single source modelling with complex terrain (Section 7.4.3) and by cumulative emissions assessment (this section).

8 Venting

For companies tracking greenhouse gas emissions, venting leads to higher equivalent CO_2 emissions and for that reason should be discouraged. However, where it is not practical to recover or flare gas, the EUB may accept venting of small volumes of gas. Venting may be considered as an alternative for disposition of small gas volumes from compressor vents, instrument gas systems, pneumatic devices, dehydrators, and storage tanks. For the purposes of this section, vented gas excludes fugitive emissions from piping and equipment leaks.

Venting of gas is governed by the following principles and requirements:

1) If continuous vent volumes are sufficient to support combustion, the gas should generally be burned in a flare.

2) Gas will not be vented if it constitutes an unacceptable fire or explosion hazard on or off the facility lease.

3) Venting of gas containing H_2S to the atmosphere must not result in exceedance of Alberta Ambient Air Quality Guidelines for H_2S or Occupational Exposure Levels for H_2S.

4) As in Section 7.070 of the Alberta *OGC Regulations*, stock tank vapours and other gas emissions from batteries receiving gas or having vapours containing more than 10 moles of H_2S per kilomole of gas must be burned.

5) Continuous venting of gas containing H_2S and other odourous compounds must not result in odours outside the lease boundary.

6) The true vapour pressure of hydrocarbon product stored in atmospheric storage tanks shall not exceed a true vapour pressure of 83 kilopascals where such tanks are vented to the atmosphere.

7) An appropriate flame arrester or equivalent safety device must be used on all vent lines from oil storage tanks connected to flare stacks (see *OGC Regulations* 8.090[7]).

8) Vented gas from gas dehydrators is subject to limitations on benzene emissions, as detailed in *IL 97-04*.[18]

9) If operators have reason to expect that the benzene content of vented gas exceeds 5 moles per kilomole, then **site vent gas** benzene emissions must be assessed and, if necessary, controlled so that total benzene emissions for the facility or lease site will not exceed

   - 3.0 tonnes per year for facilities commissioned prior to 1 January 1999 and located within 0.75 kilometres of a residence, effective 1 January 2001;

[18] *IL 97-04: Emissions from Glycol Dehydrators*, EUB, 1997.

- 3.0 tonnes per year for facilities commissioned after six months from the issuance of this guide; or

- 5.0 tonnes per year for facilities commissioned prior to the issuance of this guide, effective 1 January 2001.

The EUB plans to review operations involving the venting of gas with the objective of establishing further control criteria as necessary.

9 Sulphur Recovery Requirements

The recovery of sulphur from associated and non-associated gas is important for reasons of conservation, as well as for the protection of the environment.

The current standards for sulphur recovery requirements for new gas plants, stated in *IL 88-13*, are summarized in Table 2.

Table 2. Sulphur Recovery Requirements for Sour Gas Plants

Inlet Sulphur Rate	Sulphur Recovery[1]
1-5 tonnes/day	70%
5-10 tonnes/day	90%
10-50 tonnes/day	96.2%
50–2000 tonnes/day	98.5 - 98.8%[2]
> 2000 tonnes/day	99.8%

1 Deduct 0.3 per cent for quarterly average requirements.

2 Recovery = 98.18185 + 0.187259 $\log_{10}$ (inlet sulphur rate).

Acid gas injection is an alternative approach to meeting the sulphur recovery requirements that has an effective recovery of nearly 100 per cent if operated successfully. Excessive flaring of acid gas during injection system upsets and outages could negate the emission reduction advantages of this technology. Sour gas processing plants with acid gas injection schemes must be operated so that at least the percentage of sulphur contained in the inlet raw gas specified in Table 2 is injected or recovered or operated according to conditions within an EPEA approval issued by Alberta Environment.

9.1 Sulphur Recovery at Solution Gas Facilities

IL 88-13 forms the basis for sulphur recovery requirements for the collection (clustering) of sour solution gas from multiple sources, with the flexibility of minor relaxation available in the low inlet sulphur range (1-5 tonnes/day).

The EUB does not want the need for sulphur recovery to deter the collection (clustering) of solution gas if low levels of H_2S are present in the raw gas.

Therefore, each clustering scheme that has a total inlet sulphur of 1-5 tonnes per day will be considered for flexibility by Alberta Environment and the EUB in the application of *IL 88-13* if the scheme is otherwise uneconomic and it is processing strictly solution gas. Site-specific impacts will be part of the EUB's consideration for exemption. The existing processes used for EPEA approvals (sour gas processing plant) and EUB approvals will be used to measure public

acceptance of any proposals. If there are no unacceptable impacts and nearby residents agree, meeting the sulphur recovery guidelines may not be required for solution gas facilities. The requirements of *IL 88-13* will apply to all facilities that process any sour non-associated gas. If sulphur recovery is required, some cost sharing with the government may be available, as explained in Section 9.3.

9.2 Sulphur Recovery at Gas Gathering Facilities and Non-associated Gas Batteries

Design of certain types of gas gathering and non-associated gas battery facilities can result in significant sulphur emissions. Among other sources, these emissions may originate from flaring of low-pressure-produced water flash gas and from flaring of glycol dehydrator vent gas. The approval of such facilities falls within the EUB's jurisdiction, and related approvals from Alberta Environment are not currently required.

In approving an acceptable level of continuous sulphur emission (excluding emergency flaring), the EUB will consider the following criteria:

1) It is the EUB's intent to avoid situations where flaring of sour gas at gas batteries and gathering facilities in sour gas production systems (e.g., well through gas plant) results in substantial circumvention of the sulphur recovery levels specified in *IL 88-13*. To encourage industry-sponsored solutions, the EUB will consider cumulative sulphur emissions from gas battery, gas gathering, and gas processing facilities in assessing sulphur recovery requirements for sour gas production projects on a regional basis.

2) As a minimum, IL 88-13 sulphur recovery requirements will apply to sour gas streams continuously flared at gas gathering and gas battery facilities — i.e., if the sulphur content of produced water flash gas, dehydrator vent gas, and other flare gas sources at the site exceeds 1.0 tonne/day, then sulphur recovery in accordance with *IL 88-13* and this document is required for the flared gas.

9.3 Sulphur Emission Control Assistance Program (SECAP)

IL 88-13 normally requires some amount of sulphur recovery at all levels of sulphur inlet at or above one tonne per day. The required sulphur recovery at sulphur inlet levels of 1-5 tonnes per day, which the EUB anticipates to be the level typical for proposed solution gas clustering schemes, is 70 per cent.

A cost-sharing program is available for plants with an approved sulphur inlet of 1-5 tonnes/day that uses royalty credits for 50 per cent of eligible capital and operating costs of the sulphur recovery scheme. This Sulphur Emission Control Assistance Program (SECAP) is administered by ADRD.

SECAP allows for 50 per cent cost sharing on facilities required to recover sulphur and may also include some pipelining costs and the costs of acid gas injection facilities. ADRD will

assess the reasonableness of all costs in determining eligible costs. Full descriptions of SECAP and application forms are available from ADRD's Mineral Revenues Division.

10 Measurement and Reporting

10.1 Measurement of Flared Gas

Operators of oil, bitumen, and natural gas production and processing facilities are required to report gas flared or vented to the nearest 0.1 $10^3 m^3$/month (adjusted to 101.325 kPa and 15°C) on the appropriate EUB S statements. The requirement to report all gas vented or flared includes emissions from routine operations, emergency conditions, and the depressuring of pipeline, compression, and processing systems.

Information and references on EUB measurement and accuracy requirements, as well as requirements for determination of gas properties (e.g., density, composition, and heating value) are provided in *Guide 56* (Volume 2), *Guide 7*, *Guide 49*,[19] and *Guide 54*.[20]

It is preferred that flared or vented gas be metered with equipment suited to the source flow conditions. However, accurate engineering estimates may be accepted where meters are not practical.

10.1.1 Metering Requirements

Measurement accuracy standards defined in ID 94-01[21] apply to flaring at pipeline and gas processing facilities. In general, these accuracy standards (± 5 per cent) are such that meters designed to suit expected flow conditions would be necessary for the flare or vent gas sources listed below:

1) acid gas flared, either continuously by or in emergencies, from gas sweetening systems regardless of volume

2) fuel gas make-up to acid gas flared (where fuel gas must be added to meet minimum acid gas heating value requirements)

3) continuous or routine flare sources in conventional oil and gas production or processing facilities where annual average flared volumes exceed 500 m^3/day

4) solution gas flared from heavy oil or crude bitumen production facilities within designated oil sands areas where annual average flared or vented volumes exceed 2 000 m^3/day, based on general metering requirements specified in *IL 91-09*[22]

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19 *Guide G-49: Gas Density Measurement Frequency*, EUB, 1993.

20 *Guide G-54: Gas Inspection Manual*, EUB, 1995.

21 *ID 94-01: Measurement of Oil, Gas, and Water Production*, EUB, 1994.

22 *IL 91-09: Exemption from Gas Measurement Crude Oil/Bitumen Wells*, EUB, 1991.

Where operators can demonstrate that such flows can be consistently and accurately estimated from other data, the EUB may accept estimated measurements (see Section 10.1.2 for estimating requirements).

For the purposes of this section, routine flare sources are defined as those sources that by process design are used on a daily basis to dispose of low-pressure or waste gases. The definition excludes flare sources used solely for emergency shutdown or overpressure protection.

Where all solution gas is flared or vented from conventional or heavy oil production facilities, produced gas measurements (minus measured fuel gas use) can be used to report volumes flared or vented. In such situations, specific flare or vent gas meters are not required.

Operators are encouraged to consider measurement of total flare streams in larger oil and gas batteries, pipeline facilities, and gas processing plants where there are multiple connections to the flare system from sources, such as storage tank vents, pressure-relieving valves, manual blowdowns, and emergency vent valves. Several operators have been able to improve profitability by using total flare gas measurement to identify and correct gas losses from such sources.

The EUB may require operators to install total flare gas measurement in instances where there have been repeated failures to provide adequate estimates of flared volumes.

In addition to required measurement of total fuel gas use, operators are also expected to meter or determine fuel gas used for (1) flare pilots or (2) as flare header purge gas. Excessive flare pilot or make-up gas can be a source of significant lost sales. Fuel gas used in flare systems (including fuel gas make-up to acid gas flare) is to be reported as fuel gas on EUB S statements. Fuel gas added to flare systems should not be included in reported flare volumes if total flare gas measurement is used.

Gas measurement technology is continuously evolving. It is not the intent of this document to specify measurement equipment or to impede the application of new measurement techniques. The following guidelines address minimum expectations of flare or vent gas measurement equipment:

1) Measurement of flowing temperature, static pressure, and differential pressure are required where differential meters (e.g., orifice meters, pitot tubes, annubars) are used.

2) Flared gas composition must be determined by analysis or engineering estimate and must be incorporated into meter factor calculations as appropriate.

3) Meters must be suited to the range of flow conditions expected.

4) Measurement equipment, installation, and calculations must be consistent with applicable manufacturer, American Gas Association, and CSA standards and guidelines.

5) High turndown ratio electronic mass flow meters are preferred for measurement in open emergency flare headers.

6) Flare or vent gas measurement systems must comply with EUB requirements as summarized in *Guide 56*, Volume 2, Policy page 6, which lists related interim directives, informational letters, and guides.

10.1.2 Estimating Requirements

Where it is not practical to meter vented or flared gas, accurate estimates of gas may be accepted by the EUB. Operators must be able to demonstrate that a reliable and accurate flare or vented gas estimating and reporting system is in place and consistently used. Flare or vent gas estimating procedures and systems must include the following:

1) Estimating systems must account for all gas flared or vented (expressed to the nearest 0.1 10^3m^3/month) from the facility, including routine, emergency, and maintenance operations and depressuring of vessels, compressors, and pipelines.

2) Estimates must be based on calculations that account for the volume, gas composition, temperature, and initial and final pressures of systems vented or depressurized to flare.

3) Procedures for estimating vented or flared volumes must be developed by a qualified technical person, documented, and available for inspection by EUB staff.

4) A formal system for logging and reporting flaring or venting incidents must be in place and include procedures for reporting the information to staff responsible for preparing EUB S statements (see Section 10.3).

Operators will be expected to produce documented flare estimating procedures, reporting procedures, and logs for review by EUB staff as required. The EUB may require installation of meters in instances where there are repeated failures to demonstrate adequate flare or vent gas estimating and reporting systems.

10.2 Flared Gas Reporting on S Statements

In the CASA report *Management of Solution Gas Flaring in Alberta*, concerns were raised on data collection on solution gas flare and venting reporting.

All flared and vented gas in the province must be reported on the appropriate S statements, as described in EUB *Guide 7*. The EUB expects that industry fully understands the requirements detailed in *Guide 7* and applies them correctly.

Upon review of some industry practices, the EUB is concerned about apparent reporting deficiencies and the potential impacts of incorrect reporting of flared and vented gas. Reporting deficiencies include the incorrect reporting of flared gas as vented, reporting of vented gas as flared, and underreporting of flared and vented gas. To measure industry performance in flare

reduction against the 1996 baseline, reporting must be accurate.

To clarify tracking and reporting of solution gas the following changes will be made. The reporting of gas wells as part of an oil battery on the S-1 statement will no longer be allowed. Operators may apply to physically tie a gas well into an oil battery system where they identify a need. These applications will be reviewed and dealt with on an individual basis. If approval is granted, the operator will be expected to submit a separate set of S statements for the gas well(s) showing this facility delivering its gas volume to the oil battery. This will allow for the clear differentiation between solution gas and gas well gas. Operators that have an existing approval to report one or more gas wells on an oil battery S-1 statement are required to obtain a new battery code for the gas wells and report those wells accordingly. Operators with gas wells tied into an oil battery that do not have written approval to do so must apply immediately.

If operators are found to be not complying with these requirements, appropriate enforcement actions will be initiated.

The EUB requires that gas must be reported as flared on the S statement for the facility where the gas is physically flared. That is, gas actually flared at a downstream facility (e.g., a gas processing plant) must not be allocated to an upstream facility (e.g., a battery) and reported on the S statement for that upstream facility.

Before production (including flaring) can be reported, a battery code must be obtained from the Production and Well Data Services Group. To obtain a battery code (*Guide 7*, Appendix 3), the facility type (battery type) must be provided. This battery type is used to identify whether it is a crude oil, gas, or crude bitumen battery. Current errors in the battery type codes are a concern to the EUB. The majority of gas flared in the province comes from solution gas batteries. In order for industry and the EUB to manage and reduce these volumes, it is essential that the volumes be reported under the correct battery code.

The EUB will revise *Guide 7* to clarify the definitions of the various battery type codes. Flaring data will be subject to existing S statements submission audit and enforcement processes.

10.3 Flaring Records

Release reporting requirements are defined in EUB *IL 98-01*[23] and by Alberta Environment's Release Reporting Guideline.

In addition to the requirements of *IL 98-01* and Alberta Environment's Release Reporting Guideline, operators must maintain records on complaints related to flaring.

[23] *IL 98-01: A Memorandum of Understanding Between Alberta Environment and the Alberta Energy and Utilities Board Regarding Coordination of Release Notification Requirements and Subsequent Regulatory Response*, EUB, 1998.

The EUB requires industry to be vigilant to prevent excessive flaring and be responsive to public complaints about such events. The information must include a description of the operator's response to the complaint, including evaluation of flare incident cause and any remedies implemented by the operator. Additional information related to flaring must be available from flare measurement records, which must include date, time, duration, and volume flared. Where flared gas volumes are estimated, the records must contain any necessary information as required by the operator's estimating and flare gas accounting procedures (see Section 10.1.2).

In the event flaring incidents are reported to the EUB Field Centre for follow-up, the EUB expects such follow-up will entail a review of industry logs in the area. Accordingly, flaring records must be made available for inspection upon request of EUB staff and are required for production (battery), pipeline, and gas processing facilities where flaring occurs. Records for remote or semi-attended facilities may be retained at central locations (e.g., the field centre that would normally receive public complaints related to the facilities).

11 Industry Performance Reporting

A summary of flare and vent emission information compiled will be provided annually and made available on the EUB Web site, www.eub.gov.ab.ca. The information will include

- a pie chart showing the distribution of annual flared volumes for the various types of flaring
- a bar chart showing overall provincial solution gas conservation
- a chart comparing industry performance with the provincial reduction schedule
- tables ranking individual operating company flare reduction (gas conservation) performance by EUB Field Centre area
- a pie chart showing the distribution of gas reported as vented provincially

The above information will be compiled utilizing information submitted by operating companies to the EUB. Companies may be requested or given the opportunity to verify data submitted prior to release of the summary information.

12 Enforcement

The EUB considers the following to be critical aspects of the management framework:

- the review of existing flares,
- completion of the required personal consultation and public notification,
- compliance with the flare performance requirements,
- reducing flaring at conserving facilities, and
- accurate reporting of flare and vent data.

Accordingly, the EUB will focus its audit and enforcement efforts as necessary on these key elements.

In the context of the enforcement process detailed in *IL 99-4*, the critical aspects noted above will be considered "major" non-compliance events. Non-compliance with other requirements set out in this guide will be considered "minor."

The EUB reserves the right to escalate non-compliance issue(s) to any level should conditions warrant.

If in the opinion of the EUB, a non-compliance causes odours above allowable limits or unacceptable impacts on the public, operations may be suspended if the impacts cannot be resolved.

Appendix 1 Definitions

Acid Gas — Gas that contains hydrogen sulphide (H_2S), total reduced sulphur compounds, and/or carbon dioxide (CO_2) that is separated in the treating of solution or non-associated gas.

Associated Gas — Gas that is produced from an oil or bitumen pool. This may apply to gas produced from a gas cap or in conjunction with oil or bitumen.

Combustion Efficiency — The overall conversion of flared gases to products of complete combustion, such as CO_2, water, and SO_2.

Destruction Efficiency — The destruction of flared gas compounds to products of complete and incomplete combustion. Destruction efficiency does not address complete combustion (see Combustion Efficiency).

Gas Battery — For the purpose of this guide, a gas battery is a system or arrangement of surface equipment that receives primarily gas from one or more wells prior to delivery to a gas gathering system, to market, or to other disposition. Gas batteries may include equipment for measurement and for separating inlet streams into gas, hydrocarbon liquid, and/or water phases. Related production is reported under battery types 7-11, as defined in *Guide 7: Production Accounting Handbook.*

Gas Processing Plant — Gas processing plants are defined by Section 1.1 of the *Oil and Gas Conservation Act* as "a plant for the extraction from gas of hydrogen sulphide, helium, ethane, natural gas liquids or other substances but does not include a well head separator, treater, or dehydrator." Under this definition, any facility that includes an amine or sweetening process is a gas plant and must be approved as such by both Alberta Environment and the EUB. Any sour gas plant that proposes to emit more than 2.8 tonnes/day of sulphur is a Mandatory Activity on Schedule 1 of the EPEA Environmental Assessment (Mandatory and Exempt Activities) Regulation (Alberta Regulation 111/93) and requires an environmental assessment as part of the Alberta Environment approval process. It is EUB practice to exempt from classification as gas processing plants those production facilities that recover less than 2 m^3/day hydrocarbon liquids with refrigeration or remove small amounts of sulphur (less than 0.1 tonnes/day) using non-regenerative scavenging chemicals that have no H_2S or SO_2 air emissions. Consult Alberta Environment as necessary.

Non-Associated Gas Gas that is produced from a gas pool (e.g., gas that is not associated with oil or bitumen reservoirs or production).

Oil Battery For the purposes of this guide, an oil battery is a system or arrangement of tanks or other surface equipment receiving primarily oil or bitumen from one or more wells prior to delivery to market or other disposition. An oil battery may include equipment for measurement and for separating inlet streams into oil, gas, and/or water phases. Related production is reported under battery types 1-6 and 12-15, as defined in *Guide 7*.

Solution Gas Gas that is in solution with produced oil or bitumen. For the purposes of this guide, solution gas is all gas that is separated from oil or bitumen production.

Sour Gas Gas that contains H_2S. Unless a concentration is specified in the text, sour gas is defined as gas that contains H_2S in sufficient quantities to pose a public safety hazard if released or to result in unacceptable off-lease odours if vented to the atmosphere.

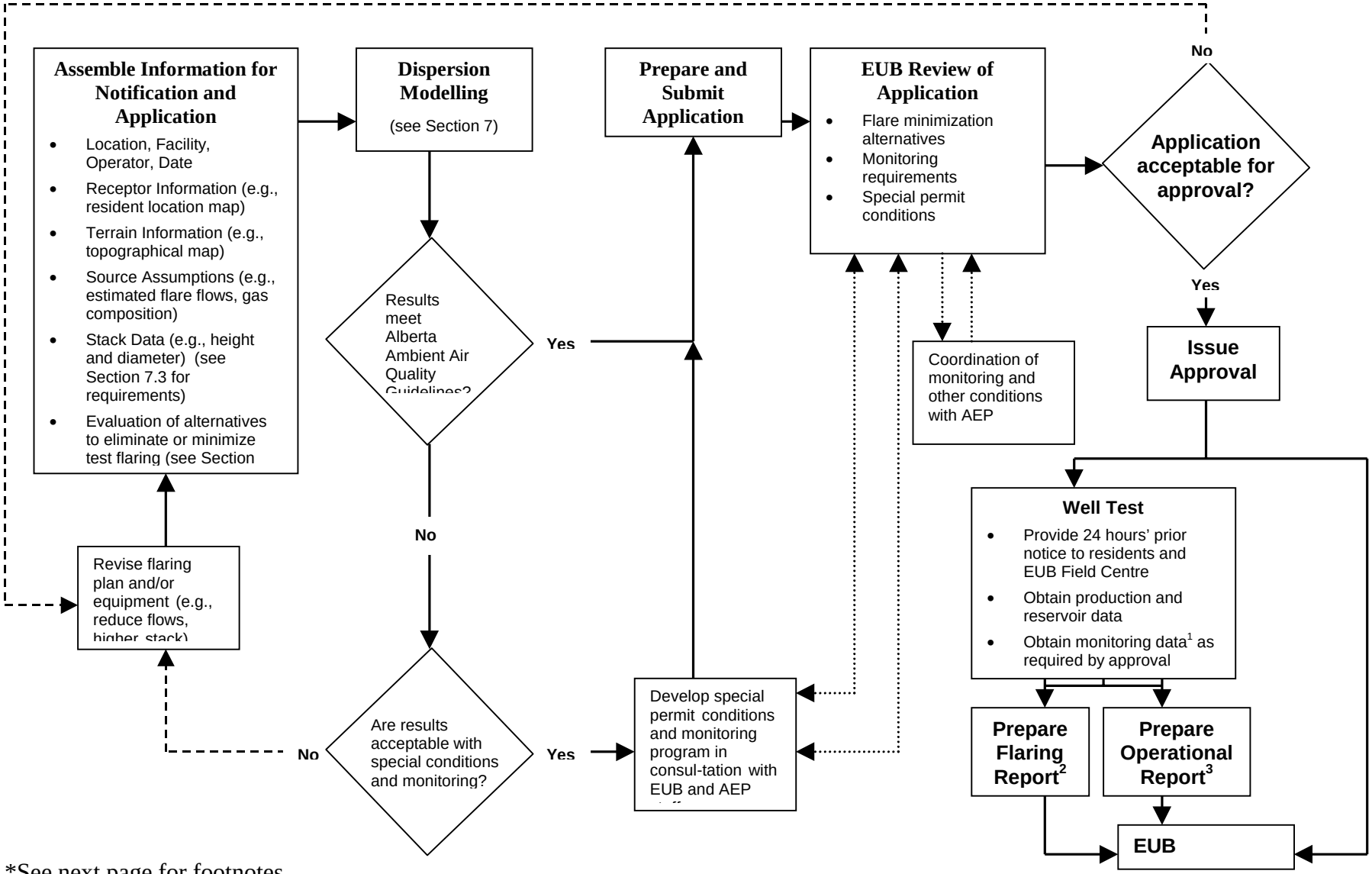
Sulphur Emissions For the purposes of this guide, sulphur emissions includes all air emissions of sulphur containing compounds including SO_2, H_2S, and total reduced sulphur compounds (e.g., mercaptans). Sulphur emissions from flare stacks are expected to be primarily in the form of SO_2, with minor amounts of other compounds.

Appendix 2 Monthly Battery (S-2) Information to Be Released

For battery type codes 1-6 (oil facilities) and 12-15 (crude bitumen facilities) only:

Field Code
Battery Code
Battery Location
Township
Range
Meridian
Operator Code
Operator
Battery Type
Data Date
Run Date
Total Number of Wells
Oil Production
Oil Receipts
Oil Opening Inventory
Oil Closing Inventory
Oil Deliveries
Gas Production
Gas Receipts
Lease Fuel
Gas Flared
Gas Vented
Gas Metering Difference
Gas Deliveries
Water Production
Water Receipts
Water Opening Inventory
Water Closing Inventory
Water Metering Inventory
Water Deliveries

Appendix 3 Flaring Permit Application Process (monitoring information and reports)*



*See next page for footnotes.

Footnotes to Appendix 3

[1] Monitoring Data —— A report of the flaring and monitoring operations must be submitted to the EUB Environment Safety and Technical Services (ESTS) Group within three weeks of the flaring completion date. The report must include

- H_2S and SO_2 concentrations
- wind speed and direction
- dates and times monitoring occurred

[2] Flaring Report — A report outlining the actual volume of gas flared, maximum and average flow rates, actual H_2S content of the flared gas, and the flaring dates must be submitted to ESTS within three weeks of the flaring completion date.

[3] Operational Report (for well tests) — Information submitted in accordance with *Guide 40* and *Guide 52*.

Appendix 4

ID 99-6

29 July 1999

TO: All Oil and Gas Operators

UPSTREAM PETROLEUM INDUSTRY FLARING REQUIREMENTS

Introduction

EUB *Guide-60*: *Upstream Petroleum Industry Flaring Guide* details new Alberta Energy and Utilities Board (EUB) requirements for upstream flaring in Alberta.

Guide 60 is effective 1 January 2000.

Guide 60 represents the end of several multistakeholder processes that examined concerns respecting upstream flaring in Alberta. It incorporates recommendations made to the EUB by the Clean Air Strategic Alliance (CASA), introduces new requirements to address some flaring issues not specifically addressed by CASA, and consolidates other existing EUB flaring requirements into one document.

1.1.1 Management Framework

CASA recommended a goal to "work toward elimination of routine solution gas flaring." CASA also recognized that reaching this goal can not be accomplished easily within a short time frame. As a result, it recommended a flaring management framework which includes significant short- and long-term targets for flare reductions, as well as improved flare performance requirements. It also recommended that the associated regulatory aspects of the recommended framework include public involvement, monitoring, and enforcement.

The Board believes that CASA's recommended goal and management framework, while recommended in the context of solution gas management, are consistent with the EUB's overall intent to optimize resource conservation and ensure appropriate levels of environmental protection. Accordingly, the EUB has adopted them to encompass flaring in general.

A summary of changes introduced by *Guide-60* is attached. Key requirements of the management framework include:

- A firm provincial **solution gas** flare volume reduction schedule:

  - 15 per cent reduction from 1996 baseline by 31 December 2000 (reduce flaring to 1445 10^6m^3/year)
  - 25 per cent reduction from 1996 baseline by 31 December 2001 (reduce flaring to 1275 10^6m^3/year)

- New flare performance requirements for **all** flares, including the following compliance deadlines:

  - all new flares by 1 January 2000
  - all existing solution gas flares by 31 December 2002
  - all flares at other existing permanent facilities by 31 December 2004

- Required evaluation of all solution gas flares by 31 December 2002 using a flaring management decision tree, including a streamlined common economic assessment process

- Commencing 1 January 2000, reduction to the New Oil Well Production Period (NOWPP) flare limit set out in *Informational Letter (IL) 87-9*[1] to 300 10^3m^3/month from 500 10^3m^3/month, implementation of a maximum gas oil ratio (GOR) criterion of 3000 m^3/m^3, above which conservation would be required; and tie in of development wells within one month in pools where gas conservation exists

- Personal consultation and public notification requirements for new and existing solution gas batteries

- Requirements for reduced flaring at normally conserving facilities during planned or emergency flaring

- Sulphur recovery requirements for facilities outside the scope of *IL 88-13*[2] and the related report *ERCB-AE 88-AA*[3]

- Clarified flaring and venting reporting requirements for all facilities

- Annual reporting of regional and overall provincial flaring performance

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1 *IL 87-9*: *Revised Procedures for Oil Production Allowable Controls and New Oil Well Production Period*, EUB, 1987.

2 *IL 88-13: Sulphur Recovery Guidelines Gas Processing Operations*, EUB, 1988.

3 *ERCB – AE 88-AA*: *Sulphur Recovery Guidelines for Sour Gas Plants in Alberta*, EUB, 1988.

Other important aspects addressed in the guide include

- Conflict resolution process to address flaring concerns
- Making available flaring and venting (S-2 statement) data to support increased use of otherwise flared gas
- Progress towards minimizing requirements for electricity generators using otherwise flared gas
- Annual EUB reporting of industry performance

Flare Efficiency Standard

The EUB has concluded that establishing an efficiency standard is not practical at this time, primarily because there are no practical methodologies for measuring either combustion or destruction efficiencies under field conditions. However, it believes that the use of "performance standard" equipment will allow industry the greatest flexibility in achieving the desired environmental protection and safety results in a cost-effective manner.

It is the EUB's view that achievement of combustion efficiencies of 98 per cent or better on both a design and operational basis would be the expected result of focused continuous improvement in flare technology research and flare performance standards. To this end, the EUB anticipates the focused attention of industry and government towards the development of flare equipment certification and field efficiency measurement protocols for consideration during the review of the management framework in 2001.

Notwithstanding the ongoing work towards a practical efficiency-based standard, the EUB expects operators, as they implement the requirements of *Guide 60*, to be able to demonstrate that they have assessed and incorporated appropriate operational practices and new technology developments that maximize combustion efficiency in the design of new or modified flare systems.

Implementation

The EUB requires companies to assess their individual flaring policies and practices as outlined by the management framework detailed in *Guide 60*. Further, it requires companies to exercise diligent operating practices and deliberate development of field facilities to enhance conservation and minimize flaring. EUB personnel will ensure the consistent application of the requirements detailed in *Guide 60* throughout the province.

IL 91-2: S*our Gas Flaring Requirements and Changes to Regulations* and *IL 96-6: Solution Gas Conservation and Emissions Reduction* are rescinded.

Compliance and Enforcement

The EUB considers the following to be critical aspects of the management framework:

- the review of existing flares,
- completion of the required personal consultation and public notification,
- compliance with the flare performance requirements,
- reducing flaring at conserving facilities, and
- accurate reporting of flare and vent data.

Accordingly, it will focus audit and enforcement efforts as necessary to these key elements.

In the context of the enforcement process detailed in *IL 99-4*,[4] the critical aspects noted above will be considered "major" non-compliance events. Non-compliance with other requirements set out in the guide will be considered "minor."

The EUB reserves the right to escalate non-compliance issue(s) to any level should conditions warrant.

If in the opinion of the EUB a non-compliance causes odours above allowable limits or unacceptable impacts on the public, the operations may be suspended if the impacts cannot be resolved.

Where possible, the EUB intends to utilize existing audit and enforcement processes. For example, existing facility application audit protocols will be revised to ensure that personal consultation and public notification specific to flaring takes place.

The following table summarizes some key implementation and compliance dates.

Implementation and Compliance Dates

Item	Effective Date	Compliance Date
Solution Gas Reduction Schedule		
15% from 1996 baseline	1 January 2000	31 December 2000
25% from 1996 baseline	1 January 2000	31 December 2001
Reduced NOWPP Flare Limit; GOR Limit; Development Well Tie-in	1 January 2000	1 January 2000
Flaring at Conserving Facilties	1 January 2000	1 January 2000
Evaluation of Solution Gas Flares/Compliance with Flare Performance Requirements		
New Flares	1 January 2000	1 January 2000
Existing Solution Gas Flares	1 January 2000	31 December 2002
Other Existing Flares	1 January 2000	31 December 2004

(continued)

[4] *IL 99-4: EUB Enforcement Process, Generic Enforcement Ladder, and Field Surveillance Enforcement Ladder,* EUB, 1999.

Implementation and Compliance Dates (cont'd)

Item	Effective Date	Compliance Date
Consultation and Notification		
New Flares – revise *Guide 56*	1 January 2000	1 January 2000
Existing Solution Gas Flares – residents within 500 m	1 January 2000	31 December 2000
Review Management Framework	31 March 2001	N/A

Other Matters

While *Guide 60* sets out existing requirements for various types of flaring, the feedback received on the review draft suggests further stakeholder discussion is necessary for some matters, including:

- well test volume approval criteria,
- gas plant flare volume limits,
- the development of flare and vent data submission business rules,
- site venting control criteria, and
- minimum heating values required for flame stability.

The EUB will initiate further discussions in due course.

1.1.2 Management Framework Review

The EUB intends to assess all aspects of the overall flare management framework set out in *Guide 60* in 2001. While the EUB anticipates that flares upgraded to meet the flare performance requirements set out in *Guide 60* prior to the 2001 review would not be subject to further revisions, it will consider this matter in light of flaring research available at that time.

Inquiries

Should you have any questions regarding *Guide 60*, please contact the EUB at (403) 297-8311 and ask to be referred to one of the following:

- General Inquiries
- Oil Batteries
- Gas Plants/Gas Batteries
- Well Test Volumes
- Flare Permits
- Flare Performance
- Dispersion Modeling
- Electricity Generation
- S Statements
- Battery Codes

You can also contact any one of the following Field Centres:

Bonnyville	(780) 826-5352
Calgary	(403) 297-8303
Drayton Valley	(780) 542-5182
Grande Prairie	(780) 538-5138
Medicine Hat	(403) 529-3626
Red Deer	(403) 340-5454
St. Albert	(780) 460-3800
Wainwright	(780) 842-7570

Guide 60 is available on the EUB Web site at http//www.eub.gov.ab.ca or through the EUB's Information Services at (403) 297-8190.

F. J. Mink, P.Eng.
Board Member

EUB *Interim Directive (ID) 99-6*: Summary of Changes

Existing	New
Solution Gas Conservation • By application and/or Gas Conservation Order	**Solution Gas Management Framework** • 15% solution gas flare reduction by end 2000 • 25% solution gas flare reduction by end 2001 • Evaluation of new and existing solution gas flares using decision tree, including streamlined common economic assessment process, i.e., discount rate equal to Alberta Treasury Branch prime lending rate plus 3% • Personal consultation and public notification required respecting evaluation results for existing facilities • Evaluation of flares within 500 m of residents with notification of results—compliance by 31 December 2000 • Flare performance requirements: compliance for all existing flares by 31 December 2002 • Reduction to NOWPP flare limit to 300 10^3m^3/month; setting of a maximum GOR limit of 3000 m^3/m^3; and early tie-in requirement – compliance by 1 January 2000
• Facility approvals: per *Guide 56*	• Facility approvals: revise *Guide 56*. • Decision tree must be used for new facilities • Expanded personal consultation and public notification requirements specific to flaring • Electricity generation: streamlined small generator approval process to expedite use of otherwise flared solution gas for electricity generation • Flare reduction requirements for conserving facilities during planned or emergency flaring, including EUB and public notification, effective 1 January 2000 • Log of flare events and complaints • Conflict resolution process to address flare-related concerns
• Reporting: per *Guide 7*	• Reporting: per *Guide 7*; review requirements to improve data quality; data submission enforcement; battery type definitions in *Guide 7*; flare and vent data publicly available • Regional and provincial company benchmarking (ranking) **See *Guide 60*, Section 2**
Well Test Flaring • 600 10^3m^3 volume approval • Flare design requirements >1% H_2S • Flare permit greater than 5% H_2S • Notification: > 1 % H_2S; 3 km, 24 hours • Reporting: per *Guide 40, Guide 7*	**Well Test Flaring** • 600 10^3m^3 volume approval • Volume approval criteria to be reviewed • Flare performance requirements • Flare permit greater than 5% H_2S • Streamlined temporary facility approvals to promote in-line testing • Notification: residents within 3 km, and EUB 24 hours in advance • Reporting: per *Guide 40*, *Guide 7* **See *Guide 60*, Section 3**

EUB *Interim Directive (ID) 99-6*: Summary of Changes (cont'd)

Existing	New
Gas Battery Flaring • Facility approvals: per *Guide 56* • Flare design requirements • Reporting: per *Guide 7*	**Gas Battery Flaring** • Facility approvals: per *Guide 56* • Flare performance requirements • Sulphur recovery requirements • Reporting: per *Guide 7* **See *Guide 60*, Section 4**
Gas Plant Flaring • Facility approvals: per *Guide 56* • Sulphur recovery: per *IL 88-13* • Flare design requirements • 0.5% raw gas inlet /year volume limit • Release reporting: per *IL 98-01* **Reporting: per *Guide 7*** • Log of flare events and complaints	**Gas Plant Flaring** • Facility approvals: per *Guide 56* • Sulphur recovery: per *IL 88-13* • Flare performance requirements: compliance by 1 January 2005; flare stability effective 1 January 2000 • 0.5% raw gas inlet/year volume limit • Flare volume limit to be reviewed • Flare measurement requirements • Notification: EUB 24 hours (advance or after) • Release reporting: per *IL 98-01* • Reporting: per *Guide 7*; EUB business rules to improve data quality; data submission enforcement **See *Guide 60*, Section 5**
Pipeline Emissions • Notification: residents within 3 km (GGS flaring) and EUB 24 hours in advance; EUB 24 hours in advance (transmission system venting or flaring) **Reporting: per *Guide 7* (gas gathering systems); Annual Transporter Statements (transmission systems)**	**Pipeline Emissions** • Notification: residents within 3 km (GGS flaring) and EUB 24 hours in advance; EUB 24 hours in advance (transmission system venting or flaring) • Review need for transmission system requirements • Reporting: per *Guide 7* (gas gathering systems); transmission system – report venting and flaring separately **See *Guide 60*, Section 6**
Flare Design Requirements • Scope: > 1% H_2S **Flare Stack Design and Operation** • Ignition: continuous ignition available • Flame stability: 9 MJ/m^3 • Stack height: Ambient Guidelines • Liquid separation: no liquids to flare • Spacing: 100 m from residence • Visible emissions: 40% opacity • Dispersion modelling: single-point source	**Flare Performance Requirements** • Scope: All flares, regardless of composition **Flare Stack Design and Operation** • Ignition: flame must be present • Flame stability: 12-20 MJ/m^3. • Exit velocity guidelines • Stack height: Ambient Guidelines • Documented procedures for emergency flares • Liquid separation: No liquids to flare; designed for specific operation; visual liquid level indicators and high-level alarms on knockout drums • Spacing: 100 m from residence • Visible emissions: 40% opacity • Dispersion modelling: cumulative emission assessment if single source exceeds 1/3 of Ambient Air Quality Guideline for SO_2 **See *Guide 60*, Section 7**

EUB *Interim Directive (ID) 99-6*: Summary of Changes (cont'd)

Existing	New
Venting Limits • Significant volumes to be burned • Ambient Air Quality Guidelines	**Venting Limits** • Significant continuous volumes to be burned; no continuous off-site odours • Site venting control criteria to be reviewed • Benzene emission requirements of *IL 97-04* • Ambient Air Quality Guidelines **See *Guide 60*, Section 8**
Sulphur Recovery Guidelines • Gas plants	**Sulphur Recovery Guidelines** • Facilities emitting more than 1 tonne/day • Review of facilities emitting 1-5 tonne/day **See *Guide 60*, Section 9**
Industry Performance Reporting • Annual solution gas conservation	**Industry Performance Reporting** • Reduction schedule progress (line chart) • Annual flaring by type (pie chart) • Annual solution gas conservation (bar chart) • Regional and provincial company solution gas flare benchmarking (ranking) • Annual venting by type (pie chart) **See *Guide 60*, Section 11**
Enforcement • New facility consultation and notification • Flare design requirements • Individual facility focus	**Enforcement** • New facility consultation and notification • Evaluation process including consultation and notification respecting existing flares • Flare performance requirements • Flaring at conserving facilities • Corporate focus • Reference *IL 99-4* ***See Guide 60*, Section 12**