



SASKATCHEWAN UPSTREAM PETROLEUM INDUSTRY ASSOCIATED GAS CONSERVATION STANDARDS

DIRECTIVE S-10

**SASKATCHEWAN UPSTREAM PETROLEUM INDUSTRY
ASSOCIATED GAS CONSERVATION STANDARDS DIRECTIVE S-10
PETROLEUM DEVELOPMENT BRANCH
CONSULTATION DRAFT JUNE 1, 2010**

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Section 1

1.1 Introduction

The Saskatchewan Energy and Resources (ER) Directive S-10: *Saskatchewan Upstream Petroleum Industry Associated Gas Conservation Standards* (the “S-10”) provide regulatory requirements for reducing flaring, incinerating, and venting of associated gas in Saskatchewan.

Saskatchewan upstream oil and gas industry is a key contributor to the provincial economy. The Government of Saskatchewan has a significant interest in ensuring that the Saskatchewan upstream oil and gas industry maintain and lead its competitive position amongst Canadian energy producing provinces while ensuring that the development occurs in an environmentally responsible manner. It is important that the Government and the upstream oil and gas industry develop proactive plans for reducing greenhouse gas emissions that are practical, applicable and economical.

The flaring and venting reduction initiative is unique in that the application of the initiative can lead to the realization of both environmental and economic benefits.

Flaring and venting emissions reduction in the upstream oil and gas industry will be an important factor in reducing Saskatchewan’s overall greenhouse gas emission. Conservation of flared and vented associated gas could also allow Saskatchewan to realize significant economic benefit. The economic benefits include new investments made to develop gas gathering systems and gas processing infrastructures to collect and process the conserved associated gas.

Flaring and venting of associated gas is known to emit air pollutants which may contribute to acid rain, smog and respiratory problems. Also, these emissions can be sources of harmful chemical contaminants such as volatile organic compounds, inhalable particulate matters and monocyclic and polycyclic aromatic hydrocarbons.

These air pollutants, with the exception of carbon dioxide, can contribute to the degradation of regional air quality, acidify surface water and soil as well as potentially impact human health. By reducing flaring and venting of associated gas the public’s health and quality of living is enhanced through improvements in air quality, protection of water resources and topsoil resources.

The Government of Saskatchewan is committed to working jointly with the oil and gas industry to develop a plan to reduce emissions from oil and gas production activities, such as flaring, venting and fugitive equipment leaks. S-10 is one method that was developed jointly and is directed towards managing emissions from associated gas flaring and venting activities.

This plan identifies economical, practical and reliable methods of reducing air pollutant emissions while improving the efficiency and competitiveness of the industry by capturing associated gas that would have been flared or vented and allowing it to be sold.

This responsibility has been assigned to Saskatchewan Energy and Resources (ER). To achieve this objective, ER has established a steering committee made up of representatives from the upstream oil and gas industry and the relevant Government departments. The steering committee is titled *Saskatchewan Upstream Oil and Gas Industry Flaring and Venting Emission Reduction Committee*. The committee consists of subject matter experts in the field of production accounting, air quality protection, oil and gas operations, and gas processing, as well as representatives from the upstream oil and gas industry associations and Government of Saskatchewan organizations. The participating organizations include:

- Canadian Association of Petroleum Producers (CAPP)
- Small Explorers and Producers Association of Canada (SEPAC)
- Saskatchewan Energy and Resources (ER)
- Saskatchewan Environment (SE)
- TransGas Limited
- SaskPower

S-10 is the first phase of the overall plan to reduce emissions from the upstream oil and gas industry. As the first phase of the flaring and venting emission reduction initiative, the Committee has recommended the adoption of a modified (simplified) version of Alberta Energy and Resources Conservation Board's *Directive 060*. This decision supports Saskatchewan's commitment to developing clear standards and expectations as part of its initiative to reduce flaring and venting.

The emission reduction initiative is based on the licensee evaluating the following three criteria:

1. Can flaring, incinerating, and venting be eliminated?
2. Can flaring, incinerating, and venting be reduced?
3. Will flaring, incinerating, and venting meet performance standards?

For the purpose of S-10, the term "licensee" is used to designate the responsible duty holder (e.g., operator, licensee, company, applicant, approval holder, or permit holder) as specified in the legislation.

The goal is to have the upstream petroleum industry continue to reduce the volume of associated gas routinely flared, incinerated, and vented so that it can be conserved. Conservation is defined as the recovery of associated gas for sale, use as fuel in production facilities, beneficial injection into an oil or gas pool (e.g., pressure maintenance, enhanced oil recovery) and for other useful purposes (e.g., power generation).

It is expected that the upstream petroleum industry will pursue continuous improvement in reducing associated gas flaring, incinerating, and venting in Saskatchewan. ER, in consultation with its stakeholders, will monitor progress of emission reduction performance to determine the need for additional or accelerated implementation of regulatory requirements to facilitate increased associated gas conservation.

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Section 2 Application

2.1 Phase-in Period

All waivers and/or exemptions provided verbally, in-writing or in a well or facility licence condition to a licensee allowing for flaring, incineration and/or venting of associated gas over 900m³/day at oil wells or upstream oil and gas facilities is hereby rescinded and replaced by requirements specified in S-10.

Effective date of S-10:

- For new oil wells and upstream oil and gas facilities licensed on or after October 1, 2011, all parts of this Directive come into effect on October 1, 2011;
- For existing oil wells and upstream oil and gas facilities licensed before October 1, 2011, all parts of this Directive come into effect on October 1, 2014.
- Immediately, where valid public complaints are raised (validated by field office investigation) with regards to odours, noise or visible smoke from venting or flaring from a well or an upstream oil and gas facility.
- Immediately for a well or a facility ordered by ER to comply with the Directive. These orders can be in the form of a licence condition, memorandum, letter or Minister's Order.

2.2 Accessing Your Data

Total associated gas production volume, lease fuel, flaring and venting data for your company is available to licensees on-line through a secure web-portal. Please contact Petroleum Development Branch Facility Licensing Section to apply for a password.

Facility Licensing Section (306) 787-0684

Section 3

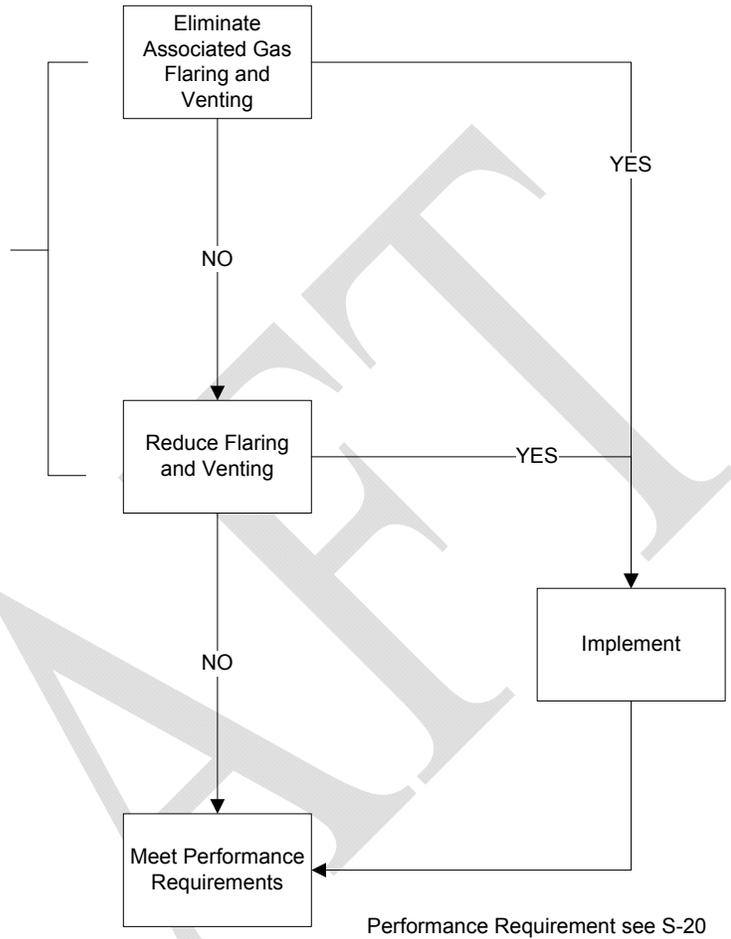
3.1 Associated Gas Flaring and Venting Decision Tree

The Licensee must apply the decision tree to all flares and vents greater than 900m³/day and exercise the highest level of due diligence in doing so. Ensure that all the elements of the decision tree are considered and appropriately implemented. This decision making process should account for the potential safety, environmental, and economic benefits as well as the technical complexity when evaluating options.

Figure 1. Associated Gas Flaring/Venting Decision Tree (adapted from CASA)

Tests

- Public Concerns?
- Health Impact?
- Economic alternatives?
- Environmental impacts/benefits?



Section 4

4.1 Conservation at New Oil Wells and Facilities (Wells, SWB, MWB)

1. All oil wells and battery sites, with exception of those wells and sites mentioned in condition number 3 of this section, must be tested in order to obtain data for the economic evaluation and for sizing conservation equipment. Upon completion of the test period, if test shows that the combined flaring and venting volumes exceed $900\text{m}^3/\text{day}$, the well or the site must be shut-in until associated gas conservation evaluation is completed as described in Appendix 1.
2. If the results of the associated gas conservation evaluation process indicate that conservation is required, the well or the facility must remain shut-in until conservation is implemented.
3. The licensee of a multi-well heavy oil battery must pre-build associated gas conservation lines to one common point on the lease as part of initial construction.

New heavy oil well or new heavy oil single well or multi-well battery must be tested in order to obtain data for the economic evaluation or for sizing conservation equipment. The test period is limited to the lesser of 6 months or until combined flared and vented volumes exceed a rolling average of $900\text{ m}^3/\text{day}$ for any consecutive 3-month period.

If testing shows that the combined flaring and venting volumes exceed $900\text{m}^3/\text{day}$ per site¹, conservation opportunity must be evaluated as described in Appendix 1.

If conservation is required, it must occur as quickly as possible and must not exceed a maximum of 6 months after flow rate determination. Shorter tie-in times must be pursued wherever possible. Wells must be shut in if required conservation is not operational within the timelines noted above.

4. If testing shows that combined flaring and venting volumes do not exceed $900\text{m}^3/\text{day}$ per site, economic evaluation of associated gas conservation is not required and the well may proceed to produce without conserving the associated gas. ER may ask for an economic evaluation of gas conservation, even in cases of less than $900\text{m}^3/\text{day}$ per site.
5. If the results of the associated gas conservation evaluation process indicate that conservation is not required, the well or the site may proceed to produce or operate without conserving the associated gas. ER still recommends economic evaluation of gas conservation, even in cases where associated gas is vented or flared less than $900\text{ m}^3/\text{day}$ where valid noise, odour, environment, oil reservoir, health or safety concerns are raised by the public.
6. If flared volumes are greater than $900\text{m}^3/\text{day}$ per site and the flare is within 500 metres of an existing residence, regardless of economics, the gas must be conserved. The exemption from this requirement will be provided:

- if consent is obtained from the residence; or
 - if licensee submits scientific or technical information and in the opinion of ER the provision of the exemption is appropriate..
7. If a new residence is constructed or relocated within 500 metres of an existing associated gas flare after the effective date of S-10, the licensee must provide information to the new residents about the flaring operations.

4.2 Conservation at Existing Oil Wells and Facilities

1. Licensee must conserve associated gas at all sites where:
 - a) combined flaring and venting volumes are greater than $900\text{m}^3/\text{day}$ per site¹ and the decision tree process and economic evaluation results in a net present value (NPV) of greater than $-\$50,000\text{Cdn}$; or
 - b) the gas: oil ratio (GOR) is greater than $3000\text{m}^3/\text{m}^3$. All wells producing with a GOR greater than $3000\text{m}^3/\text{m}^3$ at any time during the life of the well must be shut in until the gas is conserved.
2. If new residence is constructed or relocated within 500 metres of an existing associated gas flare after the effective date of S-10, the licensee must provide information to the new residents about the flaring operation.
3. For any sites flaring or venting combined volumes greater than $900\text{ m}^3/\text{day}$ and not conserving, a review of conservation economics must be done at least once per year using the criteria in Appendix 1.
4. ER may still require economic evaluations for sites flaring or venting combined volumes less than 900 m^3 per day and not conserving on a case-by-case basis if it is believed that conservation may be feasible.
5. The licensee may apply to discontinue conservation if annual operating expenses exceed annual revenue as long as public safety concerns, environmental impacts and reservoir protection are mitigated to the satisfaction of ER. The licensee must obtain approval from ER to discontinue conservation once it has been implemented at any facility. These approvals will be specified in the exemption sections of the licence.

4.3 Gas Plants

A Stand-alone licensed gas processing plants are exempt from the $900\text{m}^3/\text{day}$ per site flaring or incineration limits, subject to meeting the provincial air quality standards. Venting² of

¹ Volumes are calculated based on a 3-month rolling average.

² Venting means the intentional controlled release of un-combusted gas.

associated gas from gas plants are prohibited other than fugitive emissions³, planned turn-around or emergencies.

The aforementioned exemption is only valid when a specific allowable flaring or incineration volumes are assigned to the licensed gas plant as a condition of the licence.

This condition will be set on a site-by-site review basis. In order to conduct the review, the licensee shall submit an air quality model conducted in accordance with the most current Alberta Environment's *Air Quality Model Guidelines*. The modeling shall be based on maximum designed capacity of the facility, unless otherwise approved by ER.

The model shall be updated when:

- There is a change in types of gas received, i.e. from sweet dry gas to wet sour gas;
- There is a change in the gas plant processing system or expansion that requires a new licence;
- There is an addition of new waste gas destruction equipment, i.e. new flare or incinerator;
- The licence or Minister's Approval is amended, when necessary;
- There is a valid public complaints are raised regarding to air pollution emitted from the gas plant; or
- directed by ER.

All installed flaring and incineration systems must be designed and operated to destroy the waste gases to the specification prescribed in the *Saskatchewan Upstream Flaring and Incineration Specifications S-20*.

4.4 Venting Requirements

4.4.1 Venting of non-combustible or inert gas mixtures

Non-combustible or inert gases, such as nitrogen (N₂) or water vapours, from equipment, wells, facilities and pipelines or produced from wells may not have sufficient heating value to support combustion. These substances can be vented to atmosphere subject to the following requirements:

- No person shall vent any volume of gas or vapour (including water vapour) from a well, facility or pipeline in association with the aforementioned structures that contains H₂S in a concentration greater than 1000 parts per million or 1 mol/kmol as measured at the source (inlet header, tank vent, etc...) or a concentration greater than 10 parts per million or 0.01 mol/kmol as measured at the perimeter fence. Where perimeter fence is absent then:
 - at the lease berm;
 - at the edge of the lease; or
 - whichever is the lesser of the two:

³ Fugitive emissions mean unintentional releases of gas resulting from production, processing, transmission, storage, and delivery.

- If the vented substances contain other odorous compounds such as mercaptan, volatile organic compounds or ammonia, ER may set site specific emission concentration restrictions. Alternatives to venting such substances include thermal destruction, chemical oxidation or subsurface injection.
- The operator (licensee?) has taken a reasonable level of precaution to protect human health, public safety, property and the environment. The operator must also take precautions in fire prevention, explosion prevention and/or any other impacts (such as reduced visibility to traffic);
- Vent gas consisting of water vapour emitted from secondary water treatment facilities or non-sour water storage vessels (e.g., hot lime softeners and boiler feed water tanks) are excluded from these requirements.
- The licensee shall design the vent stacks so that it minimizes odour outside the lease boundary.
- Venting of these substances must not result in an exceedance of the *Saskatchewan Ambient Air Quality Standard*.
- Licensees of large facilities that vent non-combustible or inert gas mixtures may be directed to submit air quality modeling conducted in accordance with the most current Alberta Environment's *Air Quality Model Guidelines*.

4.4.2 Approved Continuous or Routine Venting

- All continuous venting greater than 900 m³ per day must be evaluated using the decision tree and ensure a reasonable level of precaution has been taken to protect human health, public safety, the environment, property, and to prevent fire or explosion.
- The licensee must burn all non-conserved volumes of gas if volumes and flow rates are sufficient to support stable combustion, even if it is less than 900m³ per day but not less than 500m³ per day.
- ER may investigate any volume of associated gas venting initiated by public complaint. If, based on the investigation, a stable combustion of the gas is feasible, upon instruction of ER, the licensee must provide acceptable justification for volumes not combusted or be required to flare/incinerate or capture the associated gas.
- ER permits the connection of pressure-relieving devices at oil production batteries to emergency storage device ("pop tanks"), provided that all other requirements in S-01 are met and are only used for emergency venting.
- Hydrocarbon products stored in atmospheric storage tanks at gas plants, compression stations, and gas batteries must not exceed a true vapour pressure of 83 kilopascals (kPa) at 21.1°C if such tanks are vented to the atmosphere.
- Temporary⁴ venting is allowed at wells (e.g., for well unloading and liquid cleanup), facilities, and gathering systems, with the following conditions:
 - Gas (measured at the release point) must be sweet (less than 10ppm H₂S).

⁴ Total gas volume must not exceed 2,000 m³ and the duration must not exceed 24 hours. Such incident may occur up to a maximum 3 times a month but the total cumulative volume of all three incidents must not add up to exceed 2,000 m³.

- Free hydrocarbon liquids must be removed from the gas before it is vented.
- All liquids must be separated and contained in accordance with the storage requirements of *S-01*.
- Total gas volume must not exceed 2,000 m³ and the duration must not exceed 24 hours. Such incident may occur up to a maximum 3 times a month but the total cumulative volume of all three incidents must not add up to exceed 2,000 m³. (This does not include the clean-out phase for well testing and servicing, when liquids and non-combustible gases may prevent stable combustion.)
- Temporary planned venting is not permitted within 500 metres of a residence unless written consent is obtained from the resident.
- Vented gas must not constitute as a unacceptable fire or explosion hazard. Any venting must not occur within a distance less than:
 - 25 metres from any flame type equipment (6 metres for diesel engines equipped with air intake shutoff device)
 - 50 metres from a wellhead; or
 - 50 metres from a flare stack.
- An appropriate flame arrester, equivalent safety device, or proper engineering and operating precautions (e.g., sufficient sweep gas velocity) must be used on all vent lines from oil storage tanks connected to flare or incinerator stacks.
- Licensee shall design the vent stacks so that it minimizes odour outside the lease boundary.
- Venting of these substances must not result in exceedance of the *Saskatchewan Ambient Air Quality Standard*.
- No person shall vent any volume of gas from a well, facility or pipeline that contains H₂S in a concentration greater than 1000 parts per million as measured at the source (inlet header, tank vent, etc) or 1 mol/kmol or a concentration greater than 10 parts per million or 0.01 mol/kmol as measured at the perimeter fence. Where a perimeter fence is absent then:
 - at the lease berm;
 - at the edge of the lease; or
 - whichever is the lesser of the two.
- If the gases contain other odorous compounds such as mercaptan, volatile organic compounds or ammonia, ER may set site specific emission concentration restrictions. Alternatives to venting such substance include thermal destruction, chemical oxidation or subsurface injection.

4.4.3 Non-routine Flaring, Incinerating, and Venting at Associated gas Conserving at all Facilities, Pipelines and Wells

The licensee must minimize non-routine flaring, incinerating, and venting during upsets and outages of associated gas conserving facilities. Licensee is strongly encouraged to notify the residents within 500 metres of the site and licensee must notify the appropriate ER Field Office by phone call, e-mail or letter of planned non-routine flaring 48 hours prior to carrying out the activity.

Non-routine flaring, incineration and venting may be carried out in an emergency, plant turn-around, drilling, well servicing, and routine maintenance and where a reasonable level of precaution has been taken to protect human health, public safety, property and the environment and to prevent fire or explosion; or approved by ER. Non-routine flaring, incineration and venting shall not extend over one week (7 days) unless otherwise approved by ER.

In addition to these requirements, for large or extended flaring events, ER recommends that the licensee contact the appropriate ER Field Centre for recommendations on approaches to minimize associated gas flaring during conserving facility outages.

- Temporary venting is allowed at wells (e.g., for well unloading and liquid cleanup), facilities, and gathering systems, with the following conditions:
 - Gas (measured at the release point) must be sweet (less than 10ppm H₂S).
 - Gas must not contain free hydrocarbon liquid (if free hydrocarbon liquids are present in the produced gas, a flare [or other gas combustion device] and liquid separation must be used).
 - All liquids must be separated and contained in accordance with the storage requirements of *S-01*.
 - Total gas volume must not exceed 2,000 m³ and the duration must not exceed 24 hours. Such incident may occur up to a maximum 3 times a month but the total cumulative volume of all three incidents must not add up to exceed 2,000 m³. (This does not include the clean-out phase for well testing and servicing, when liquids and non-combustible gases may prevent stable combustion.)
- Temporary planned venting is not permitted within 500 metres of a residence unless written consent is obtained from the resident or unless approved by ER where consent cannot be obtained.
- Vented gas must not constitute an unacceptable fire or explosion hazard. Any venting must not occur within a distance less than:
 - 25 metres from any flame type equipment (6 metres for diesel engines equipped with air intake shutoff device)
 - 50 metres from a wellhead, or
 - 50 metres from a flare stack.
- An appropriate flame arrester, equivalent safety device, or proper engineering and operating precautions (e.g., sufficient sweep gas velocity) must be used on all vent lines from oil storage tanks connected to flare or incinerator stacks.
 - Operators shall design the vent stacks so that it minimizes odour outside the lease boundary.
 - Venting of these substances must not result in exceedance of the *Saskatchewan Ambient Air Quality Standards*.
- No person shall vent any volume of gas or vapour (including water vapour) from a well, facility or pipeline that contains H₂S in a concentration greater than 1000 ppm or 1 mol/kmol or a concentration greater than 10 ppm or 0.01 mol/kmol as measured at the edge of the lease or property boundary, whichever is the lesser of the two:

- unless it is an emergency and a reasonable level of precaution has been taken to protect human health, public safety, property and the environment and to prevent fire or explosion; or
 - unless approved by ER.
- Venting of these substances must not result in exceedance of the *Saskatchewan Ambient Air Quality Standards*.
- Licensee shall design the vent stacks so that it minimizes odour outside the lease boundary.

Section 5

5.1 Associated Gas Reporting Requirements

Submission requirements specified in the Petroleum Registry.

5.2 Flaring and Incineration Performance Requirements

All flaring and incineration systems must be designed and operated to destroy the waste gases to the specification prescribed in the *Saskatchewan Upstream Flaring and Incineration Specifications S-20*.

5.3 Fugitive Emissions Management Requirements

This document does not address the management of fugitive emission.

5.4 Estimating Requirements

- ER will accept estimates of flared, incinerated, and vented gas:
 - Estimating systems must account for all gas flared, incinerated, and vented from the facility (expressed to the nearest $0.1 \times 10^3 \text{ m}^3/\text{month}$) during routine, emergency, and maintenance operations, well deliverability testing, and the depressurising of vessels, compressors, and pipelines.
 - Volume estimates must be based on measurement and/or engineering calculations.
 - Procedures or use of software for estimating flare and vent volumes must be developed by a technically knowledgeable person.
 - If flared volumes are not measured by existing flare meters, a formal system for consistently estimating and reporting these volumes must be in place.
- The Licensee must produce documentation describing flared and vented gas estimating and reporting procedures, as well as related operating logs, for review by ER upon request.
- ER may require that meters be installed where there are failures to demonstrate adequate flare or vent gas estimating and reporting systems.

5.5 Flared, Incinerated, and Vented Gas Reporting

- All flared and vented gas must be reported as described in Petroleum Registry. Incinerated gas must be reported as “flared” gas if an incinerator is used in place of a flare stack. This would not apply to acid gas streams at a gas plant that are flared or incinerated as part of normal operations; in these cases the flared or incinerated acid gas would be reported as acid gas shrinkage, not flared.
- The operator must report gas flared or vented, wherever possible, at the facility where the flaring or venting took place. This will help industry and ER staff to match up flaring or venting that is observed in the field with that reported. As part of the Electronic Data Registry, flared and vented gas at a facility must be reported separately.

- When the flaring or venting location is on a gas gathering system but is not from a licensed entity,
 - it must be reported as an activity associated with the closest licensed facility (e.g., compressor) on the gas gathering system;
 - if there is no licensed facility on the gas gathering system, it must be reported as an activity associated with the gas gathering system.
- The licensee must not prorate or allocate flared and vented volumes that occur at a facility to other upstream facilities.
- If there is gas flared or vented during drilling and completion, it must be reported.

5.6 Flaring, Incinerating, and Venting Records (Logs)

- The licensee must maintain a log of flaring, incinerating, and venting events and respond to public complaints in order to comply with release reporting requirements.
 - Logs must include information on complaints related to flaring, incinerating, and venting events and include how these complaints were investigated and addressed.
 - Logs must describe each non-routine flaring, incinerating, and venting incident and any changes implemented to prevent future non-routine events of a similar nature from occurring.
 - Logs must include the date, time, duration, gas source or type (e.g., sour inlet gas, acid gas), and volumes for each incident.
 - Logs must be kept for a minimum of 12 months.
- Flaring, incinerating, and venting records must be made available to ER upon request for each production facility, pipeline and gas processing facility where flaring, incinerating and/or venting occurs.

Appendix 1

Economic Evaluation of Gas Conservation

If conservation is determined to be economic by any method using the economic decision tree process, the gas must be conserved.

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

For any sites that have combined flaring and venting combined volumes greater than 900 m³/day and are not currently conserving associated gas, conservation economics must be updated every 12 months. This information, with the responsible individual named and the document dated, is to be kept on file by the operator and must be provided to ER upon request. Evaluation information may be stored at a central location rather than being stored on site.

Licensees are not required to provide copies of evaluations to ER unless requested. Upon request, licensee must provide the evaluation to ER within 5 working days.

If ER determines that the economic evaluation process has not been completed in accordance with S-10, the operator will be subject to enforcement action, which may include suspension of facility operations.

Economic evaluations of gas conservation must use the criteria described below. The operator must consider the most economically feasible option in providing detailed economics.

Clustering

Associated gas is economic to conserve in some areas if licensee coordinate their efforts in an efficient, cooperative process to take advantage of combined gas volumes and economies of scale. Furthermore, associated gas conservation economics will be enhanced if conservation is incorporated into the initial planning of larger multi-well projects.

Licensee of production facilities operating within 3 kilometres (km) of each other or other appropriate oil and gas facilities (including pipelines) must jointly consider “clustering” when evaluating associated gas conservation economics.

ER may make orders to suspend production in the area under consideration until the economic assessment is complete.

ER recommends that

- Licensees exchange production data and jointly consider clustering of associated gas production or regional gas conservation systems;
- the operator with the largest flare and vent volumes would take the lead in coordinating the evaluation of conservation economics for the area;

- The licensee of multi-well oil or bitumen developments must assess conservation on a project or development area basis regardless of distance. Evaluations must address all potential gas vents and flare sources associated with the multi-well development.
- The Licensee must incorporate provision for conservation at all stages of project development to optimize the opportunity for economic conservation of associated gas.
- Applications under Upstream *Facility Licensing Applications* for multi-well oil developments must include a summary of the gas conservation evaluation and a description of the operator's related project plans.

Economic Evaluation Criteria

- Evaluations must be completed on a before-tax basis.
- Price forecasts used in the evaluation of associated gas conservation projects (gas gathered, processed, and sold to market) must use the most recent GLJ Petroleum Consultants' *Product Price and Market Forecasts for the Canadian Oil and Gas Industry*.
<http://www.gljpc.com/pdfs/pricing.pdf>
- Price forecasts for power generation projects must reflect the most recent 12-month rolling average of the Pool Monthly Summary price as published by SaskPower or where this information is not available then operator shall use Alberta Electric System Operator (AESO). This information can be obtained from the AESO Web site.
<http://ets.powerpool.ab.ca>. The power price must be escalated at the long-term inflation rate (see item 8). Alternatively, the cost of the power displaced at the site may be used.
- The Licensee must have information to support the remaining reserves calculation and the production forecast (including planned drilling programs and pressure maintenance schemes).
- The Licensee must have a detailed breakdown of capital costs showing equipment, material, installation, and engineering costs. Capital costs must be approved-for-expenditure quality numbers and must be based on selection of appropriate technology. Any capital costs incurred prior to the initiation of the associated gas project (sunk costs) must not be included in the analysis; only future capital costs related to associated gas conservation may be included.
 - For new flares, if there is capital cost savings resulting from implementing gas conservation, such as any equipment that would otherwise be required, they must be considered in the conservation economic evaluation and subtracted from the overall cost of the conservation infrastructure in evaluating the economics of associated gas tie-in.
 - Salvage value of gas conservation infrastructure must be included as project revenue in the year the value would be realized (e.g., transfer of a gas compressor from one conservation project at the end of that project's life to another conservation project). The salvage value must be a reasonable market value estimate of the equipment and not a depreciated value from a taxation perspective.
- The incremental annual operating costs for the gas conservation project, including gas gathering and processing fees, are to be assumed as up to 10% of the initial capital cost of installing the conservation facilities. If the gas contains 10 moles per kilomole (mol/kmol) hydrogen sulphide (H₂S) or more, the incremental annual operating costs for the associated gas project may be assumed to be up to 20% of the capital cost to initially install the conservation facilities.

- The economic evaluation must account for any cost savings, such as reduced trucking, equipment rental, and operator costs that may result from the conservation project.
- The incremental annual operating costs for power generation projects are to be assumed as up to 10% of the initial capital cost of installing the generation facilities. Standby fees may be calculated in addition to this 10% allowance.
- The most recent long-term inflation rate must be based on the Consumer Price Index forecast as published on <http://www.stats.gov.sk.ca/>
- The discount rate must be equal to the prime lending rate of ATB Financial on loans payable in Canadian dollars plus 3%, based on the month preceding the month during which the evaluation is conducted. This rate is reviewed periodically by ER and will be revised if the cost of capital for the oil and gas industry changes significantly.
- The conservation economics must be evaluated on a royalties-in basis (paying royalties) for incremental gas and gas by-products that would otherwise be flared or vented. If this evaluation results in an NPV equal to or greater than –\$50,000Cdn, the operator must proceed with the conservation project.
- An associated gas conservation project is considered economic, and the gas must be conserved, if the economics of gas conservation generates an NPV before-tax greater than –\$50,000Cdn.
 - The NPV is defined as the sum of discounted, annual, before-tax cash flows for the economic life of the associated gas conservation project, where each annual before-tax cash flow is net of that year’s conserving project capital investment, if any.
 - The economic life of a conservation project is defined as the period from the start of the project to the time when annual expenses exceed annual revenue. Note licensee may apply to discontinue conservation if annual expenses exceed annual revenue.
- If an associated gas conservation project has an NPV less than –\$50,000Cdn and is therefore considered uneconomic on its initial evaluation, the project economics must be re-evaluated annually (within 12 months after the latest evaluation) using updated prices, costs, and forecasts.

ER Economic Evaluation Audit Requirements

- Economic evaluation audit packages submitted to ER upon request must contain the following information in International System of Units (SI):
 - detailed capital and operating cost schedules as set out in Sections 2.8.1(5) and 2.8.1(6) ERCB Directive 60;
 - oil and gas reserves calculations and supporting information (including a discussion of planned drilling programs and pressure maintenance schemes);
 - a production forecast for both the oil and gas streams and the economic limit (date and production rates) of the project based on the oil production rate (including planned drilling programs and pressure maintenance schemes);
 - a copy of the gas analysis from the project or a representative analog complete with gas heating value and gas liquid yields;
 - documentation of alternatives that were considered in order to eliminate or reduce flaring, incinerating, or venting, how they were evaluated, and the outcome of the evaluation; and
 - All associated documents shall be kept for three years and made available upon request of ER.

GLOSSARY

Acid gas Gas that is separated in the treating of solution or non-associated gas that contains hydrogen sulphide (H₂S), total reduced sulphur compounds, and/or carbon dioxide (CO₂).

Associated gas that is produced from oil or heavy oil reservoirs. This may apply to gas produced from a gas cap or in conjunction with oil or heavy oil.

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

Conservation The recovery of associated gas for use as fuel for production facilities, other useful purposes (e.g., power generation), sale, or beneficial injection into an oil or gas pool.

Conserving facility Any potential tie-in point that is conserving gas, such as batteries, plants, compressor stations, pipelines, and pump stations.

Directives means Minister's Order issued in accordance with *The Oil and Gas Conservation Act*.

Fugitive emissions Unintentional releases of gas resulting from production, processing, transmission, storage and delivery.

Gas battery A system or arrangement of tanks and other surface equipment (including interconnecting piping) that receives the effluent from one or more wells that might provide measurement and separation, compression, dehydration, dew point control, H₂S scavenging where <0.1 tonne/day of sulphur is being treated, line heating, or other gas handling functions prior to the delivery to market or other disposition. This does not include gas processing equipment that recovers more than 2 m³ /day of liquids or that processes more than 0.1 tonne/day of sulphur.

Gas processing plant A system or arrangement of equipment used for the extraction of H₂S, helium, ethane, natural gas liquids, or other substances from raw gas; does not include a wellhead separator, treater, dehydrator, or production facility that recovers less than 2 m³/day of hydrocarbon liquids without using a liquid extraction process (e.g., refrigerant, desiccant). In addition, does not include an arrangement of equipment that removes small amounts of sulphur (less than 0.1 tonne/day) through the use of non-regenerative scavenging chemicals that generate no H₂S or SO₂.

"Heavy crude oil" (heavy oil) means crude oil with density equal to or greater than 946 kg/m³. This definition only applies in the context of this document. It does not apply to any other legislation, regulations, policies, standards or guidelines.

Heavy oil wells (heavy oil) means wells that produce heavy oil. This definition only applies in the context of this document. It does not apply to any other legislation, regulations, policies, standards or guidelines.

Must indicate a requirement that an operator is legally required to meet and for which ER will initiate enforcement action for noncompliance.

New means any wells or facilities licenced after October 1, 2011.

Non-associated gas produced from a gas pool (i.e., not associated with oil or bitumen reservoirs or with production).

Non-routine flaring, venting, incinerating Intermittent and infrequent events such as planned maintenance, process upsets, and emergencies that result in flaring, venting, or incinerating.

Oil battery A system or arrangement of tanks or other surface equipment or devices receiving the effluent of one or more wells for the purpose of separation and measurement prior to the delivery to market or other disposition.

Old means any wells or facilities licenced before October 1, 2011.

Recommended or recommends The word “recommends” indicates that the procedure or practice described is a Directive that can be used by the applicable party but is not an ER requirement and does not carry an enforcement consequence. Should and suggested have the same meaning.

Refined assessment This is a more complex and data-intensive level of dispersion modelling. Refined assessments more closely estimate actual air quality impacts by using site-specific meteorological data.

Required The word “required” means that the specified action or item is a minimum regulatory requirement and is subject to ER enforcement. Shall and must have the same meaning.

Routine flaring, venting, incinerating “Routine” applies to continuous flaring, venting, and incinerating.

Screening assessment This is the quickest and simplest dispersion modelling approach. Screening assessments usually provide a conservative (worst-case) estimate of downwind concentrations. If exceedance of the *Saskatchewan Ambient Air Quality Standards* is predicted by a screening assessment, a refined assessment may be necessary. Alternatively, stack design parameters may be modified until predicted ambient air quality meets the *Saskatchewan Ambient Air Quality Standards*.

Sour gas is gas containing H₂S. Depending on H₂S concentrations, sour gas may pose a public safety hazard if released or may result in unacceptable off-lease odours if vented into the atmosphere.

Source gas flared, incinerated, or vented from a single operating site, such as an oil battery or multiple-well pad.

Sulphur emissions For the purposes of S-10, this includes all air emissions of sulphur-containing compounds, including SO₂, H₂S, and total reduced sulphur compounds (e.g., mercaptans). Sulphur emissions from flare stacks are expected to be primarily in the form of SO₂, with minor amounts of other compounds.

Venting is the intentional controlled release of un-combusted gas or vapours.

Abbreviations

10⁶ m³ million cubic metres

10³ m³ thousand cubic metres

CO₂ carbon dioxide

CSA Canadian Standards Association

GOR gas-to-oil ratio (gas:oil)

H₂S hydrogen sulphide

km kilometre

kPa kilopascal

mol/kmol mole per kilomole

MJ megajoule

MJ/m³ megajoule per cubic metre

MW megawatt

NPV net present value

ppm parts per million

PSV pressure safety valve

S-01 Saskatchewan Upstream Petroleum Industry Storage Standards

S-20 Saskatchewan Upstream Flaring and Incineration Specifications

SO₂ sulphur dioxide

SWB Single Well Battery

Regulatory Contact List

Ministry of Energy and Resources

Head Office

200, 2101 Scarth Street, Regina, S4P 2H9

Petroleum Development Branch

Todd Han, Director

(306) 787-2221

Brad Wagner, Manager of Environment and Liability

(306) 787-2348

Technical Inquiries on the Storage Standards

(306) 798-3083

Fax

(306) 787-2478

Petroleum Development Branch Field Offices

Flaring and Incineration Emission Inquires, Notification or Complaints

Estevan

P.O. Box 5000, 1219 - 5th Street, Estevan, S4A OZ1

General Inquiry

(306) 637-4541

Regional Area Manager, Dean Pylypuk

(306) 637-4542

Fax

(306) 637-4547

Kindersley

P.O. Box 850, 113 2nd Avenue E. Kindersley, SOL 1S0

General Inquiry

(306) 463-5400

Regional Area Manager, Kirk Hogarth

(306) 463-5402

Fax

(306) 463-5404

Lloydminster

4815 - 50th Street, Lloydminster, S9V OM8

General Inquiry

(306) 825-6434

Regional Area Manager, Gary Ericson

(306) 825-6436

Fax

(306) 825-6433

Swift Current

P. O. Box 5000, 350 Cheadle St. W., Swift Current, S9H 4G3

General Inquiry

(306) 778-8252

Regional Area Manager, Ron Dolter

(306) 778-8253

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(306) 778-8256