



Sulphur Recovery and Sulphur Emissions at Alberta Sour Gas Plants

Annual Report for the 2011 Calendar Year

September 2012



ENERGY RESOURCES CONSERVATION BOARD
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1 Introduction

The Energy Resources Conservation Board's (ERCB's) annual summary report on industry performance regarding sulphur recovery and sulphur emissions for conventional sour gas plants is published in accordance with *Interim Directive (ID) 2001-03: Sulphur Recovery Guidelines for the Province of Alberta* and fulfills the ERCB's commitment to report on the sulphur recovery of grandfathered sour gas plants.¹ This report covers both grandfathered sour gas plants (sulphur recovery [SR] and larger acid gas flaring [AGF] sour gas plants) and nongrandfathered sour gas plants² (SR and acid gas injection [AGI] sour gas plants), which are listed in Appendices 2.1 through 2.4.

In the last eleven years, a number of plants have been degrandfathered:³ 17 plants have made modifications and 13 plants have been relicensed to meet the requirements of *ID 2001-03* for new plants. Additionally, 12 plants have ceased operating. There are 18 grandfathered plants remaining.

Sulphur emissions have decreased substantially from 2000 to 2011 for both grandfathered AGF plants (emissions down 83 per cent) and grandfathered SR plants (emissions down 59 per cent). In the last year, emissions have decreased for grandfathered AGF plants (emissions down 19 per cent) and decreased for grandfathered SR plants (emissions down 5 per cent).

While *ID 2001-03* did not change the recovery levels expected for new gas plants, it set clear requirements on when grandfathered plants must meet the same requirements as new plants. The ID incorporated a phased approach for grandfathered plants to meet the sulphur recovery requirements set out in Table 1 of the ID and encouraged operators of SR plants to take early action to improve performance. The ID allowed older plants that were reducing sulphur throughput by 7.5 per cent each year (and thus emissions) to continue to operate under their existing approvals until December 31, 2016, at which time grandfathering will end for all plants.

Grandfathered SR plants that perform better than the minimum requirements specified in *ID 2001-03* had the option to file sulphur emission performance credit report forms between 2001 and 2012 and may use the credits to meet a portion of the sulphur recovery requirements at a future date (i.e., operate for a longer time or at a higher inlet rate before having to degrandfather the plant).

AGF plants are not eligible to earn credits and are subject over time to the sulphur recovery requirements for new plants in *ID 2001-03*, Table 1.

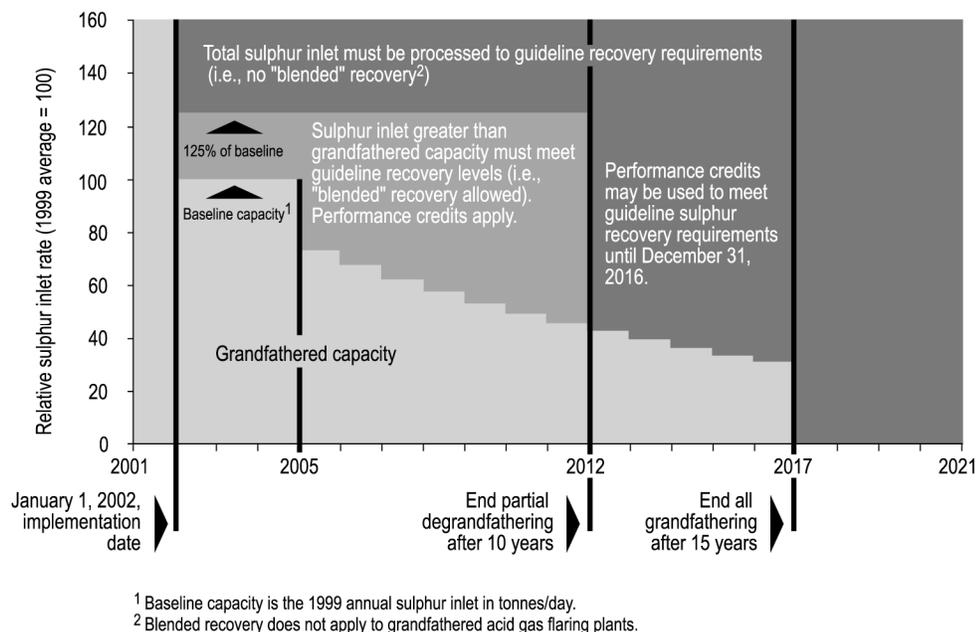
Effective January 1, 2012, SR and AGF plants operating at average calendar quarter-year sulphur inlet rates greater than the maximum grandfathered capacity, as defined in *ID 2001-03* and illustrated below, must comply with the sulphur recovery requirements listed in Table 1 of *ID 2001-03* or use earned credits to meet the Table 1 requirements. As of January 1, 2012, grandfathered sour gas plants are no longer able to earn credits. Credits earned up to December 31, 2011, may be used to meet the sulphur recovery

¹ Grandfathered plants are those that do not meet the sulphur recovery requirements for new plants listed in *ID 2001-03*. This includes some sulphur recovery plants and larger (sulphur inlet greater than 1 tonne per day [t/d]) acid gas flaring plants. All grandfathering will end by December 31, 2016.

² Nongrandfathered plants are those with an approved sulphur inlet greater than 1 t/d meeting the requirements for new plants, as listed in *ID 2001-03*. This includes both SR plants and AGI plants.

³ Degrandfathered plants are those plants that did not previously meet the requirements of *ID 2001-03* for new plants but now meet the requirements.

requirements until December 31, 2016, as long as the plant operates below the 125 per cent baseline capacity. In accordance with the ID, plants must be degrandfathered if they are to operate in excess of 125 per cent of the baseline capacity. All grandfathering ends effective December 31, 2016, as mentioned above.



Limitations on grandfathered sour gas plant approvals (ID 2001-03, Figure 1)

2 Summary of Performance for Grandfathered Plants, 2000–2011

2.1 Grandfathered Plants That Have Been Degrandfathered

In the last eleven years, 17 plants have made modifications to improve performance or install sulphur recovery equipment to meet the sulphur recovery requirements for new plants. In addition, 13 plants relicensed to meet the sulphur recovery requirements for new plants and 12 grandfathered plants have shut down. Further details on these plants are in Appendix 1.

When plants make modifications to their facilities or licensed operating parameters, they may be required to degrandfather as part of the relicensing process to meet the sulphur recovery requirements for new plants.

Plants degrandfathered in 2011 include

- 1) Balzac (Crossfield) – Nexen Inc. (shut down)
- 2) Enchant – Altagas Holdings Inc. (degrandfathered in 2006 and shut down 2012)

As of December 2011, there were 10 grandfathered SR plants and 8 grandfathered AGF plants remaining (see Appendix 2).

A detailed list of plants that have been degrandfathered in the last eleven years is in Appendix 3, along with the process used for improving sulphur recovery.

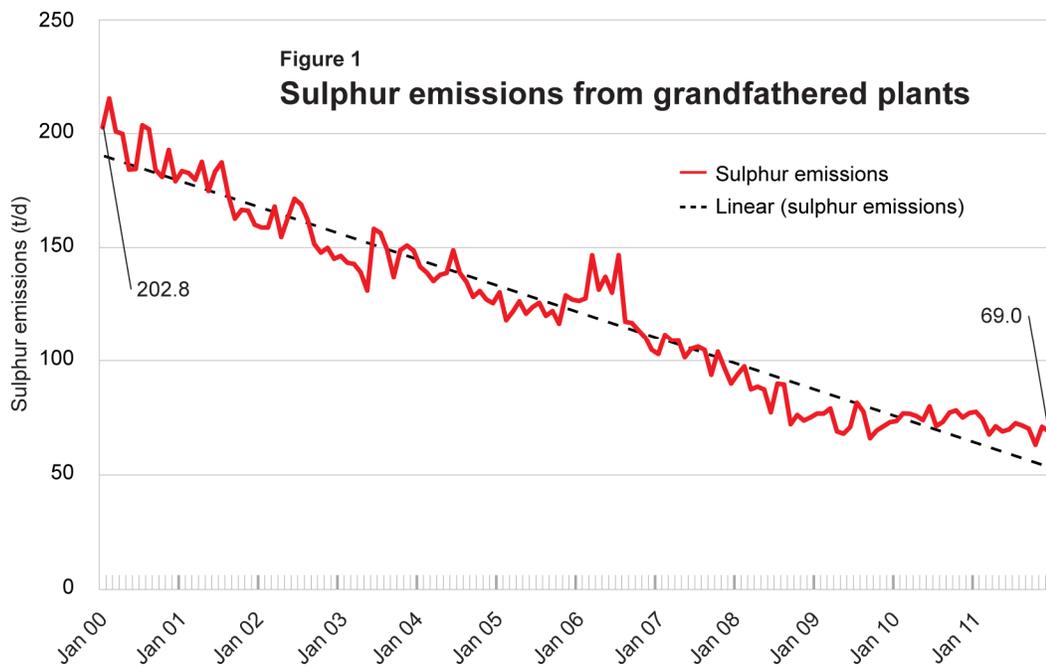
2.2 Sulphur Emissions and Inlets at Grandfathered Plants, 2000–2011

An analysis of the sulphur emissions and sulphur inlet for the plants listed in *ID 2001-03* as grandfathered follows in Sections 2.2.1 and 2.2.2. For the purpose of this analysis, plants that have been degrandfathered since *ID 2001-03* was published are included with the grandfathered plants.

2.2.1 Sulphur Emissions Reduction

The grandfathered plants substantially reduced sulphur emissions from 2000 to 2011, as shown in Figure 1. In the last few years, decreases in emissions have levelled off.

The 64 per cent drop in emissions from grandfathered plants from the 2000 baseline year to 2011, shown in Figure 1, is due to a decrease of about 83 per cent in emissions from the grandfathered AGF plants and a decrease of about 59 per cent in emissions from the grandfathered SR plants.



From 2010 to 2011, there was a 7 per cent decrease in emissions (see Figure 1) and a 6 per cent decrease in inlet for grandfathered plants.

This decrease in emissions was due in part to increased sulphur recovery performance at Kaybob Amalgamated (1 & 2) and Keyera Strachan plants and the shutdown of the Nexen Balzac (Crossfield) plant in 2011. Increased inlet and associated increased emissions at Shell Waterton partially offset this decrease in emissions.

The 83 per cent decrease in emissions from grandfathered AGF plants from 2000 to 2011 was accompanied by a 25 per cent decrease in sulphur inlet. The decrease in emissions was due in part to AGI plants installed at Apache Hope Creek (Virginia Hills), ConocoPhillips Vulcan (Long Coulee), Pengrowth Judy Creek (Swan Hills South), Harvest Operations Bellshill Lake, AltaGas Holdings Turin (Retlaw), Trilogy Resources Kaybob, and AltaGas Bantry and the installation of sulphur recovery at Suncor Energy

Wilson Creek. From 2000 to 2011, 26 of the 28 grandfathered AGF plants showed emissions reductions.

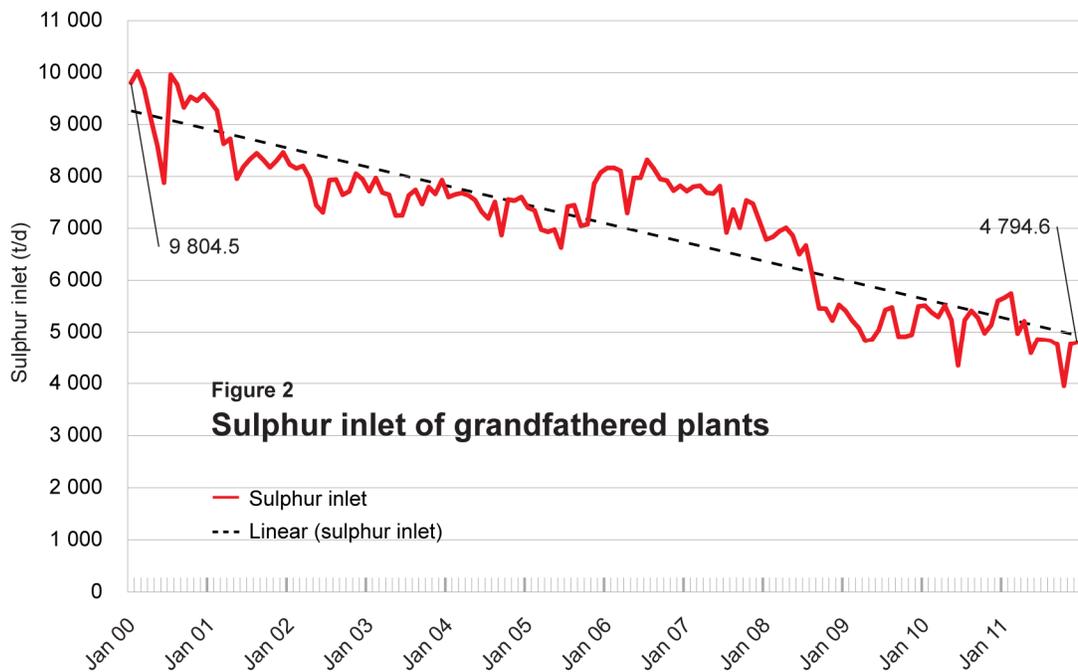
From 2000 to 2011, there was a 59 per cent decrease in emissions from grandfathered sulphur recovery plants, which was accompanied by a 48 per cent decline in sulphur inlet. The decrease in emissions was due in large part to a drop in sulphur inlet but also due to plant modifications and/or improved operations at Husky Ram River (Strachan), SemCAMS Kaybob South 3, Shell Burnt Timber, Nexen Balzac (Crossfield), Keyera Brazeau River, Shell Jumping Pound, Kaybob South 1 & 2, and Shell Waterton. Of the 28 grandfathered SR plants, 26 reduced emissions from 2000 to 2011, as shown in Appendix 4.1.

Appendix 4 lists sulphur production and emissions for each of the SR plants for the years 2000 and 2011.

2.2.2 Decline in Sulphur Inlet

Operational improvements and plant modifications have played a significant role in the 64 per cent emission reductions at the grandfathered plants since 2000. As noted above, the overall decrease in emissions has also been due to a 48 per cent decline in the sulphur inlets of these plants from 2000 to 2011, as shown in Figure 2.

As also shown in Figure 2, there was about a 6 per cent decrease in the sulphur inlets of the grandfathered plants from 2010 to 2011. This was primarily due to a decrease in throughput at four plants: Nexen Balzac (Crossfield) (shutdown in 2011), SemCAMS Kaybob South 3, Keyera Brazeau River, and Shell Jumping Pound. Inlet increases at Husky Ram River (Strachan) and Shell Waterton offset decreases by about 40 per cent.



2.3 Sulphur Emission Performance Credits

After December 31, 2011, sulphur credits can no longer be earned. Credits earned prior to 2012 by grandfathered sour gas plants with sulphur recovery can be still be used until 2017. Each emission credit may be applied as the equivalent of 1 t of sulphur not emitted. Credits may not be transferred between facilities and do not apply to AGF plants.

Emission credits may enable an operator to

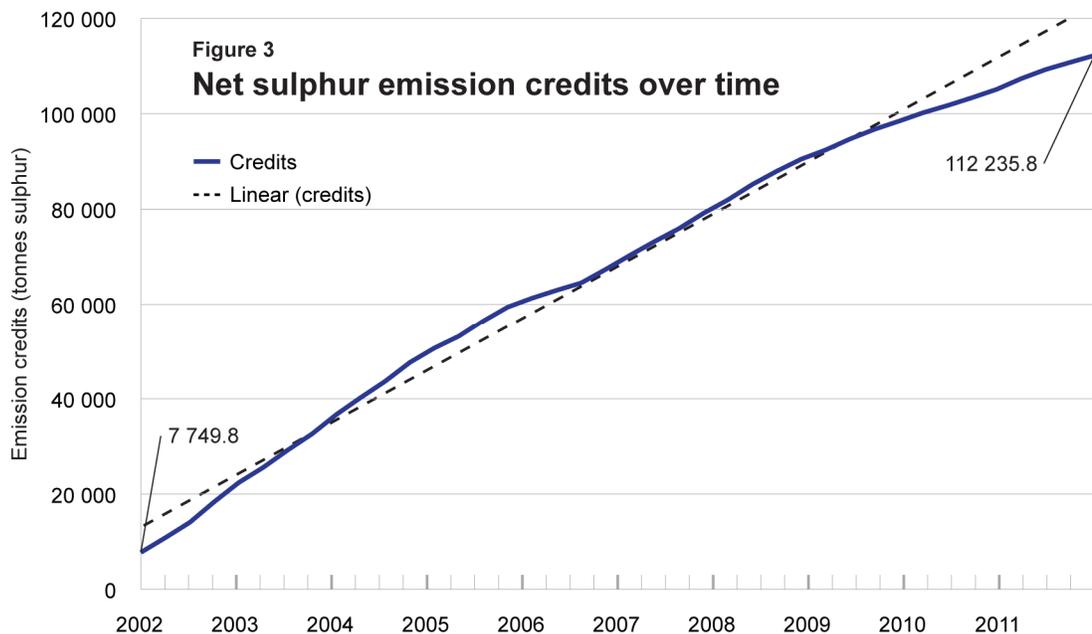
- operate at higher sulphur inlets,
- meet the Table 1 sulphur recovery efficiency requirements, and
- defer upgrading for a longer period of time.

Each emission credit, representing 1 t of sulphur emissions that would have been emitted if the plant exactly met its minimum requirement, must be earned before it can be used.

All plants that are eligible to file credit reports are doing so, and emission credits continued to increase until Dec 31, 2011. As of the end of the fourth quarter of 2011, about 112 000 t of sulphur emission credits had been earned (see Figure 3 and Appendix 5). The total sulphur emissions from grandfathered SR plants in 2011 was 23 500 t. Emission credits as of December 2011 equate to about 57 months of emissions from the grandfathered SR plants.

To date, 30 per cent of the credits are now retired due to plants degrandfathering and/or shutting down. This represents the equivalent of approximately 33 000 tonnes of emissions that will not be released by industry.

Appendix 5 lists quarterly credits earned and cumulative credits for each of the grandfathered SR plants in 2011.



3 Summary of Performance for Nongrandfathered Plants, 2000–2011

The ERCB also examined the sulphur emissions and sulphur inlet of each sour gas plant that had a sulphur inlet greater than 1 t/d and that met the requirements for new plants when *ID 2001-03* was issued.

The drop in sulphur emissions from these nongrandfathered plants was about 55 per cent between 2000 and 2011. The reduction in sulphur inlet was about 59 per cent over the same period. Details on these reductions on an individual plant basis for plants with sulphur recovery are given in Appendix 4. From 2010 to 2011, emissions for non-grandfathered plants dropped about 6 per cent, while sulphur inlet dropped about 13 per cent. The decrease in emissions is primarily due to decreased inlet at Shell Caroline.

4 Summary of Overall Performance for Grandfathered and Nongrandfathered Plants, 2000–2011

Examining the sulphur inlet and sulphur emissions of both the grandfathered AGF and sulphur recovery plants and nongrandfathered AGI and sulphur recovery plants reveals a 62 per cent drop in emissions from 2000 to 2011, together with a reduction in sulphur inlet of 53 per cent. From 2010 to 2011, emissions dropped about 7 per cent and sulphur inlet dropped about 9 per cent.

Appendix 1 Grandfathered Plants That Have Been Degrandfathered, 2000–2011

In the last eleven years, 17 plants have made modifications to improve performance or install sulphur recovery equipment to meet the sulphur recovery requirements for new plants in *ID 2001-03*. In addition, 13 plants have been relicensed to meet the sulphur recovery requirements for new plants and 12 grandfathered plants have shut down.

The 17 plants listed below underwent significant physical modifications to achieve higher sulphur recoveries.

Plants making modifications to meet the requirements for new plants

Plant name	Operator at time of change
1. Brazeau River	Keyera
2. Garrington (Olds)	Esprit
3. Homeglen (Rimbey)	Keyera
4. Bantry	AltaGas
5. Vulcan (Long Coulee)	ConocoPhillips
6. Wilson Creek	Petro-Canada
7. Rainbow	Husky
8. Edson	Talisman
9. Retlaw (Turin)	Taylor Management
10. Virginia Hills	Apache
11. Bellshill	Harvest Operations
12. Simonette	Suncor
13. Swan Hills South (Judy Creek)	Pengrowth
14. Kaybob South 3	SemCAMS
15. South Rosevear	Suncor
16. Nordegg (Brazeau River)	Keyera
17. Kaybob	Trilogy

Of the 13 plants listed below, 4 were relicensed to a higher sulphur recovery efficiency with existing equipment and/or minor modifications and 9 were relicensed to a lower throughput without modifications. Two plants have now ceased operations.

Plants relicensing to meet the requirements for new plants

Plant name	Operator at time of change
1. Okotoks (Mazeppa)	MPP
2. Crossfield East	Primewest
3. Sylvan Lake	NAL Resources
4. Sturgeon Lake	Kereco
5. Carson Creek	Pengrowth
6. Holmberg (Strome)	CNRL
7. Wilson Creek	Imperial
8. Strachan	Keyera
9. Big Bend	CNRL
10. Gold Creek	CNRL
11. Spirit River	Bonavista
12. Boundary Lake South	Talisman
13. Waterton	Shell

Grandfathered plants that have ceased operating

Plant name	Operator at time of change
1. North Rosevear	Suncor
2. Bittern Lake	CNRL
3. North Caroline	BP Canada
4. South Caroline	BP Canada
5. Harmattan - Elkton	Bonavista
6. Leduc - Woodbend	Imperial
7. West Drumheller	Penn West
8. Carstairs	Bonavista
9. Zama 1	Apache
10. West Whitecourt (Windfall)	SemCAMS
11. Balzac (Crossfield)	Nexen (2011)
12. Enchant	Taylor Management (2011)

A detailed list of plants that have been degrandfathered in the last eleven years is in Appendix 3, along with the process used for improving the sulphur recovery.

As of December 2011, there are 10 grandfathered SR plants and 8 grandfathered AGF plants remaining (see Appendices 2.1 and 2.2).

Appendix 2.1 Grandfathered Sulphur Recovery (SR) Gas Plants 2011

	Plant Code	Current Approved Sulphur Recovery Efficiency (%)	Guideline Recovery for Approved Sulphur Inlet (%)	Approved S Inlet (t/d)	Baseline Capacity 1999 S Inlet (t/d)	Change in Status (From ID 2001-03)	
1	Balzac (Crossfield) - Nexen Inc.	1050	98.0	98.5	1,730.50	414.6	Plant shut down in 2011
2	Brazeau River - Keyera Energy Ltd.	1108	98.4	98.4	466.00	67.3	Degrandfathered in 2003; became AGI
3	Burnt Timber (Undefined) - Shell Canada Limited	1131	96.5	98.4	560.00	412.4	
4	Caroline North (Caroline) - Apache Canada Ltd.	1374	69.7	69.7	5.00	5.0	Plant shut down in 2003
5	Caroline South (Caroline) - Apache Canada Ltd.	1104	85.0	89.7	9.83	6.8	Plant shut down in 2003
6	Carstairs - Bonavista Energy Corporation	1020	90.0	98.2	72.7*	9.5	Plant shut down in 2008
7	Edson - Talisman Energy Inc.	1084	98.4	98.4	350.00	220.9	Degrandfathered in 2003; upgraded SR
8	Gold Creek - Canadian Natural Resources Limited	1129	95.9	95.9	49.90	64.1	Degrandfathered in 2007
9	Jumping Pound - Shell Canada Limited	1037	96.2	98.4	619.00	472.1	
10	Kaybob South 1 & 2 (Kaybob South) - Semcams ULC	1107	98.4	98.5	1,107.70	540.6	
11	Kaybob South 3 (Kaybob South) - Semcams ULC	1144	98.5	98.5	1,999.00	1,009.6	Degrandfathered in 2006; upgraded SR
12	Lone Pine Creek - Exxonmobil Canada Ltd. & Exxonmobil Resources Comp	1139	98.0	98.3	165.40	129.5	
13	Mazeppa (Okotoks) - MPP Ltd.	1530	98.4	98.4	586.60	263.4	Degrandfathered in 2002
14	Minnehik-Buck Lake - Keyera Energy Ltd.	1047	95.6	95.9	49.17	22.0	
15	Nordegg (Brazeau River) - Keyera Energy Ltd.	1121	95.9	95.9	49.80	38.2	Degrandfathered in 2009; acid gas now going to 1133
16	Ram River (Strachan) - Husky Oil Operations Limited	1141	98.1	99.5	4660.5*	2,301.8	
17	Redwater - ARC Resources Ltd.	1028	Fluctuating	95.9	12.2*	3.1	
18	Rosevear - Bonavista Energy Corporation	1206					Plant shut down in 2001; consolidation with 1268
19	Rosevear South (Rosevear) - Bonavista Energy Corporation	1268	98.3	98.3	100.70	76.0	Degrandfathered in 2007; became AGI
20	Simonette - Keyera Energy Ltd.	1113	95.9	95.9	50.00	92.3	Degrandfathered in 2005; upgraded SR
21	Strachan - Keyera Energy Ltd.	1133	98.4	98.4	971.10	264.9	Degrandfathered in 2005
22	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	1112	95.9	95.9	49.81	40.6	Degrandfathered in 2005
23	Teepee - Canadian Natural Resources Limited	1296	92.0	95.9	25.00	17.5	
24	Waterton - Shell Canada Limited	1056	98.7	98.5	1,450.00	2,099.6	Degrandfathered in 2009
25	West Whitecourt (Windfall) - Semcams ULC	1034	98.3	98.5	1,356.00	777.6	Plant shut down in 2010
26	Wildcat Hills (Jumping Pound) - Direct Energy Marketing Limited	1054	97.5	98.3	287.50	181.3	
27	Wimborne - Penn West Petroleum Ltd.	1081	95.5	98.3	235.00	182.1	
28	Zama 1 (Zama) - Apache Canada Ltd.	1219		98.2	80.30	38.6	Plant shut down in 2009

* Annual average sulphur inlet.

Appendix 2.2 Grandfathered Acid Gas Flaring Plants 2011

	Plant Code	Guideline	2011	Approved	Baseline	Change in	
		Recovery for					S Emissions
		Approved	(t/d)	S Inlet	1999 S Inlet	(From ID 2001-03)	
		Sulphur Inlet (%)		(t/d)	(t/d)		
1	Bantry - Altagas Ltd.	1114	89.7	0.01	9.60	1.0	Degrandfathered in 2002; became AGI
2	Bellshill Lake - Harvest Operations Corp.	1280	89.7	0.00	5.77	3.8	Degrandfathered in 2005; became AGI
3	Big Bend - Canadian Natural Resources Limited	1293	0	0.02	0.67	1.0	Degrandfathered in 2006
4	Bigoray - Penn West Petroleum Ltd.	1138	0	0.54	1.70	1.8	
5	Bittern Lake - Canadian Natural Resources Limited	1124	69.7		2.48	1.0	Plant shut down in 2000
6	Boundary Lake South - Canadian Natural Resources Limited	1024	0	0.36	0.99	1.0	Degrandfathered in 2008
7	Carson Creek - Pengrowth Energy Corporation	1062	0	0.39	0.83	1.0	Degrandfathered in 2004
8	Enchant - Altagas Holdings Inc.	1039	0	0.13	0.99	1.0	Degrandfathered in 2006; Shut down in 2011
9	Forestburg - Signalta Resources Limited	1365	69.7	0.33	4.50	4.0	
10	Galloway (Ansell) - Canadian Natural Resources Limited	1417	69.7	0.63	1.40	1.3	
11	Greencourt - Canadian Natural Resources Limited	1127	69.7	0.63	1.00	1.3	
12	Harmattan-Elkton - Bonavista Energy Corporation ¹	1083	0		0.53	1.0	Plant shut down; operating as compressor
13	Hope Creek (Virginia Hills) - Apache Canada Ltd.	1135	95.9	0.13	16.00	5.2	Degrandfathered in 2004; became AGI
14	Judy Creek (Swan Hills South) - Pengrowth Energy Corporation	1069	69.7	0.01	3.75	2.7	Degrandfathered in 2006; became AGI
15	Kaybob - Trilogy Resources Ltd.	1058	95.9	0.14	49.90	1.0	Degrandfathered in 2010; became AGI
16	Leduc-Woodbend - Imperial Oil Resources Limited	1023	69.7		1.01	1.0	Plant shut down in 2006
17	Neptune (Boundary Lake South) - Penn West Petroleum Ltd.	1202	69.7	0.67	1.63	1.1	
18	Sedgewick (Killam) - Altagas Ltd.	1510	69.7	0.42	1.99	2.2	
19	Spirit River - Bonavista Energy Corporation	1560	0	0.47	0.99	1.0	Degrandfathered in 2007
20	Strome Holmberg (Holmberg) - Canadian Natural Resources Limited	1179	0	0.00	0.61	1.6	Degrandfathered in 2005
21	Sylvan Lake - Nal Resources Limited	1070	0	0.15	0.75	1.0	Degrandfathered in 2002
22	Travers (Little Bow) - Bonavista Energy Corporation	1150	69.7	0.29	1.50	1.2	
23	Turin (Retlaw) - Altagas Holdings Inc.	1191	69.7	0.03	4.64	1.7	Degrandfathered in 2004; became AGI
24	Vulcan (Long Coulee) - Conocophillips Canada Resources Corp.	1100	69.7	0.02	4.90	2.7	Degrandfathered in 2002; became AGI
25	West Drumheller - Charger Energy Corp.	1109	69.7		2.99	1.1	Plant shut down in 2007
26	Whitcourt - Taqa North Ltd.	1115	89.7	1.18	7.50	3.5	
27	Wilson Creek - Imperial Oil Resources Limited	1399	0	0.00	0.95	1.0	Degrandfathered in 2005
28	Wilson Creek - Suncor Energy Inc.	1096	85.0	0.10	4.70	2.3	Degrandfathered in 2001; became SR

Appendix 2.3 Nongrandfathered Sulphur Recovery Plants 2011

		Plant Code	Current Approved Sulphur Recovery Efficiency (%)	Approved S Inlet (t/d)
1	Brazeau River - Blaze Energy Ltd.	1482	98.4	500.00
2	Carbondale (Morinville) - Atco Midstream Ltd.	1638	69.7	1.15*
3	Caroline - Shell Canada Limited	1662	99.5	5,445.00
4	Coleman - Devon Canada Corporation	1051	98.6	800.00
5	Crossfield East - Taqa North Ltd.	1079	98.4	863.82
6	Hanlan-Robb (Basing) - Suncor Energy Inc.	1360	98.5	1,270.00
7	Harmattan-Elkton - Taylor Processing Inc.	1060	95.9	49.99
8	Hays - Canadian Natural Resources Limited	1585	90.0	9.90
9	Homeglen-Rimbey - Keyera Energy Ltd.	1004	98.3	150.00
10	Hythe Brainard (Sinclair) - Encana Corporation	1147	98.3	127.80
11	Nevis - Keyera Energy Ltd.	1002	95.9	50.00
12	Olds (Garrington) - Pengrowth Energy Corporation	1021	98.4	404.90
13	Progress - Canadian Natural Resources Limited	1506	96.5	49.50
14	Progress - Suncor Energy Inc.	1629	69.7	2.51
15	Quirk Creek - Pengrowth Energy Corporation	1134	98.3	306.4*
16	Rainbow - Altagas Ltd. [†]	1658	95.9	23.18
17	Rainbow - Husky Oil Operations Limited	1105	98.3	213.49
18	Sexsmith (La Glace) - Encana Corporation	1892	98.4	483.10
19	Swalwell - Taqa North Ltd. [‡]	1654	69.7	4.60
20	West Pembina (Brazeau River) - Keyera Energy Ltd.	1458	98.3	520.00

* Annual average sulphur inlet.

[†] Started as an AGI facility in January 2002.

[‡] Started as an AGI facility in January 2005.

Appendix 2.4. Acid Gas Injection Plants Licenced > 1t/d of Sulphur 2011

Nongrandfathered acid gas injection plants		Plant Code	Sulphur Recovery Equivalent Required (%)	Approved S Inlet (t/d)	2011 S Emissions (t/d)	2011 Sulphur Injected (t/d)
1	Acheson - Penn West Petroleum Ltd.	1628	98.2	90.20	0.01	1.45
2	Bigoray - Keyera Energy Ltd.	1357	98.2	64.00	0.05	14.68
3	Bistcho Lake (Bistcho) - Paramount Resources Ltd.	1975	95.9	25.00	0.13	5.08
4	Calmar (Leduc-Woodbend) - NEP Canada ULC	1676	95.9	15.50	0.04	3.67
5	Clear Hills (Boundary Lake South) - Canadian Natural Resources Limited	1880	95.9	38.04	0.08	6.16
6	Dunvegan - Devon Canada Corporation	1169	89.7	9.90	0.01	0.41
7	Fourth Creek (Mulligan) - Spectra Energy Midstream Corporation	1895	95.9	12.60	0.01	5.94
8	Glacier - Advantage Oil and Gas Ltd.	107835	95.9	10.75	0.09	1.61
9	Golden Spike - ATCO Midstream Ltd.	1547	95.9	26.46	0.00	1.78
10	Gordondale - Spectra Energy Midstream Corporation	1668	98.2	54.31	0.01	23.28
11	Hansman Lake (Provost) - Husky Oil Operations Limited	1698	89.7	6.90	0.00	3.65
12	Hastings Coulee (Galahad) - Husky Oil Operations Limited	1690	89.7	10.90	0.00	1.77
13	Holmberg (Kelsey) - Sword Energy Inc.	1244	69.7	3.07	0.00	0.00
14	Marlowe - Bears paw Petroleum Ltd.	1765	95.9	20.90	0.00	0.00
15	Mitsue - Penn West Petroleum Ltd. †	1123	69.7	4.60	0.00	0.25
16	Normandville - Devon Canada Corporation	1990	69.7	1.90	0.00	0.08
17	O'Chiese (Pembina) - Conocophillips Canada Operations Ltd.	1970	95.9	28.74	0.01	0.68
18	Paddle River - Keyera Energy Ltd.	1089	69.7	1.50	0.00	0.40
19	Pembina - Imperial Oil Resources Limited	1625	89.7	7.23	0.01	3.30
20	Pembina - Keyera Energy Ltd.	1402	95.9	29.7*	0.01	1.71
21	Pouce Coupe (Pouce Coupe South) - Birchcliff Energy Ltd.	106663	95.9	34.59	0.04	1.91
22	Pouce Coupe - Altagas Ltd.	1634	95.9	17.25	0.02	0.54
23	Pouce Coupe - Spectra Energy Midstream Corporation	1746	95.9	26.18	0.01	3.56
24	Puskwaskau - Devon Canada Corporation	1964	89.7	5.15	0.00	0.06
25	Rainbow - Husky Oil Operations Limited	1155	95.9	20.1*	0.00	0.00
26	Rycroft - Birchcliff Energy Ltd.	1793	95.9	21.00	0.00	0.94
27	Steen River (Dizzy) - Strategic Oil & Gas Ltd.	1738	95.9	34.40	0.02	0.84
28	Thompson Lake (Provost) - Husky Oil Operations Limited	1695	95.9	12.00	0.02	3.47
29	Wayne-Rosedale - Encana Corporation	1888	89.7	5.9*	0.01	1.09
30	Wembley - Conocophillips Canada Resources Corp.	1520	98.3	124.00	0.45	69.23
31	West Culp (Eaglesham North) - Devon Canada Corporation	1775	95.9	17.20	0.00	0.36
32	Wizard Lake - Atco Midstream Ltd.	1672	69.7	3.30	0.00	0.05
33	Zama 2 & 3 (Zama) - Apache Canada Ltd.(1878&1978 amalgamated)	1878	98.3	247.00	0.05	10.01

* Annual average sulphur inlet.

† Previously a nongrandfathered acid gas flaring plant that had emissions of less than 1 t/d and is now an AGI facility.

Grandfathered sulphur recovery or grandfathered acid gas flaring plants that are now AGI facilities

34	Bantry - Altagas Ltd.	1114	89.7	9.60	0.01	1.43
35	Bellshill Lake - Harvest Operations Corp.	1280	89.7	5.77	0.00	3.25
36	Brazeau River - Keyera Energy Ltd.	1108	98.4	466.00	0.53	47.62
37	Hope Creek (Virginia Hills) - Apache Canada Ltd.	1135	95.9	16.00	0.13	4.16
38	Judy Creek (Swan Hills South) - Pengrowth Energy Corporation	1069	69.7	3.75	0.01	1.61
39	Kaybob - Trilogy Resources Ltd.	1058	95.9	49.90	0.14	9.81
40	Rainbow - Husky Oil Operations Limited	1105	98.3	213.49	0.09	90.80
41	Rosevear South (Rosevear) - Bonavista Energy Corporation	1268	98.3	100.70	0.11	29.04
42	Turin (Retlaw) - Altagas Holdings Inc.	1191	69.7	4.64	0.03	1.60
43	Vulcan (Long Coulee) - Conocophillips Canada Resources Corp.	1100	69.7	4.90	0.02	0.82

Appendix 3. Plants That Have Been Degrandfathered

Plants that have made modifications

		Plant Code	Plant Name	Approved S Inlet (t/d)	Modification Process
1	Plant Mods	1108	Brazeau R. - Keyera	400.00	(AGI)
2	Plant Mods	1021	Garrington (Olds) - Pengrowth	404.90	(SuperClaus)
3	Plant Mods	1004	Homeglen Rimbey - Keyera	150.00	(SuperClaus)
4	Plant Mods	1114	Bantry - AltaGas	9.60	(AGI)
5	Plant Mods	1100	Vulcan - ConocoPhillips	4.90	(AGI)
6	Plant Mods	1096	Wilson Creek - Petro-Canada	4.70	(Claus)
7	Plant Mods	1105	Rainbow - Husky	213.50	(AGI)
8	Plant Mods	1084	Edson - Talisman	350.00	(SuperClaus)
9	Plant Mods	1191	Retlaw (Turin) - Taylor Management	4.64	(AGI)
10	Plant Mods	1135	Virginia Hills (Hope Creek) - Apache	16.00	(AGI)
11	Plant Mods	1280	Bellshill Lake - Harvest Operations	5.77	(AGI)
12	Plant Mods	1113	Simonette - Suncor	120.00	(SuperClaus)
13	Plant Mods	1069	Swan Hills South (Judy Creek) - Pengrowth	3.75	(AGI)
14	Plant Mods	1144	Kaybob S. 3 - SemCAMS	1,999.00	(SuperClaus)
15	Plant Mods	1268	Rosevear (South) - Suncor	100.70	(AGI)
16	Plant Mods	1121	Nordegg (Brazeau River) - Keyera	49.80	Deliver acid gas to 1133
17	Plant Mods	1058	Kaybob - Trilogy	49.90	(AGI)

Plants that have been relicensed to higher sulphur recovery efficiency or lower sulphur inlets

		Plant Code	Plant Name	Approved S Inlet (t/d)
1	Relicensed	1530	Okotoks (Mazeppa) - MPP	586.60
2	Relicensed	1079	Crossfield E. - Primewest	863.82
3	Relicensed	1070	Sylvan Lake - NAL Resources	0.75
4	Relicensed	1112	Sturgeon Lake - Cadence	49.81
5	Relicensed	1062	Carson Creek - Pengrowth	0.83
6	Relicensed	1179	Holmberg (Strome Holmberg) - CNRL	0.61
7	Relicensed	1399	Wilson Creek - Imperial	0.95
8	Relicensed	1133	Strachan - Keyera	971.10
9	Relicensed	1293	Big Bend - CNRL	0.67
10	Relicensed	1129	Gold Creek - CNRL	49.90
11	Relicensed	1560	Spirit River - Bonavista	0.99
12	Relicensed	1024	Boundary Lake - Talisman	0.99
13	Relicensed	1056	Waterton - Shell	1450.00

Appendix 4.1. Gas Plants with Sulphur Recovery, Year 2011 Minus Year 2000

			Change in production and emissions year 2011 minus year 2000	
			2011-2000	2011-2000
Plant Code	Field-Licensee		S Production (t/y)	S Emissions (t/y)
Grandfathered plants (in 2001)				
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	(478,468.7)	(6,211.5)
2	1144	Kaybob South 3 (Kaybob South) - Semcams Ulc	(216,278.5)	(4,696.0)
3	1034	West Whitecourt (Windfall) - Semcams Ulc	(292,237.0)	(4,616.6)
4	1131	Burnt Timber (Undefined) - Shell Canada Limited	(10,972.5)	(2,315.7)
5	1050	Balzac (Crossfield) - Nexen Inc.	(116,363.6)	(2,041.7)
6	1108	Brazeau River - Keyera Energy Ltd.	(35,158.5)	(1,959.7)
7	1037	Jumping Pound - Shell Canada Limited	21,264.5	(1,890.0)
8	1107	Kaybob South 1 & 2 (Kaybob South) - Semcams Ulc	(157,938.9)	(1,620.1)
9	1056	Waterton - Shell Canada Limited	(263,532.4)	(1,135.6)
10	1081	Wimborne - Penn West Petroleum Ltd.	(36,537.2)	(994.5)
11	1084	Edson - Talisman Energy Inc.	(22,228.2)	(773.8)
12	1121	Nordegg (Brazeau River) - Keyera Energy Ltd.	(12,842.1)	(713.6)
13	1219	Zama 1 (Zama) - Apache Canada Ltd.	(14,405.1)	(583.9)
14	1113	Simonette - Keyera Energy Ltd.	(18,451.1)	(533.2)
15	1206	Rosevear - Bonavista Energy Corporation	(12,290.7)	(499.6)
16	1054	Wildcat Hills (Jumping Pound) - Direct Energy Marketing Limited	(27,470.3)	(475.7)
17	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	(11,273.3)	(428.8)
18	1268	Rosevear South (Rosevear) - Bonavista Energy Corporation	(18,426.7)	(415.7)
19	1104	Caroline South (Caroline) - Apache Canada Ltd.	(2,186.0)	(349.5)
20	1020	Carstairs - Bonavista Energy Corporation	(3,370.0)	(324.6)
21	1129	Gold Creek - Canadian Natural Resources Limited	(15,572.3)	(309.2)
22	1530	Mazeppa (Okotoks) - Mpp Ltd.	(27,405.8)	(287.9)
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. & Exxonmobil Resources Comp	(17,530.1)	(255.0)
24	1047	Minnehik-Buck Lake - Keyera Energy Ltd.	(3,943.5)	(171.2)
25	1374	Caroline North (Caroline) - Apache Canada Ltd.	(903.1)	(86.8)
26	1296	Teepee - Canadian Natural Resources Limited	(1,319.2)	(74.3)
27	1028	Redwater - Arc Resources Ltd.	(393.0)	68.1
28	1133	Strachan - Keyera Energy Ltd.	85,886.2	674.2
Totals			(1,710,347.1)	(33,021.9)

Grandfathered plants that were previously acid gas flaring and are now sulphur recovery

1	1096	Wilson Creek - Suncor Energy Inc.		(991.4)
Totals			259.8	(991.4)

Nongrandfathered plants (plants meeting the requirements for new plants)

1	1079	Crossfield East - Taqa North Ltd.	(117,476.0)	(2,533.0)
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	(150,444.9)	(2,319.0)
3	1021	Olds (Garrington) - Pengrowth Energy Corporation	(32,011.7)	(1,240.7)
4	1105	Rainbow - Husky Oil Operations Limited	(22,351.5)	(1,090.9)
5	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	(71,004.7)	(999.3)
6	1004	Homeglen-Rimbey - Keyera Energy Ltd.	(9,100.7)	(900.9)
7	1662	Caroline - Shell Canada Limited	(1,261,514.1)	(669.3)
8	1892	Sexsmith (La Glace) - Encana Corporation	(52,604.2)	(442.0)
9	1002	Nevis - Keyera Energy Ltd.	(27,513.4)	(278.9)
10	1134	Quirk Creek - Pengrowth Energy Corporation	(36,118.9)	(223.7)
11	1051	Coleman (Undefined) - Devon Canada Corporation	(45,535.3)	(173.5)
12	1654	Swalwell - Taqa North Ltd.	(533.4)	(138.9)
13	1045	Bonnie Glen - Imperial Oil Resources Limited	(3,062.0)	(125.7)
14	1147	Hythe Brainard (Sinclair) - Encana Corporation	(15,284.5)	(118.3)
15	1506	Progress - Canadian Natural Resources Limited	1,424.7	(81.6)
16	1585	Hays - Canadian Natural Resources Limited	(683.5)	(77.1)
17	1658	Rainbow - Altagas Ltd.	700.8	(67.7)
18	1482	Brazeau River - Blaze Energy Ltd.	(13,964.9)	(40.7)
19	1060	Harmattan-Elkton - Taylor Processing Inc.	(6,829.9)	(33.4)
20	1638	Carbondale (Morinville) - Atco Midstream Ltd.	(326.7)	(0.2)
21	1629	Progress - Suncor Energy Inc.	158.8	0.0
Totals			(1,864,076.1)	(11,554.7)

Grand totals			(3,574,163.4)	(45,568.0)
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Appendix 4.2. Gas Plants with Sulphur Recovery, Year 2000

Plant Code	Field-Licensee	Total Inlet (t/y)	Total Annual Emissions (t/y)	Actual Sulphur Recovery Effic. (%)	Current Approved Sulphur Recovery Effic. (%)	Total Annual Production (t/y)	
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	791,052.9	7,877.7	99.0	98.1	781,009.3
2	1144	Kaybob South 3 (Kaybob South) - Semcams Ulc	360,565.8	6,646.1	98.2	98.1	369,708.4
3	1034	West Whitecourt (Windfall) - Semcams Ulc	286,311.3	4,616.6	98.4	98.3	292,237.0
4	1131	Burnt Timber (Undefined) - Shell Canada Limited	156,959.7	4,844.0	96.9	96.5	152,115.5
5	1050	Balzac (Crossfield) - Nexen Inc.	144,323.2	2,408.8	98.3	98.0	141,245.3
6	1108	Brazeau River - Keyera Energy Ltd.	36,697.0	2,152.6	94.2	92.1	35,158.5
7	1037	Jumping Pound - Shell Canada Limited	161,744.1	5,509.7	96.6	96.2	158,522.1
8	1107	Kaybob South 1 & 2 (Kaybob South) - Semcams Ulc	234,341.8	2,756.9	98.9	98.4	250,134.3
9	1056	Waterton - Shell Canada Limited	671,377.4	6,233.1	99.1	98.7	679,224.2
10	1081	Wimborne - Penn West Petroleum Ltd.	57,618.0	1,833.9	96.7	95.5	54,008.0
11	1084	Edson - Talisman Energy Inc.	73,009.3	1,421.2	98.1	97.9	73,337.4
12	1121	Nordegg (Brazeau River) - Keyera Energy Ltd.	12,991.3	727.9	94.6	93.5	12,842.1
13	1219	Zama 1 (Zama) - Apache Canada Ltd.	15,117.5	583.9	96.1	92.0	14,405.1
14	1113	Simonette - Keyera Energy Ltd.	32,358.2	793.8	97.5	96.5	31,239.2
15	1206	Rosevear - Bonavista Energy Corporation	10,771.6	499.6	96.1	94.6	12,290.7
16	1054	Wildcat Hills (Jumping Pound) - Direct Energy Marketing Limited	71,413.7	1,220.0	98.2	97.5	66,931.2
17	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	18,698.9	729.2	96.2	94.0	18,456.1
18	1268	Rosevear South (Rosevear) - Bonavista Energy Corporation	16,104.4	457.5	97.6	95.6	18,426.7
19	1104	Caroline South (Caroline) - Apache Canada Ltd.	2,483.7	349.5	86.2	85.0	2,186.0
20	1020	Carstairs - Bonavista Energy Corporation	3,815.5	324.6	91.2	90.0	3,370.0
21	1129	Gold Creek - Canadian Natural Resources Limited	20,071.4	514.9	97.6	97.0	20,883.0
22	1530	Mazeppa (Okotoks) - Mpp Ltd.	95,120.2	1,260.7	98.7	98.3	95,760.9
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. & Exxonmobil Resources Comp	38,390.2	599.7	98.4	98.0	37,232.3
24	1047	Minnehik-Buck Lake - Keyera Energy Ltd.	7,018.8	270.4	96.1	95.6	6,748.4
25	1374	Caroline North (Caroline) - Apache Canada Ltd.	1,039.2	86.8	91.2	89.7	903.1
26	1296	Teepee - Canadian Natural Resources Limited	5,424.7	372.2	93.2	92.0	5,070.9
27	1028	Redwater - Arc Resources Ltd.	1,184.9	88.3	92.7	70.0	1,118.3
28	1133	Strachan - Keyera Energy Ltd.	97,769.5	1,169.6	98.8	98.1	97,129.6
	Totals		3,423,774.2	56,349.3	98.4		3,431,693.7

Grandfathered plants that were previously acid gas flaring and are now sulphur recovery

1	1096	Wilson Creek - Suncor Energy Inc.	908.0	1,036.4	0.0		
	Totals		908.0	1,036.4	0.0		

Nongrandfathered plants (plants meeting the requirements for new plants)

1	1079	Crossfield East - Taqa North Ltd.	170,668.1	3,028.6	98.2	98.0	169,921.2
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	299,824.2	3,434.8	98.8	98.5	288,911.9
3	1021	Olds (Garrington) - Pengrowth Energy Corporation	103,220.0	2,152.2	97.9	97.1	101,783.0
4	1105	Rainbow - Husky Oil Operations Limited	25,910.0	1,123.5	95.2	95.0	22,351.5
5	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	107,983.1	1,624.1	98.6	98.4	112,615.2
6	1004	Homeglen-Rimbey - Keyera Energy Ltd.	19,957.4	1,003.0	94.8	92.0	18,208.7
7	1662	Caroline - Shell Canada Limited	1,833,270.9	2,458.5	99.9	99.8	1,844,827.3
8	1892	Sexsmith (La Glace) - Encana Corporation	125,906.9	1,292.2	99.0	98.4	126,382.7
9	1002	Nevis - Keyera Energy Ltd.	37,590.7	467.5	98.8	98.4	37,091.8
10	1134	Quirk Creek - Pengrowth Energy Corporation	86,771.0	1,002.1	98.9	98.3	90,372.6
11	1051	Coleman (Undefined) - Devon Canada Corporation	137,197.0	1,369.9	99.0	98.6	136,352.7
12	1654	Swalwell - Taqa North Ltd.	517.6	138.9	79.3	70.0	533.4
13	1045	Bonnie Glen - Imperial Oil Resources Limited	3,281.6	125.7	96.1	95.9	3,062.0
14	1147	Hythe Brainard (Sinclair) - Encana Corporation	28,431.8	296.2	99.0	98.3	28,291.8
15	1506	Progress - Canadian Natural Resources Limited	9,215.7	237.8	97.4	96.5	9,060.8
16	1585	Hays - Canadian Natural Resources Limited	2,390.2	129.0	94.5	90.0	2,217.5
17	1658	Rainbow - Altagas Ltd.	1,882.0	127.9	92.6	70.0	1,597.4
18	1482	Brazeau River - Blaze Energy Ltd.	97,601.0	917.1	99.1	98.4	96,505.4
19	1060	Harmattan-Elkton - Taylor Processing Inc.	11,515.1	164.6	98.6	98.6	11,875.6
20	1638	Carbondale (Morinville) - Atco Midstream Ltd.	364.6	0.2	100.0	69.7	403.5
21	1629	Progress - Suncor Energy Inc.	389.1	0.0	100.0	69.7	336.7
	Totals		3,103,887.8	21,093.7	99.3		3,102,702.7

	Grand totals		6,528,570.0	78,479.4	98.8		6,534,396.4
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Appendix 4.3. Gas Plants with Sulphur Recovery, Year 2011

Plant Code	Field-Licensee	Total Inlet (t/y)	Total Annual Emissions (t/y)	Actual Sulphur Recovery Effic. (%)	Current Approved Sulphur Recovery Effic. (%)	Total Annual Production (t/y)	
Grandfathered plants (in 2001)							
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	305,384.8	1,666.3	99.5	98.1	302,540.6
2	1144	Kaybob South 3 (Kaybob South) - Semcams Ulc	155,484.6	1,950.1	98.7	98.5	153,429.9
3	1034	West Whitecourt (Windfall) - Semcams Ulc	0.0	0.0			0.0
4	1131	Burnt Timber (Undefined) - Shell Canada Limited	136,680.7	2,528.3	98.2	96.5	141,143.0
5	1050	Balzac (Crossfield) - Nexen Inc.	26,014.8	367.1	98.5	98.0	24,881.7
6	1108	Brazeau River - Keyera Energy Ltd.	17,244.1	192.9	98.9	98.4	Injected (17,381.0)
7	1037	Jumping Pound - Shell Canada Limited	184,580.8	3,619.7	98.0	96.2	179,786.6
8	1107	Kaybob South 1 & 2 (Kaybob South) - Semcams Ulc	93,531.6	1,136.8	98.8	98.4	92,195.4
9	1056	Waterton - Shell Canada Limited	419,864.2	5,097.6	98.8	98.7	415,691.8
10	1081	Wimborne - Penn West Petroleum Ltd.	18,741.5	839.4	95.4	95.5	17,470.9
11	1084	Edson - Talisman Energy Inc.	52,719.5	647.4	98.7	98.4	51,109.2
12	1121	Nordeg (Brazeau River) - Keyera Energy Ltd. ¹	4,295.5	14.3	99.7	95.9	Delivered (4,254.0)
13	1219	Zama 1 (Zama) - Apache Canada Ltd.	0.0	0.0			0.0
14	1113	Simonette - Keyera Energy Ltd.	13,298.5	260.7	98.0	95.9	12,788.1
15	1206	Rosevear - Bonavista Energy Corporation	0.0	0.0	0.0	94.6	0.0
16	1054	Wildcat Hills (Jumping Pound) - Direct Energy Marketing Limited	41,130.8	744.3	98.1	97.5	39,460.9
17	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	7,407.3	300.4	96.0	95.9	7,182.8
18	1268	Rosevear South (Rosevear) - Bonavista Energy Corporation	11,145.9	41.8	99.6	98.3	Injected (10,600.1)
19	1104	Caroline South (Caroline) - Apache Canada Ltd.	0.0	0.0	0.0	69.7	0.0
20	1020	Carstairs - Bonavista Energy Corporation	0.0	0.0			0.0
21	1129	Gold Creek - Canadian Natural Resources Limited	5,487.8	205.7	96.3	95.9	5,310.7
22	1530	Mazeppa (Okotoks) - Mpp Ltd.	68,834.7	972.8	98.6	98.4	68,355.1
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. & Exxonmobil Resources Comp	19,398.7	344.7	98.3	98.0	19,702.1
24	1047	Minnehik-Buck Lake - Keyera Energy Ltd.	2,933.1	99.2	96.6	95.6	2,804.9
25	1374	Caroline North (Caroline) - Apache Canada Ltd.	0.0	0.0	0.0	85.0	0.0
26	1296	Teepee - Canadian Natural Resources Limited	4,105.8	297.9	92.6	92.0	3,751.7
27	1028	Redwater - Arc Resources Ltd.	871.1	156.4	82.3	70.0	725.3
28	1133	Strachan - Keyera Energy Ltd.	190,805.7	1,843.8	99.0	98.4	183,015.8
Totals			1,779,961.7	23,327.4	98.7		1,721,346.5

¹ Delivering acid gas to 1133 sulphur recovery plant.

Grandfathered plants that were previously acid gas flaring and are now sulphur recovery

1	1096	Wilson Creek - Suncor Energy Inc.	333.8	45.0	85.2	85.0	259.8
Totals			333.8	45.0	85.2	85.0	259.8

Nongrandfathered plants (plants meeting the requirements for new plants)

1	1079	Crossfield East - Taqa North Ltd.	50,996.9	495.6	99.1	98.4	52,445.2
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	135,472.2	1,115.8	99.2	98.5	138,467.0
3	1021	Olds (Garrington) - Pengrowth Energy Corporation	70,619.3	911.6	98.7	98.4	69,771.3
4	1105	Rainbow - Husky Oil Operations Limited	36,458.5	32.5	99.9	98.3	Injected (33,140.3)
5	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	42,383.5	624.8	98.5	98.3	41,610.5
6	1004	Homeglen-Rimbey - Keyera Energy Ltd.	9,095.4	102.1	98.9	98.3	9,108.0
7	1662	Caroline - Shell Canada Limited	559,161.3	1,789.2	99.7	99.5	583,313.2
8	1892	Sexsmith (La Glace) - Encana Corporation	71,962.2	850.3	98.9	98.4	73,778.5
9	1002	Nevis - Keyera Energy Ltd.	9,593.6	188.7	98.1	95.9	9,578.4
10	1134	Quirk Creek - Pengrowth Energy Corporation	53,364.6	778.4	98.6	98.3	54,253.7
11	1051	Coleman (Undefined) - Devon Canada Corporation	92,033.9	1,196.4	98.7	98.6	90,817.4
12	1654	Swalwell - Taqa North Ltd.	0.0	0.0		69.7	0.0
13	1045	Bonnie Glen - Imperial Oil Resources Limited	0.0	0.0			0.0
14	1147	Hythe Brainard (Sinclair) - Encana Corporation	13,155.1	178.0	98.7	98.3	13,007.3
15	1506	Progress - Canadian Natural Resources Limited	11,093.3	156.1	98.5	96.5	10,485.5
16	1585	Hays - Canadian Natural Resources Limited	1,625.8	51.9	96.7	90.0	1,534.0
17	1658	Rainbow - Altgas Ltd.	2,418.6	60.1	97.4		2,298.2
18	1482	Brazeau River - Blaze Energy Ltd.	84,946.0	876.4	98.9	98.4	82,540.5
19	1060	Harmattan-Elkton - Taylor Processing Inc.	5,171.9	131.2	97.5	95.9	5,045.7
20	1638	Carbondale (Morinville) - Atco Midstream Ltd.	74.9	0.0	100.0	69.7	76.8
21	1629	Progress - Suncor Energy Inc.	468.8	0.0	100.0	69.7	495.5
Totals			1,250,096.0	9,539.0	99.2		1,238,626.6

Grand totals			3,030,391.5	32,911.4	98.9		2,960,233.0
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Appendix 5: Sulphur Credits Earned

			Credits				Cumulative Credits				Status
			Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	
Grandfathered Sulphur Recovery Gas Plants											
1	1108	Brazeau R. -Keyspan									Degradfathered
2	1121	Brazeau R. -Keyspan				727.3	727.3	727.3	727.3		Degradfathered
3	1131	Burnt Timber -Shell	258.4	274.7	257.4	324.3	4,432.4	4,707.1	4,964.4	5,288.7	
4	1374	Caroline North -BP Canada									Plant shut down
5	1104	Caroline South -BP Canada									Plant shut down
6	1020	Carstairs -Bonivista					293.5	293.5	293.5	293.5	Plant shut down
7	1050	Crossfield (Balzac) -Nexen	113.8	9.1			3,940.3	3,949.5	3,949.5	3,949.5	Plant shut down
8	1084	Edson -Talisman					122.2	122.2	122.2	122.2	Degradfathered
9	1129	Gold Creek -CNRL					189.5	189.5	189.5	189.5	Degradfathered
10	1037	Jumping Pound -Shell	287.0	289.7	251.7	270.0	12,375.9	12,665.6	12,917.3	13,187.3	
11	1107	Kaybob S. 1 & 2 -SemCAMS	97.2	75.1	95.8	90.5	3,954.9	4,030.0	4,125.7	4,216.3	
12	1144	Kaybob S. 3 -SemCAMS					3,213.9	3,213.9	3,213.9	3,213.9	Degradfathered
13	1139	Lone Pine Ck. -ExxonMobil	14.0	16.5	22.3	1.5	651.7	668.2	690.5	692.1	
14	1047	Minnehik B. L. -Keyera	8.0	7.0	3.8	10.1	207.8	214.8	218.6	228.6	
20	1141	Ram River (Strachan) -Husky	1,346.5	1,151.2	830.9	798.8	44,526.8	45,678.0	46,508.9	47,307.7	
15	1530	Mazeppa (Okotoks) -MPP									Degradfathered
16	1028	Redwater -ARC	23.9	25.8	5.3	4.8	804.2	830.0	835.3	840.1	Variable inlet rate
17	1206	Rosevear (North)-Bonavista ¹									Plant shut down
18	1268	Rosevear (South)-Bonavista ¹					1,634.7	1,634.7	1,634.7	1,634.7	Degradfathered
19	1113	Simonette -Keyera					663.7	663.7	663.7	663.7	Degradfathered
21	1133	Strachan -Keyera					1,229.7	1,229.7	1,229.7	1,229.7	Degradfathered
22	1112	Sturgeon Lk. -Barrick					590.6	590.6	590.6	590.6	Degradfathered
23	1296	Teepee -CNRL	4.9	-6.0	-2.5	-12.3	1,059.7	1,053.7	1,051.2	1,038.9	
24	1056	Waterton -Shell					13,346.2	13,346.2	13,346.2	13,346.2	Degradfathered
25	1054	Wildcat Hills -Direct Energy	70.9	26.5	53.6	29.4	3,786.8	3,813.3	3,866.8	3,896.2	
26	1081	Wimborne -Devon	17.2	39.4	-17.3	-54.2	2,429.4	2,468.9	2,451.5	2,397.4	
27	1034	West Whitecourt (Windfall) -SemCAMS					6,199.3	6,199.3	6,199.3	6,199.3	Plant shut down
28	1219	Zama -Apache					982.4	982.4	982.4	982.4	Plant shut down
		Totals	2,241.6	1,908.9	1,500.9	1,463.0	107,363.0	109,271.9	110,772.8	112,235.8	

¹ Plant Consolidation