



Sulphur Recovery and Sulphur Emissions at Alberta Sour Gas Plants

Annual Report for the 2010 Calendar Year

July 2011



ENERGY RESOURCES CONSERVATION BOARD
ST101-2011: Sulphur Recovery and Sulphur Emissions at Alberta Sour Gas Plants for the 2010
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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 grandfathered¹ sour gas plants. This report covers both grandfathered sour gas plants (sulphur recovery [SR] and larger acid gas flaring [AGF] sour gas plants) and nongrandfathered² sour gas plants (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 14 plants have been relicensed to meet the requirements for new plants. Additionally, 10 plants have ceased operating. There are 19 grandfathered plants remaining.

Sulphur emissions have decreased substantially from 2000 to 2010 for both grandfathered AGF plants (emissions down 80 per cent) and grandfathered SR plants (emissions down 56 per cent). In the last year, emissions have decreased for grandfathered AGF plants (emissions down 8 per cent) and increased for grandfathered SR plants (emissions up 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 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* have the option to file sulphur emission performance credit report forms 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). All grandfathered SR plants are taking advantage of the emission credit program, and credits continue to increase every year.

AGF plants have no ability to earn credits and are subject over time to the sulphur recovery requirements for new plants in *ID 2001-03*, Table 1.

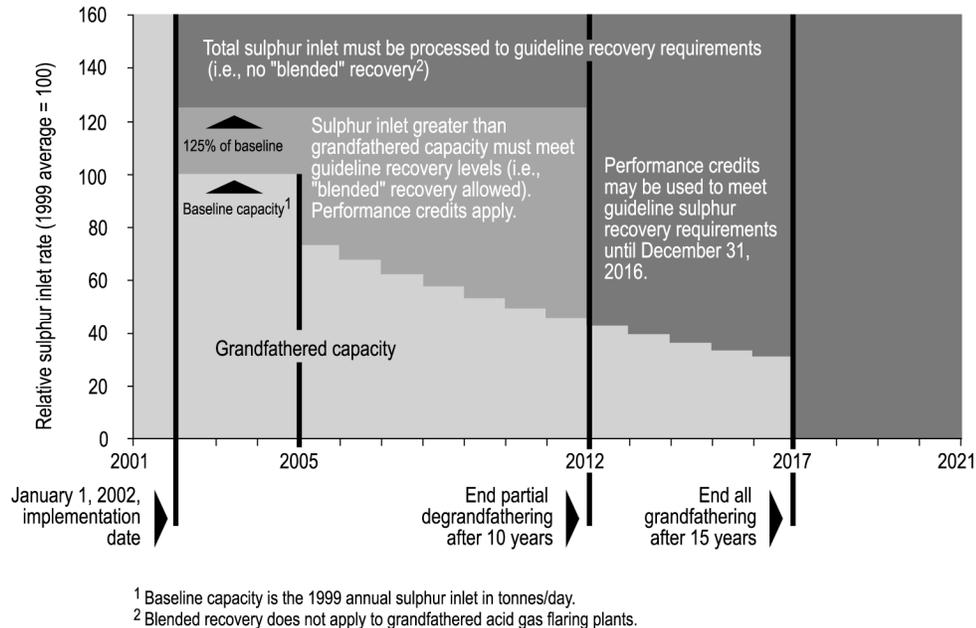
Effective January 1, 2012, SR and AGF plants operating at average calendar quarter-year sulphur inlet rates greater than the maximum grandfathered capacity, as defined in *ID 2001-03* and illustrated below, must comply with the sulphur recovery requirements listed in Table 1 of *ID 2001-03* or use earned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

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.

Credits earned up to December 31, 2011, may be used to meet the sulphur recovery 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, 2000-2010

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, 14 plants relicensed to meet the sulphur recovery requirements for new plants and 10 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 2010 include

- 1) Kaybob – Trilogy Resources Ltd.
- 2) West Whitecourt (Windfall) – SemCAMS ULC (shut down)

As of December 2010, there were 11 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.

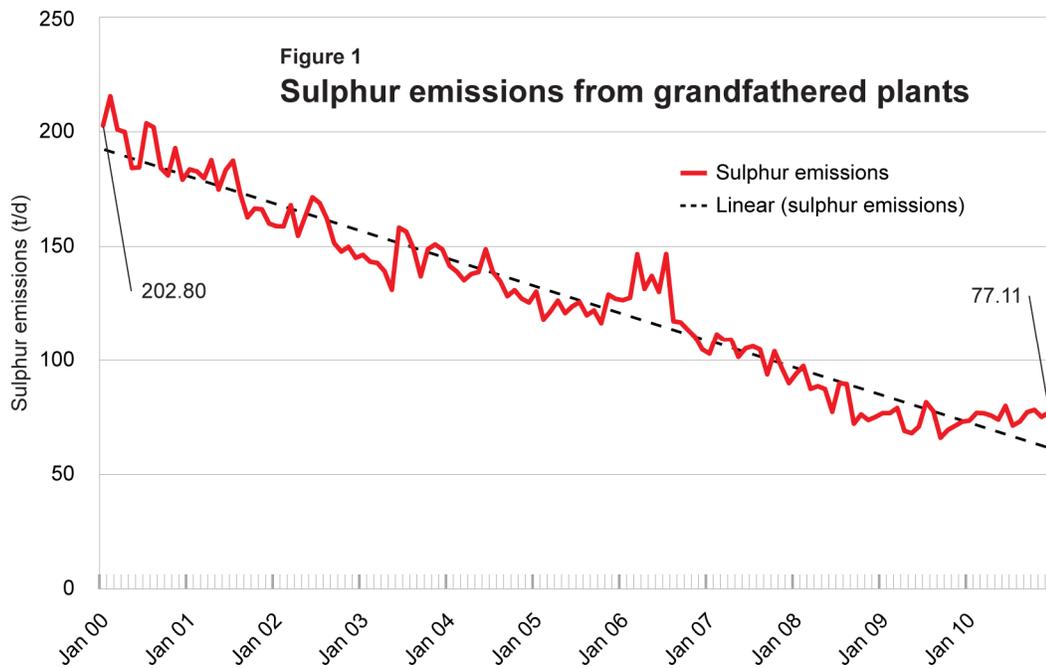
2.2 Sulphur Emissions and Inlets at Grandfathered Plants, 2000-2010

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 issued are included with the grandfathered plants.

2.2.1 Sulphur Emissions Reduction

The grandfathered plants substantially reduced sulphur emissions from 2000 to 2010, as shown in Figure 1. In the last few years, decreases in emissions have levelled off.

The 61 per cent drop in emissions from grandfathered plants from the 2000 baseline year to 2010, shown in Figure 1, is due to a decrease of about 80 per cent in emissions from the grandfathered AGF plants and a decrease of about 56 per cent from the grandfathered SR plants.



From 2009 to 2010, there was a small increase in emissions (about 3 per cent) following a 13 per cent decrease in 2009 for grandfathered plants (see Figure 1). This increase was primarily due to increased inlet in 2010 at two plants, Shell Waterton and Shell Jumping Pound, after significant operational downtime in 2009. Operational problems contributed to increased emissions at two plants, SemCAMS Kaybob South 1 & 2 and Keyera Strachan. Decreased inlet and subsequent decreased emissions at Husky Ram River (Strachan) and SemCAMS West Whitecourt (Windfall) (shut down in 2010) offset these increased emissions by about 40 per cent from 2009 to 2010.

The 80 per cent decrease in emissions from grandfathered AGF plants from 2000 to 2010 was accompanied by a 44 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), AltaGas Bantry, and Trilog Resources Kaybob and the installation of sulphur recovery at Suncor Energy

Wilson Creek. From 2000 to 2010, 27 of the 28 grandfathered AGF plants showed emissions reductions.

From 2000 to 2010, there was a 56 per cent decrease in emissions from grandfathered sulphur recovery plants, which was accompanied by a 44 per cent decline in sulphur inlet. The decrease in emissions was due in large part to plant modifications and/or improved operations at Husky Ram River (Strachan), SemCAMS Kabob South 3, SemCAMS West Whitecourt (Windfall) (shut down), Shell Burnt Timber, Keyera Brazeau River, Shell Jumping Pound, and Nexen Balzac (Crossfield). Lower emissions due to decreased inlet were noted at Shell Waterton, SemCAMS Kaybob South 1 & 2, and Penn West Wimborne. However, the impact of the decreased inlet was offset to some extent by an overall decrease in sulphur recovery efficiency at these three plants. Of the 28 grandfathered SR plants, 26 reduced emissions from 2000 to 2010, as shown in Appendix 4.1.

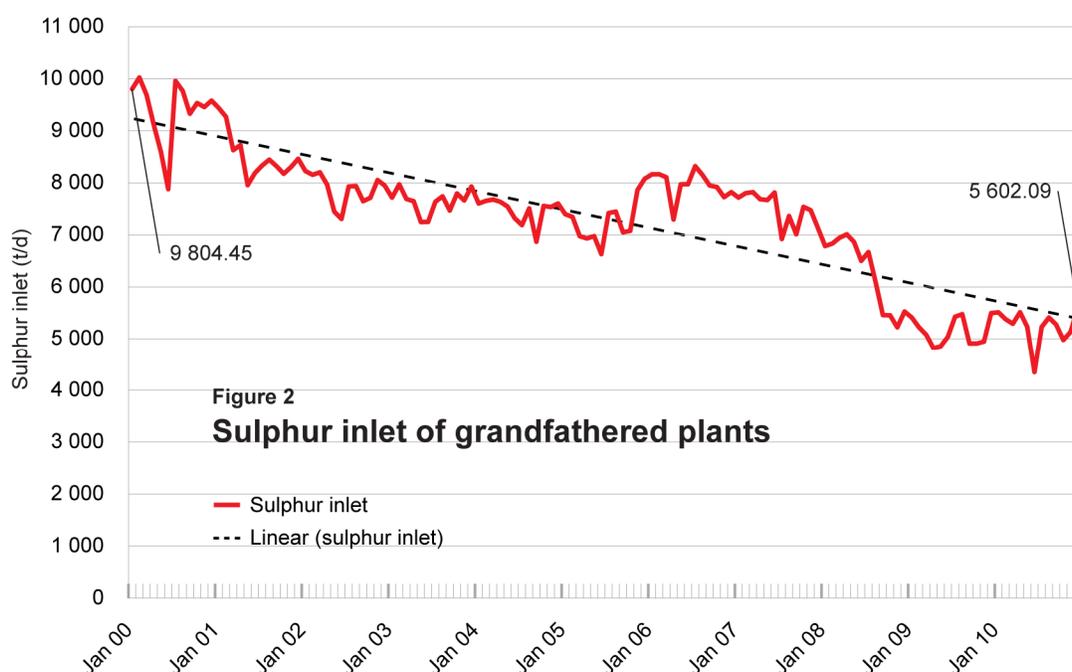
Appendix 4 lists sulphur production and emissions for each of the SR plants for the years 2000 and 2010.

2.2.2 Decline in Sulphur Inlet

Operational improvements and plant modifications have played a significant role in emissions reductions at the grandfathered plants since 2000. As noted above, the overall decrease in emissions has also been due to a 44 per cent decline in the sulphur inlets of these plants from 2000 to 2010, as shown in Figure 2.

As also shown in Figure 2, there was about a 2 per cent increase in the sulphur inlets of the grandfathered plants from 2009 to 2010. This was primarily due to an increase in throughput at two plants, Shell Waterton and Shell Jumping Pound. Inlet decreases at SemCAMS West Whitecourt (Windfall) (shut down in 2010), Husky Ram River (Strachan), and Keyera Strachan offset increases by about 65 per cent.

Figure 2 shows the overall decline in sulphur inlets of the grandfathered gas plants.



2.3 Sulphur Emission Performance Credits

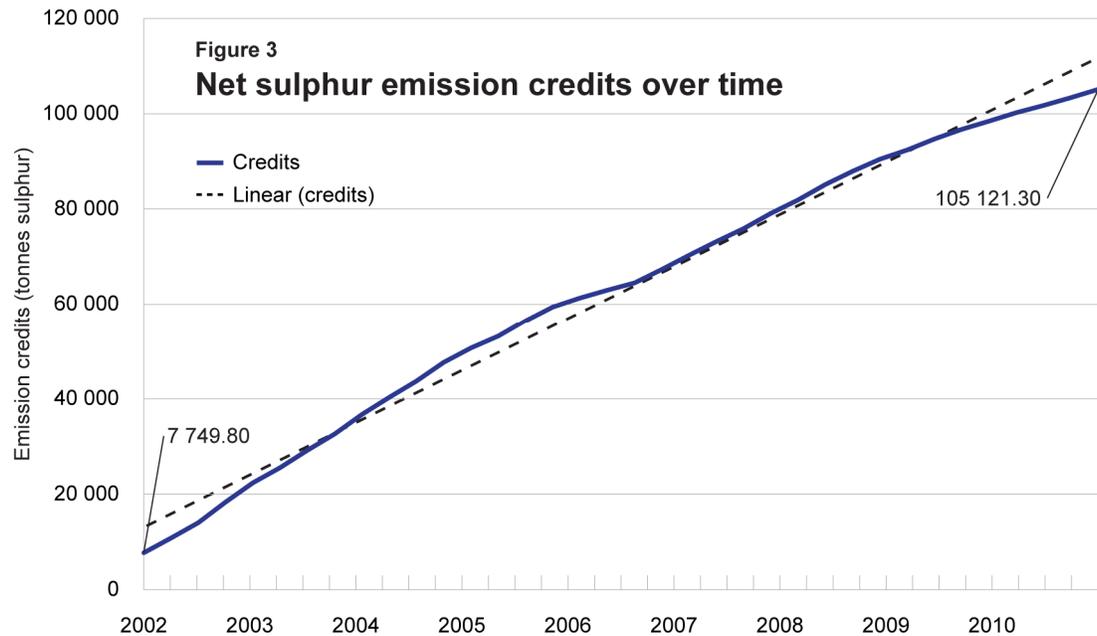
Sulphur emission performance credits (emission credits) can be earned until December 31, 2011, by grandfathered sour gas plants with sulphur recovery that achieve recovery efficiencies higher than their required blended sulphur recovery efficiency. Each emission credit may be applied as the equivalent of 1 t of sulphur not emitted. Credits may not be transferred between facilities and do not apply to AGF plants.

Emission credits can help an operator

- operate at higher sulphur inlets,
- meet the required blended sulphur recovery efficiency, 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 able to file credit reports are doing so, and emission credits are still increasing. As of the end of the fourth quarter of 2010, about 105 000 t of sulphur emission credits had been earned (see Figure 3 and Appendix 5). The total sulphur emissions from grandfathered SR plants in 2010 was 24 500 t. Emission credits as of December 2010 equate to about 51 months of emissions from the grandfathered SR plants.



Appendix 5 lists quarterly credits earned and cumulative credits for each of the grandfathered SR plants in 2010.

3 Summary of Performance for Nongrandfathered Plants, 2000-2010

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 53 per cent between 2000 and 2010. The reduction in sulphur inlet was about 53 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 2009 to 2010, emissions dropped about 12 per cent, while sulphur inlet dropped about 21 per cent.

4 Summary of Overall Performance for Grandfathered and Nongrandfathered Plants, 2000-2010

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 59 per cent drop in emissions from 2000 to 2010, together with a reduction in sulphur inlet of 49 per cent. From 2009 to 2010, emissions dropped about 1 per cent and sulphur inlet dropped about 10 per cent.

Appendix 1 Grandfathered Plants That Have Been Degrandfathered, 2000-2010

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, 14 plants have been relicensed to meet the sulphur recovery requirements for new plants and 10 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
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 (2010)

Of the 14 plants listed below, 4 were relicensed to a higher sulphur recovery efficiency with existing equipment and/or minor modifications and 10 were relicensed to a lower throughput without modifications.

Plants relicensing to meet the requirements for new plants

Plant name	Operator
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. Enchant	Taylor Management
11. Gold Creek	CNRL
12. Spirit River	Bonavista
13. Boundary Lake South	Talisman
14. Waterton	Shell

Grandfathered plants that have ceased operating

Plant name	Operator
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 (2010)

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

As of December 2010, there are 11 grandfathered SR plants and 8 grandfathered AGF plants remaining (see Appendices 2.1 and 2.2).

Appendix 2.1. Grandfathered Sulphur Recovery Gas Plants, 2010

			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)
	Plant Code						
1	Balzac (Crossfield) - Nexen Inc.	1050	98.0	98.5	1,730.50	414.6	
2	Brazeau River - Keyera Energy Ltd.	1108	98.4	98.4	466.00	67.3	Degradfathered in 2003; became AGI
3	Burnt Timber (Undefined) - Shell Canada Limited	1131	96.5	98.4	560.00	412.4	
4	Caroline North (Caroline) - BP Canada Energy Company	1374	69.7	69.7	5.00	5.0	Plant shut down in 2003
5	Caroline South (Caroline) - BP Canada Energy Company	1104	85.0	89.7	9.83	6.8	Plant shut down in 2003
6	Carstairs - Bonavista Energy Corporation	1020	90.0	98.2	72.70*	9.5	Plant shut down in 2008
7	Edson - Talisman Energy Inc.	1084	98.4	98.4	350.00	220.9	Degradfathered in 2003; upgraded SR
8	Gold Creek - Canadian Natural Resources Limited	1129	95.9	95.9	49.90	64.1	Degradfathered 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	Degradfathered in 2006; upgraded SR
12	Lone Pine Creek - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	1139	98.0	98.3	165.40	129.5	
13	Mazeppa (Okotoks) - MPP Ltd.	1530	98.4	98.4	586.60	263.4	Degradfathered 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	Degradfathered in 2009; acid gas now going to 1133
16	Ram River (Strachan) - Husky Oil Operations Limited	1141	98.1	99.5	4,660.50*	2,301.8	
17	Redwater - ARC Resources Ltd.	1028	Fluctuating	95.9	12.20*	3.1	
18	Rosevear - Bonavista Energy Corporation	1206					Plant shut down; consolidation with 1268
19	Rosevear South (Rosevear) - Bonavista Energy Corporation	1268	98.3	98.3	100.70	76.0	Degradfathered in 2007; became AGI
20	Simonette - Keyera Energy Ltd.	1113	98.3	98.3	120.00	92.3	Degradfathered in 2005; upgraded SR
21	Strachan - Keyera Energy Ltd.	1133	98.4	98.4	971.10	264.9	Degradfathered in 2005
22	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	1112	95.9	95.9	49.81	40.6	Degradfathered 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	Degradfathered in 2009; upgraded SR
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, 2010

		Plant Code	Guideline Recovery for Approved Sulphur Inlet (%)	2010 S Emissions (t/d)	Approved S Inlet (t/d)	Baseline Capacity 1999 S Inlet (t/d)	Change in Status (from ID 2001-03)
1	Bantry - Altagas Ltd.	1114	89.7	0.02	9.60	1.0	Degrandfathered in 2002; became AGI in 2009
2	Bellshill Lake - Harvest Operations Corp.	1280	89.7	0.01	5.77	3.8	Degrandfathered in 2005; became AGI
3	Big Bend - Canadian Natural Resources Limited	1293	0	0.03	0.67	1.0	Degrandfathered in 2006
4	Bigoray - Penn West Petroleum Ltd.	1138	0	0.71	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	0.34	0.99	1.0	Degrandfathered in 2008
7	Carson Creek - Pengrowth Energy Corporation	1062	0	0.32	0.83	1.0	Degrandfathered in 2004
8	Enchant - Altagas Holdings Inc.	1039	0	0.25	0.99	1.0	Degrandfathered in 2006
9	Forestburg - Signalta Resources Limited	1365	69.7	0.61	4.50	4.0	
10	Galloway (Ansell) - Canadian Natural Resources Limited	1417	69.7	0.21	1.40	1.3	
11	Greencourt - Canadian Natural Resources Limited	1127	69.7	0.68	1.00	1.3	
12	Harmattan-Elkton ¹ - Bonavista Energy Corporation	1083	0		0.53	1.0	Plant shut down; operating as compressor
13	Hope Creek (Virginia Hills) - Apache Canada Ltd.	1135	95.9	0.06	16.00	5.2	Degrandfathered in 2004; became AGI
14	Judy Creek (Swan Hills South) - Pengrowth Energy Corporation	1069	69.7	0.02	3.75	2.7	Degrandfathered in 2006; became AGI
15	Kaybob - Trilogy Resources Ltd.	1058	95.9	0.86	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	0.79	1.63	1.1	
18	Sedgewick (Killam) - Altagas Ltd.	1510	69.7	0.73	1.99	2.2	
19	Spirit River - Bonavista Energy Corporation	1560	0	0.53	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	0.19	0.75	1.0	Degrandfathered in 2002
22	Travers (Little Bow) - Bonavista Energy Corporation	1150	69.7	0.32	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	0.05	4.90	2.7	Degrandfathered in 2002; became AGI
25	West Drumheller - Sirius Energy Inc.	1109	69.7		2.99	1.1	Plant shut down in 2007
26	Whitecourt - TAQA North Ltd.	1115	89.7	1.41	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

¹ Now operating as a compressor.

Appendix 2.3. Nongrandfathered Sulphur Recovery Plants, 2010

		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 (Undefined) - 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 - Imperial Oil Resources Limited	1134	98.3	306.40*
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	98.4	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. Nongrandfathered Acid Gas Injection Plants Processing >1 t/d of Sulphur, 2010

Nongrandfathered acid gas injection plants		Plant Code	Sulphur Recovery Equivalent Required (%)	Approved S Inlet (t/d)	2010 S Emissions (t/d)	2010 Sulphur Injected (t/d)
1	Acheson - Penn West Petroleum Ltd.	1628	98.2	90.20	0.02	1.40
2	Bigoray - Keyera Energy Ltd.	1357	98.2	64.00	0.03	15.89
3	Bistcho Lake (Bistcho) - Paramount Resources Ltd.	1975	95.9	25.00	0.15	6.63
4	Calmar (Leduc-Woodbend) - MEC Operating Company ULC	1676	95.9	15.50	0.04	3.16
5	Clear Hills (Boundary Lake South) - Canadian Natural Resources Limited	1880	95.9	38.04	0.03	5.60
6	Dunvegan - Devon Canada Corporation	1169	89.7	9.90	0.01	0.49
7	Fourth Creek (Mulligan) - Spectra Energy Midstream Corporation	1895	95.9	12.60	0.09	6.64
8	Golden Spike - ATCO Midstream Ltd.	1547	95.9	26.46	0.00	1.75
9	Gordondale - Spectra Energy Midstream Corporation	1668	98.2	54.31	0.01	22.90
10	Hansman Lake (Provost) - Husky Oil Operations Limited	1698	89.7	6.90	0.00	3.51
11	Hastings Coulee (Galahad) - Husky Oil Operations Limited	1690	89.7	10.90	0.00	1.56
12	Holmberg (Kelsey) - Sword Energy Inc.	1244	69.7	3.07	0.00	0.00
13	Marlowe - Bearspaw Petroleum Ltd.	1765	95.9	20.90	0.00	0.00
14	Mitsue [†] - Penn West Petroleum Ltd.	1123	69.7	4.60	0.00	0.22
15	Normandville - Devon Canada Corporation	1990	69.7	1.90	0.00	0.07
16	O'Chiese (Pembina) - Conocophillips Canada Operations Ltd.	1970	95.9	14.53	0.01	0.70
17	Paddle River - Keyera Energy Ltd.	1089	69.7	1.50	0.00	0.34
18	Pembina - Imperial Oil Resources Limited	1625	89.7	7.23	0.00	3.15
19	Pembina - Keyera Energy Ltd.	1402	95.9	29.70*	0.04	1.65
20	Pouce Coupe - Spectra Energy Midstream Corporation	1746	95.9	26.18	0.03	4.10
21	Puskwaskau - Devon Canada Corporation	1964	89.7	5.15	0.00	0.08
22	Rainbow - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	1155	95.9	20.10*	0.00	0.65
23	Rycroft - Birchcliff Energy Ltd.	1793	95.9	21.00	0.02	3.09
24	Steen River (Dizzy) - Steen River Oil & Gas Ltd.	1738	95.9	34.40	0.02	0.90
25	Thompson Lake (Provost) - Husky Oil Operations Limited	1695	95.9	12.00	0.03	4.12
26	Wayne-Rosedale - Encana Corporation	1888	89.7	5.90*	0.01	0.84
27	Wembley - Conocophillips Canada Resources Corp.	1520	98.3	124.00	0.08	66.08
28	West Culp (Eaglesham North) - Devon Canada Corporation	1775	95.9	17.20	0.00	0.35
29	Wizard Lake (Watelet) - ATCO Midstream Ltd.	1672	69.7	3.30	0.00	0.04
30	Zama 2 & 3 (Zama) - Apache Canada Ltd. (1878 & 1978 amalgamated)	1878	98.3	247.00	0.04	19.64
31	Pouce Coupe - Birchcliff Energy Ltd. (2010 start-up)	106663	95.9	34.59	0.04	1.04
32	Pouce Coupe - Altagas Ltd. (2010 start-up)	1634	95.9	17.25	0.10	0.12

* 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 and nongrandfathered sulphur recovery or acid gas flaring plants that are now acid gas injection facilities

33	Bantry - Altagas Ltd.	1114	89.7	9.60	0.02	1.23
34	Bellshill Lake - Harvest Operations Corp.	1280	89.7	5.77	0.01	2.88
35	Brazeau River - Keyera Energy Ltd.	1108	98.4	466.00	0.45	123.21
36	Hope Creek (Virginia Hills) - Apache Canada Ltd.	1135	95.9	16.00	0.06	4.56
37	Judy Creek (Swan Hills South) - Pengrowth Energy Corporation	1069	69.7	3.75	0.02	1.85
38	Kaybob - Trilogy Resources Ltd.	1058	95.9	49.90	0.86	0.77
39	Rainbow - Husky Oil Operations Limited	1105	98.3	213.49	0.68	116.42
40	Rosevear South (Rosevear) - Bonavista Energy Corporation	1268	98.3	100.70	0.12	36.56
41	Swalwell - TAQA North Ltd.	1654	69.7	4.60	0.00	0.00
42	Turin (Retlaw) - Altagas Holdings Inc.	1191	69.7	4.64	0.03	1.58
43	Vulcan (Long Coulee) - Conocophillips Canada Resources Corp.	1100	69.7	4.90	0.05	1.01

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

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	1039	Enchant - Taylor Management	0.99
11	Relicensed	1129	Gold Creek - CNRL	49.90
12	Relicensed	1560	Spirit River - Bonavista	0.99
13	Relicensed	1024	Boundary Lake - Talisman	0.99
14	Relicensed	1056	Waterton - Shell	1450.00

Appendix 4.1. Gas Plants with Sulphur Recovery, Year 2010 Minus Year 2000

	Plant Code	Field-Licensee	Change in production and emissions year 2010 minus year 2000	
			2010 – 2000 S Production (t/y)	2010 – 2000 S Emissions (t/y)
Grandfathered plants (in 2001)				
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	(524,219.6)	(6,091.0)
2	1144	Kaybob South 3 (Kaybob South) - SemCAMS ULC	(167,359.8)	(4,711.7)
3	1034	West Whitecourt (Windfall) - SemCAMS ULC	(284,017.0)	(4,534.8)
4	1131	Burnt Timber (Undefined) - Shell Canada Limited	(12,890.6)	(2,089.0)
5	1056	Waterton - Shell Canada Limited	(305,357.8)	(2,028.1)
6	1108	Brazeau River - Keyera Energy Ltd.	(35,158.5)	(1,988.0)
7	1037	Jumping Pound - Shell Canada Limited	46,330.2	(1,579.5)
8	1050	Balzac (Crossfield) - Nexen Inc.	(56,429.3)	(1,290.7)
9	1107	Kaybob South 1 & 2 (Kaybob South) - SemCAMS ULC	(163,530.3)	(1,192.2)
10	1081	Wimborne - Penn West Petroleum Ltd.	(33,125.2)	(1,039.6)
11	1084	Edson - Talisman Energy Inc.	(4,114.9)	(791.7)
12	1121	Nordegg (Brazeau River) - Keyera Energy Ltd.	(12,842.1)	(702.3)
13	1219	Zama 1 (Zama) - Apache Canada Ltd.	(14,405.1)	(583.9)
14	1054	Wildcat Hills (Jumping Pound) - Direct Energy Marketing Limited	(24,811.4)	(513.7)
15	1113	Simonette - Keyera Energy Ltd.	(11,558.8)	(506.5)
16	1206	Rosevear - Bonavista Energy Corporation	(12,290.7)	(499.6)
17	1268	Rosevear South (Rosevear) - Bonavista Energy Corporation	(18,426.7)	(414.9)
18	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	(9,122.4)	(378.0)
19	1104	Caroline South (Caroline) - BP Canada Energy Company	(2,186.0)	(349.5)
20	1020	Carstairs - Bonavista Energy Corporation	(3,370.0)	(324.6)
21	1530	Mazeppa (Okotoks) - MPP Ltd.	(21,482.2)	(303.3)
22	1129	Gold Creek - Canadian Natural Resources Limited	(13,288.6)	(252.2)
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	(15,408.4)	(240.9)
24	1047	Minnehik-Buck Lake - Keyera Energy Ltd.	(3,883.9)	(162.7)
25	1296	Teepee - Canadian Natural Resources Limited	(491.1)	(116.5)
26	1374	Caroline North (Caroline) - BP Canada Energy Company	(903.1)	(86.8)
27	1028	Redwater - ARC Resources Ltd.	(347.7)	27.5
28	1133	Strachan - Keyera Energy Ltd.	87,452.0	1,021.1
		Totals	(1,617,239.0)	(31,723.0)

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

1	1096	Wilson Creek - Suncor Energy Inc.	354.2	(998.2)
		Totals	354.2	(998.2)

Nongrandfathered plants (plants meeting the requirements for new plants in 2001)

1	1079	Crossfield East - TAQA North Ltd.	(96,602.6)	(2,183.2)
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	(136,203.3)	(2,178.5)
3	1021	Olds (Garrington) - Pengrowth Energy Corporation	(24,168.4)	(1,185.8)
4	1662	Caroline - Shell Canada Limited	(1,159,771.0)	(1,074.7)
5	1004	Homeglen-Rimbey - Keyera Energy Ltd.	(7,283.2)	(917.0)
6	1105	Rainbow - Husky Oil Operations Limited	(22,351.5)	(873.5)
7	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	(44,573.9)	(488.3)
8	1051	Coleman (Undefined) - Devon Canada Corporation	(45,964.6)	(396.8)
9	1892	Sexsmith (La Glace) - Encana Corporation	(42,350.7)	(391.3)
10	1002	Nevis - Keyera Energy Ltd.	(26,017.4)	(300.3)
11	1482	Brazeau River - Blaze Energy Ltd.	(28,673.5)	(273.6)
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	(13,569.8)	(85.7)
15	1585	Hays - Canadian Natural Resources Limited	(590.9)	(73.6)
16	1506	Progress - Canadian Natural Resources Limited	2,374.9	(54.2)
17	1658	Rainbow - Altagas Ltd.	1,371.2	(43.4)
18	1134	Quirk Creek - Imperial Oil Resources Limited	(29,307.1)	(37.8)
19	1060	Harmattan-Elkton - Taylor Processing Inc.	(5,634.4)	(13.1)
20	1638	Carbondale (Morinville) - ATCO Midstream Ltd.	(341.5)	(0.2)
21	1629	Progress - Suncor Energy Inc.	20.0	0.0
		Totals	(1,683,233.0)	(10,835.5)

		Grand totals	(3,300,117.8)	(43,556.7)
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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 Efficiency (%)	Current Approved Sulphur Recovery Efficiency (%)	Total Annual Production (t/y)
Grandfathered plants (in 2001)							
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	1056	Waterton - Shell Canada Limited	671,377.4	6,233.1	99.1	98.7	679,224.2
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	1050	Balzac (Crossfield) - Nexen Inc.	144,323.2	2,408.8	98.3	98.0	141,245.3
9	1107	Kaybob South 1 & 2 (Kaybob South) - SemCAMS ULC	234,341.8	2,756.9	98.9	98.4	250,134.3
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	1054	Wildcat Hills (Jumping Pound) - Direct Energy Marketing Limited	71,413.7	1,220.0	98.2	97.5	66,931.2
15	1113	Simonette - Keyera Energy Ltd.	32,358.2	793.8	97.5	96.5	31,239.2
16	1206	Rosevear - Bonavista Energy Corporation	10,771.6	499.6	96.1	94.6	12,290.7
17	1268	Rosevear South (Rosevear) - Bonavista Energy Corporation	16,104.4	457.5	97.6	95.6	18,426.7
18	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	18,698.9	729.2	96.2	94.0	18,456.1
19	1104	Caroline South (Caroline) - BP Canada Energy Company	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	1530	Mazeppa (Okotoks) - MPP Ltd.	95,120.2	1,260.7	98.7	98.3	95,760.9
22	1129	Gold Creek - Canadian Natural Resources Limited	20,071.4	514.9	97.6	97.0	20,883.0
23	1139	Resources Ltd.	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	1296	Teepee - Canadian Natural Resources Limited	5,424.7	372.2	93.2	92.0	5,070.9
26	1374	Caroline North (Caroline) - BP Canada Energy Company	1,039.2	86.8	91.2	89.7	903.1
27	1028	Redwater - ARC Resources Ltd.	1,184.9	88.3	92.7	Fluctuating	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 in 2001)

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	1662	Caroline - Shell Canada Limited	1,833,270.9	2,458.5	99.9	99.8	1,844,827.3
5	1004	Homeglen-Rimbey - Keyera Energy Ltd.	19,957.4	1,003.0	94.8	92.0	18,208.7
6	1105	Rainbow - Husky Oil Operations Limited	25,910.0	1,123.5	95.2	95.0	22,351.5
7	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	107,983.1	1,624.1	98.6	98.4	112,615.2
8	1051	Coleman (Undefined) - Devon Canada Corporation	137,197.0	1,369.9	99.0	98.6	136,352.7
9	1892	Sexsmith (La Glace) - Encana Corporation	125,906.9	1,292.2	99.0	98.4	126,382.7
10	1002	Nevis - Keyera Energy Ltd.	37,590.7	467.5	98.8	98.4	37,091.8
11	1482	Brazeau River - Blaze Energy Ltd.	97,601.0	917.1	99.1	98.4	96,505.4
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	1585	Hays - Canadian Natural Resources Limited	2,390.2	129.0	94.5	90.0	2,217.5
16	1506	Progress - Canadian Natural Resources Limited	9,215.7	237.8	97.4	96.5	9,060.8
17	1658	Rainbow - Altagas Ltd.	1,882.0	127.9	92.6	70.0	1,597.4
18	1134	Quirk Creek - Imperial Oil Resources Limited	86,771.0	1,002.1	98.9	98.3	90,372.6
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 2010

	Plant Code	Field-Licensee	Total Inlet (t/y)	Total Annual Emissions (t/y)	Actual Sulphur Recovery Efficiency (%)	Current Approved Sulphur Recovery Efficiency (%)	Total Annual Production (t/y)
Grandfathered plants (in 2001)							
1	1141	Ram River (Strachan) - Husky Oil Operations Limited	260,842.3	1,786.7	99.3	98.1	256,789.7
2	1144	Kaybob South 3 (Kaybob South) - SemCAMS ULC	204,746.2	1,934.4	99.1	98.5	202,348.6
3	1034	West Whitecourt (Windfall) - SemCAMS ULC	8,118.2	81.8	99.0	98.3	8,220.0
4	1131	Burnt Timber (Undefined) - Shell Canada Limited	136,702.9	2,755.0	98.1	96.5	139,224.9
5	1056	Waterton - Shell Canada Limited	380,067.6	4,205.1	98.9	98.7	373,866.4
6	1108	Brazeau River - Keyera Energy Ltd.	45,512.3	164.6	99.6	98.4	Injected (44,971.2)
7	1037	Jumping Pound - Shell Canada Limited	210,885.2	3,930.2	98.1	96.2	204,852.3
8	1050	Balzac (Crossfield) - Nexen Inc.	85,961.6	1,118.1	98.7	98.0	84,816.0
9	1107	Kaybob South 1 & 2 (Kaybob South) - SemCAMS ULC	90,113.6	1,564.8	98.2	98.4	86,604.0
10	1081	Wimborne - Penn West Petroleum Ltd.	21,586.5	794.3	96.3	95.5	20,882.9
11	1084	Edson - Talisman Energy Inc.	69,547.4	629.5	99.1	98.4	69,222.5
12	1121	Nordegg (Brazeau River) - Keyera Energy Ltd. ¹	4,273.3	25.6	99.4	95.9	Delivered (4,242.8)
13	1219	Zama 1 (Zama) - Apache Canada Ltd.	0.0	0.0			0.0
14	1054	Wildcat Hills (Jumping Pound) - Direct Energy Marketing Limited	42,557.5	706.3	98.4	97.5	42,119.8
15	1113	Simonette - Keyera Energy Ltd.	20,118.9	287.3	98.6	98.3	19,680.4
16	1206	Rosevear - Bonavista Energy Corporation	0.0	0.0	0.0	94.6	0.0
17	1268	Rosevear South (Rosevear) - Bonavista Energy Corporation	13,504.9	42.6	99.7	98.3	Injected (13,344.2)
18	1112	Sturgeon Lake (Sturgeon Lake South) - Barrick Energy Inc.	9,579.0	351.2	96.4	95.9	9,333.7
19	1104	Caroline South (Caroline) - BP Canada Energy Company	0.0	0.0	0.0	69.7	0.0
20	1020	Carstairs - Bonavista Energy Corporation	0.0	0.0			0.0
21	1530	Mazeppa (Okotoks) - MPP Ltd.	75,677.3	957.4	98.7	98.4	74,278.7
22	1129	Gold Creek - Canadian Natural Resources Limited	7,806.5	262.7	96.7	95.9	7,594.4
23	1139	Lone Pine Creek - Exxonmobil Canada Ltd. and Exxonmobil Resources Ltd.	21,906.0	358.8	98.4	98.0	21,823.8
24	1047	Minnehik-Buck Lake - Keyera Energy Ltd.	3,009.8	107.7	96.4	95.6	2,864.5
25	1296	Teepee - Canadian Natural Resources Limited	4,940.7	255.7	94.7	92.0	4,579.8
26	1374	Caroline North (Caroline) - BP Canada Energy Company	0.0	0.0	0.0	85.0	0.0
27	1028	Redwater - ARC Resources Ltd.	882.6	115.8	86.9	Fluctuating	770.6
28	1133	Strachan - Keyera Energy Ltd.	186,959.7	2,190.7	98.8	98.4	184,581.6
		Totals	1,905,299.9	24,626.3	98.7		1,814,454.6

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.	429.8	38.2	90.3	85.0	354.2
		Totals	429.8	38.2	90.3	85.0	354.2

Nongrandfathered plants (plants meeting the requirements for new plants in 2001)

1	1079	Crossfield East - TAQA North Ltd.	71,701.4	845.4	98.9	98.4	73,318.6
2	1360	Hanlan-Robb (Basing) - Suncor Energy Inc.	150,063.1	1,256.3	99.2	98.5	152,708.6
3	1021	Olds (Garrington) - Pengrowth Energy Corporation	79,254.1	966.4	98.8	98.4	77,614.6
4	1662	Caroline - Shell Canada Limited	664,099.9	1,383.8	99.8	99.5	685,056.3
5	1004	Homeglen-Rimbey - Keyera Energy Ltd.	10,923.3	86.0	99.2	98.3	10,925.5
6	1105	Rainbow - Husky Oil Operations Limited	37,149.2	250.0	99.4	98.3	Injected (42,492.6)
7	1458	West Pembina (Brazeau River) - Keyera Energy Ltd.	68,509.4	1,135.8	98.4	98.4	68,041.3
8	1051	Coleman (Undefined) - Devon Canada Corporation	90,419.8	973.1	98.9	98.6	90,388.1
9	1892	Sexsmith (La Glace) - Encana Corporation	81,947.4	901.0	98.9	98.4	84,032.0
10	1002	Nevis - Keyera Energy Ltd.	11,167.6	167.3	98.5	95.9	11,074.4
11	1482	Brazeau River - Blaze Energy Ltd.	68,334.5	643.5	99.1	98.4	67,831.9
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	15,011.4	210.5	98.6	98.3	14,722.0
15	1585	Hays - Canadian Natural Resources Limited	1,724.6	55.4	96.7	90.0	1,626.6
16	1506	Progress - Canadian Natural Resources Limited	12,291.7	183.5	98.4	96.5	11,435.7
17	1658	Rainbow - Altgas Ltd.	3,067.9	84.5	97.2	95.9	2,968.6
18	1134	Quirk Creek - Imperial Oil Resources Limited	59,422.3	964.3	98.4	98.3	61,065.5
19	1060	Harmattan-Elkton - Taylor Processing Inc.	6,045.5	151.5	97.6	95.9	6,241.2
20	1638	Carbondale (Morinville) - ATCO Midstream Ltd.	61.9	0.0	100.0	69.7	62.0
21	1629	Progress - Suncor Energy Inc.	292.9	0.0	100.0	69.7	356.7
		Totals	1,431,487.8	10,258.2	99.3		1,419,469.8

		Grand totals	3,337,217.6	34,922.7	98.9		3,234,278.6
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Appendix 5. Sulphur Credits Earned

			<u>Credits</u>				<u>Cumulative Credits</u>				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. - Keyera					-	-	-	-	Degrandfathered
2	1121	Brazeau R. (Nordegg) - Keyera					727.3	727.3	727.3	727.3	Degrandfathered
3	1131	Burnt Timber - Shell	202.4	269.6	274.4	242.2	3,387.9	3,657.4	3,931.8	4,174.0	
4	1374	Caroline (North) 1-11 - BP Canada					-	-	-	-	Plant shut down
5	1104	Caroline (South) 4-20 - BP Canada					-	-	-	-	Plant shut down
6	1020	Carstairs - Bonavista					293.5	293.5	293.5	293.5	Plant shut down
7	1050	Crossfield (Balzac) - Nexen	156.3	130.0	168.7	145.5	3,382.4	3,512.4	3,681.0	3,826.5	
8	1084	Edson - Talisman					122.2	122.2	122.2	122.2	Degrandfathered
9	1129	Gold Creek - CNRL					189.5	189.5	189.5	189.5	Degrandfathered
10	1037	Jumping Pound - Shell	346.1	381.0	334.2	244.1	11,129.6	11,510.5	11,844.8	12,088.9	
11	1107	Kaybob S. 1 & 2 - SemCAMS	42.8	39.2	-87.8	-151.9	4,058.3	4,097.5	4,009.6	3,857.8	
12	1144	Kaybob S. 3 - SemCAMS					3,213.9	3,213.9	3,213.9	3,213.9	Degrandfathered
13	1139	Lone Pine Creek - ExxonMobil	32.7	11.7	20.3	19.4	586.3	598.0	618.3	637.7	
14	1047	Minnehik Buck Lake - Keyera	4.6	6.9	5.5	6.4	180.9	187.8	193.4	199.7	
15	1530	Okotoks - MPP					-	-	-	-	Degrandfathered
16	1028	Redwater - ARC Resources	37.9	15.0	17.3	13.2	734.9	749.9	767.2	780.4	Variable inlet rate
17	1206	Rosevear (North) - Suncor ¹					-	-	-	-	Plant shut down
18	1268	Rosevear (South) - Suncor ¹					1,634.7	1,634.7	1,634.7	1,634.7	Degrandfathered
19	1113	Simonette - Suncor					663.7	663.7	663.7	663.7	Degrandfathered
20	1141	Strachan (Ram River) - Husky	770.5	513.2	794.5	1,076.3	40,796.3	41,309.5	42,104.0	43,180.3	
21	1133	Strachan - Keyera					1,229.7	1,229.7	1,229.7	1,229.7	Degrandfathered
22	1112	Sturgeon Lake - Cadence					590.6	590.6	590.6	590.6	Degrandfathered
23	1296	Teepee - CNRL	20.8	35.2	7.6	0.3	1,011.6	1,046.9	1,054.5	1,054.8	
24	1056	Waterton - Shell					13,346.2	13,346.2	13,346.2	13,346.2	Degrandfathered
25	1054	Wildcat Hills - Direct Energy	77.3	61.2	67.3	81.1	3,506.3	3,567.5	3,634.8	3,715.9	
26	1081	Wimborne - Penn West	34.2	51.0	35.2	60.3	2,265.9	2,316.9	2,352.0	2,412.3	
27	1034	Windfall (West Whitecourt) - SemCAMS	57.6				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					100,233.3	101,747.3	103,384.4	105,121.3	

¹ Plant consolidation.