Appendix C

Control Option 6

Control Options Analysis for Rocky Mountain National Park Initiative

Proposed Implementation of BART to all major sources Statewide

Purpose

Purpose: This analysis presents the pros and cons of implementing Best Available Retrofit Technology from pre-1962 major sources (similar to the BART provisions adopted in March 2006) and would result in emission reductions from under- and non-controlled facilities

Cost/Benefit

Costs: There are 20 major pre-1962 sources present in Colorado, with several sources considered as one for PSD purposes. For implementing BART on pre-1962 major sources, the Colorado Air Pollution Control Division estimates that NOx reduction cost per ton to range from $1500 - $4000 (based on DOE and Northeast Air Management values), with a total NOx reduction expense for all sources ranging from $67 million to $180 million. Please refer to spreadsheet below for additional details about individual sources.

Benefits: This analysis assumes an average NOx reduction per source of 85% with the main control(s) being Non-Selective Catalytic Reduction (NSCR) and Selective Catalytic Reduction (SCR) implemented on major source engines and boilers. This analysis resulted in an annual NOx reduction of approximately 45,000 tons per year based on allowable emissions.

Disadvantages: The BART provisions are intended to reduce NOx emissions and will result in an increase in ammonia emissions. Several of the major sources are major for VOCs and are being controlled under the 1-hr ozone area under RACT, therefore these sources were not included in the analysis and should be examined separately.

Secondary Option: Low-NOx burners could be implemented instead or in place of SCR/NSCR on a case-by-case, there would be a 30 - 60% reduction in NOx and a cost of $150-300/ton as a secondary option. This option would result in approximately 29,000 tons/year of NOx reduction and the cost would range from $4.4 million to $8.7 million dollars.

Implementation

Both SCR/NSCR and Low-Nox control equipment is readily available and implementable. The BART analysis on these sources could take a considerable amount of time, especially when considering allowable versus actual emissions. Actual emissions could be used to determine new allowable limits for certain sources, thus exempting those sources from BART. The Commission would have to re-examine Public Service Company on an individual plant basis, rather than allow a cap for all facilities to acheive these NOx emission reductions.

Viability

The realistic implementation date would be over several years or up to a decade, as each source is examined and subjected to BART on a case-by-case basis. However, this option is viable and would result in a substantial reduction in NOx emissions around the state and would capture a large amount of uncontrolled NOx emissions.

Table C-1: Pre-1962 Sources Eligible for BART-like controls

					Additional Details						
SOURCE	Pre-1962?	NOx (tpy)	VOCs (tpy)	PM (tpy)	Comments	Controls?	85% NOx Reduction (assuming SCR)	NOx Removal (assume 85%)	45% NOx Reduction (assuming low NOx)	NOx removal (assume 45%)
1 Arapahoe, Inc. - W. H. Clark Plant	Yes - 1955	1666		170.7	2 Boilers totaling 572 MMBtu/hr fueled by coal only	Equipped with baghouse, PM emissions mostly fug	249.9	1416.1	916.3	749.7
2 Arapahoe, Inc. - Portlo	Yes - 1949 for n.g. boiler and 1964 for diesel generator	boiler - 832.04		115.32	One steam driven unit and five diesel fired	No controls, however plants actuals low due to output of only 10 MW and primary usage of boiler (steam)	124.806	707.234	457.622	374.418
3 Colorado Interstate Gas - Springfield	Yes - 1955	639.4	26.3		6 natural gas fired engines (1350 hp each) for NG compression	NONE	96.91	543.49	351.67	287.73
4 Colorado Interstate Nat Gas - Kit Carson	Yes - 1949 - 1954	1574	60		13 natural gas fired engines (1000 hp first 10 and 326 hp last 3) for NG compression	NONE	236.1	1337.9	865.7	708.3
5 Colorado Springs - Birdwell	Yes - 1955 - 1957	2211.15	26.74		Three steam boilers with associated turbine-generators and cooling towers running on n.g. or fuel oil	NONE	331.6725	1879.4775	1216.1325	995.0175
6 Phillips Pipeline Company - Denver Terminal	Boiler and tanks pre-1972	28.5	141.83		Bulk gasoline terminal	Vapor combustion unit for loadout; not all tanks connected to VCU. However, substantial reduction in VOCs may not be achievable			15.675	12.825
7 Coors - Brewing and Packaging	1980s		450	46	single source with Tri-Gen Golden and RMMC - gram loadout	PM baghouse - rerouting of VOC venting to boilers for destruction. Subject to RACT 1-hr ozone area and must achieve 69.6 tons/year of VOC reduction through special projects	0	0	0	0
8 Delta Municipal Light & Power	Yes - 1955 - 1956	859.4	85.06	69.17	seven (7) internal combustion engines, three diesel fuel fired and four that burn diesel or a combination of diesel and natural gas (dual-fuel)	NONE	128.91	730.49	472.57	386.73
9 Northwest Pipeline - Ringsby Compressor Station	Yes -1956	1366.4	43		four (4) internal combustion engines, all natural gas fired at 2,000 hp and 2 cycle standard lean burn	NONE	204.96	1161.44	751.52	614.88
10 Public Service Company - Arapahoe	Yes - 1951, 1955	12443	50		Four coal fired boilers with coal as primary fuel burned with natural gas as a back-up fuel	Unit No. 1 is a 40 MW boiler equipped with electrostatic precipitator for PM. Unit 2 is also equipped with EP and 2 baghouses. Unit No. 4 is a 110 MW boiler equipped with a baghouse, low NOX burners with over-fire air to control NOX emissions	1866.45	10576.55	6843.65	5599.35
11 Public Service Company - Cameo	Yes - 1957, 1960	1890	19.4		This facility consists of 2 boilers used to produce electricity	Each boiler exhausts through a baghouse to reduce particulate emissions. 2nd Boiler has a low Nox burner installed	283.5	1606.5	1039.5	850.5
12 Public Service Company - Cherokee Station	Yes - 1957 - 1968	21665	96		Four coal fired boilers with coal as primary fuel burned with natural gas as a back-up fuel. UNIT 4 IS SUBJECT TO BART	All 4 units equipped with baghouses and low NOx burners with over-fire air	3249.25	18406.75	11910.25	9744.75
13 Public Service Company - Denver Steam Plant	Yes - 2 boilers pre-1972	1091	4		Two boilers using natural gas or fuel oil rated at 210 mmBtu/hr	NONE	163.65	927.35	600.05	490.95
14 Questar Gas Management Company-E. Hiawatha C.S.	Yes - one engine from 1957, rest 1970/71/74	239	50		Five (5) internal combustion engines natural gas fired, rated at 660, 660, 265 hp, 60 hp, and 60 hp. Installed in 1971, 1974, 1967, and 1970 respectively	NONE	35.85	203.15	131.45	107.55
15 Questar Pipeline-Powder Wash C.S.	Yes - one engine from 1946, rest 1974/79/80/84	377.3	152		Six (6) internal combustion engines, all natural gas fired as 4 cycle standard rich burn	One engine was replaced in 1990 and took synthetic minor emission limitations (hours of operation and production). Another engine was placed in service in 1994 and has a NSCR. Four engines are uncontrolled	56.595	320.705	207.515	169.785
16 Rocky Mountain Metal Container	Yes - 1980s	29	653		Can Line Cleaning, Manufacturing, and Internal Can Coating, Aluminum Scrap System	Subject to VOC RACT - limits VOC content of can coatings and requires minimization of fugitive emissions	4.35	24.65	15.95	13.05
17 Rocky Mountain Pipeline System LLC - DuPont Terminal	Yes - 1948 (with additions afterwards - unclear)	9.79	193.67		Nineteen (19) storage tanks, tank truck loading rack	Two tanks subject to fixed roof requirements; loading/unloading equipped with vapor collection system and combustion device; limits on gas throughput; MTBE use restricted to 6 months; facility limits on pollutants and HAPs	27.5895	156.2895	5.379	4.401
18 Springfield Municipal Power Plant	Yes - 4 engines 1930s and 1960s	528	36		Four (4) internal combustion engines diesel fired or combination natural gas and diesel	Plant primarily serves as standby/backup electric generation; all pollutants actual less ten 1 tpy However, there NO controls on this facility	79.2	448.8	290.4	237.6
19 Tilgen-Colorado - Golden Facility	Yes - 3 boilers pre-1971	3693	55	306	Five (5) boilers and associated coal and ash handling equipment. Boilers 1 and 2 equipped for natural gas and fuel oil. Boiler 3 uses only coal for fuel. Boiler 4/5 use natural gas as primary fuel and fuel oil for backup. Auxiliary fuel (ethanol, sludge, and on-site oil) used in Boilers 4/5.	PM baghouse for boilers 4/5. NOV NOx reduction of 285 tpy using emission limitations (hours and throughput) and SIP reduction of 255 tpy (again using throughput limits) for a total reduction for 510 tpy - These reductions are on boilers 4/5 only. Boilers 1,2,3 have NO controls. The coal and ash handling operations have 4 fabric filters, hopper capture, and 3 cyclones for PM control	553.95	3139.05	2031.15	2937.6
20 Western Sugar Co- Fort Morgan Facility	Yes - 2 boilers 1947(n.g. conversion 1980's) 2 dryers 1974 mills/coolers 1953 others pre-1950	1385.16	86.6	576.6	Facility operates 5 months/year processing harvested beets. Sugar storage bins and associate dust collectors rest of year as sugar is shipped. Two (2) boilers fired on coal. Two (2) dryers fired on natural gas. Four (4) beet pulp pellemills and coolers. Two (2) sugar granulators (two steam dryers and coolers)	Boilers have venturi scrubber to control PM and SO2. The dryers have 4 cyclones for PM control NO NOx controls present at facility	207.774	1177.386	761.636	490.11
					SCR/NSCR Reduction (85%)			Low-Nox Burners (45%)		
TOTAL NOx Emission Reduction						44763	tons per year		28884	tons per year
minimum $/ton estimate					$	1,500	per ton removal	$	150	per ton removal
maximum $/ton estimate					$	4,000	per ton removal	$	300	per ton removal
SOURCES										
Department of Energy (National Energy Modeling System)										
NOx Control Status Report - 2000 - Northeast States for Coordinated Air Use Management (NESCAUM)										
MINIMUM TOTAL NOx Reduction COST:						$67,144,968		$	4,332,663	
MAXIMUM TOTAL NOx Reduction COST:						$179,053,248		$	8,665,326	