Appendix O

Control Option 43

Control Options Analysis for Rocky Mountain National Park Initiative

Proposed Implementation of Stage II Vapor Recovery Statewide and in the North Front Range

Purpose

Purpose: This analysis presents the pros and cons of implementing Stage II Vapor Recovery on gasoline dispensing facilities (GDFs) statewide. Gasoline vapor recovery systems are categorized under two stages. Stage I gasoline vapor recovery systems capture the vapors expelled from the underground storage tanks at gas stations when being refilled by tank trucks. Stage II systems capture gasoline vapors that would otherwise be vented during individual vehicle refueling at gas stations. There are two basic types stage II vapor recovery systems on the market. The "balance" system utilizes a double hose with rubber boot on the dispensing nozzle that provides seal between the nozzle and the vehicle gasoline filler opening. As gasoline in transfered via the inner hose into the vehicle tank the vapors are forced to the rubber boot which forces the vapors to travel in the outer hose back to gasoline dispensing facility storage tank. The "vacuum assist or bootless nozzle" system also utilizes a double hose but the outer edge of the dispensing nozzle tip has small holes that draw the vapors under a vacuum back to the gasoline dispensing facility storage tank.

Cost/Benefit

Costs: Both stage II vapor recovery systems require changes to existing GDF underground plumbing systems unless the facility was pre-plumbed in anticipation of future stage II requirements. Based on information from the New Hampshire Department of Environmental Services, the cost of stage II installation can range from $18k to $30K with yearly maintanance costs from $1k-$4k depending on the size and site characteristics. In Montana, two GDFs were retrofit with stage II for $123k. In Las Vegas, the typical cost to retrofit a GDF ranged from $40k-$60k. On average, the stage II retrofit cost is probably around $50k per GDF and the cost of building stage II into a new GDF is probably less than $30k.

Benefits: When properly installed and maintained, a stage II vapor recovery system can reduce VOC emissions by about 95% but AP-42 estimates efficiencies more in the range of 88% - 92%. However, the long-term viability of stage II vapor recovery systems are in doubt because the EPA adopted regulations in 1994 that require automakers to equip new vehicles with "onboard refueling vapor recovery" systems (ORVR). ORVR systems are required to meet a refueling emission standard of 0.20 grams per gallon of dispensed fuel, which will yield a 95 % emission reduction over uncontrolled levels. This rule essentially transfers the control of gasoline refueling vapors to to vehicle rather than at the GDF. The full implementation of ORVR systems was realized in 2006 model year. Presently, the ORVR fleet penetration in Colorado is about 45%.

Implementation

Based on a query of the permit system, there are approximately 2988 GDFs in Colorado and 2166 in North Front Range

Number of GDF's Statewide (2006):		**2988**	
Average GDF Retrofit Cost :	$	50,000	
Annual Maintenance Cost on Stage II Systems:	$	2,000	
Total Cost to Retrofit Existing GDF's with Stage II (Statewide):	$	149,400,000	[$/year/GDF] (one time cost)
Annual Maintenance on Stage II Systems (Statewide):	$	5,976,000	[$/year/GDF]
Number of GDF's in North Front Range (2006):		**2166**	
Average GDF Retrofit Cost :	$	50,000	
Annual Maintenance Cost on Stage II Systems:	$	2,000	
Total Cost to Retrofit Existing GDF's with Stage II (NFR):	$	108,300,000	[$/year/GDF] (one time cost)
Annual Maintenance on Stage II Systems (NFR):	$	4,332,000	[$/year/GDF]

Viability

Statewide Gasoline Throughput (2002):		5,700,000	[gallons/day]
If we assume Stage II Vapor Recovery is installed on all GDFs in Colorado			
[1]Vehicle Refueling Displacement Emission Factor (uncontrolled):		0.0110	[pounds/gallon]
[1]Vehicle Refueling Displacement Emission Factor (controlled-Stage II):		0.0011	[pounds/gallon]
Estimated Statewide Rule Effectiveness Factor:		80%	
Estimated Statewide VOC Emission Reduction:		45,144	[pounds/day]
Estimated Statewide VOC Emission Reduction:		**22.6**	**[tons/day]**
Estimated Statewide VOC Emission Reduction:		8,239	[tons/year]
Annualized Costs (assuming 15 year life):	$	44,635,656	[annual]
Cost per ton of VOC reduced (assume 15 year life):	**$**	**5,418**	**[$/VOC ton]**
If we assume Stage II Vapor Recovery is installed on all GDFs in North Front Range			
Estimated North Front Range Market Share of Statewide Gasoline Throughput (2002):		72%	
Estimated North Front Range VOC Emission Reduction:		32,725	[pounds/day]
Estimated North Front Range VOC Emission Reduction:		**16.4**	**[tons/day]**
Estimated Statewide VOC Emission Reduction:		5,972	[tons/year]
Annualized Costs (assuming 15 year life):	$	32,356,370	[annual]
Cost per ton of VOC reduced (assume 15 year life):	**$**	**5,418**	**[$/VOC ton]**

Additional Details

[1]Source AP-42, Table 5.2-7, 5th Edition

The regulatory costs to administer and inspect a Stage II program are not included