

Draft Ozone State Implementation Plan (SIP) Revision Regarding Wisconsin's Stage 2 Vapor Recovery Program

Date: August 31, 2012

The Wisconsin Department of Natural Resources (WDNR) requests that the U.S. Environmental Protection Agency (EPA) expeditiously remove NR 420.045, Wis. Adm. Code, as a component of Wisconsin's ozone maintenance plan. This request is due to the widespread use of onboard refueling vapor recovery (ORVR) technology within the state's gasoline powered on-road vehicle fleet.

The U.S. EPA's Motor Vehicle Emission Simulator (MOVES) model indicates that by 2016, the absence of stage 2 vapor recovery technology will result in a net volatile organic compound (VOC) emissions **benefit** compared to the continued utilization of this emissions control technology in Wisconsin. The MOVES modeling was conducted by the WDNR in accordance with the U.S. EPA's recently issued guidance on widespread use¹. The WDNR is providing excess, permanent and enforceable VOC emission reduction credits for the years of 2012, 2013, 2014 and 2015 to make up for the limited period until ORVR technology sufficiently is in widespread use throughout the vehicle fleet. The VOC reduction credit substitution addresses the anti-backsliding concerns associated with Section 110(l) of the Clean Air Act (CAA), as amended in 1990, and guarantees no net increase in allowable emissions during the transition period. The credits substituted could have otherwise been utilized for new emissions in the form of offset credits supplied to new or expanding VOC point sources.

Ozone SIP Component History

Wisconsin submitted a SIP revision to the U.S. EPA on November 18, 1992 to satisfy the requirement of Section 182(b)(3) of the CAA. This section required owners and operators of gasoline dispensing facilities to install and operate stage 2 vapor recovery equipment in ozone nonattainment areas of moderate severity or worse. The revision applied to the counties of Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan, Washington and Waukesha and was incorporated within the WDNR's 1993-94 Ozone 15% Control Plan. The U.S. EPA approved a revision to Wisconsin's SIP on August 13, 1993 pertaining to implementation of the stage 2 vapor recovery program [58 FR 43080].

The WDNR and the Wisconsin Department of Safety and Professional Services (WDSPPS) have actively supported installation and requisite testing and inspection of gasoline dispensing facilities with both stage 1 and stage 2 vapor recovery technology. The WDSPPS is responsible for system design and installation and the WDNR is responsible for stage 2 vapor recovery compliance inspections. The WDNR maintains a database of the approximate 900 gasoline stations subject to the stage 2 vapor recovery requirements (NR 420.045, Wis. Adm. Code).

Current Stage 2 Vapor Recovery Program Status

On July 15, 2011, the U.S. EPA proposed a finding of national default widespread use of ORVR, with a proposed effective date of June 30, 2013. On May 16, 2012, the U.S. EPA published a finding of widespread use of ORVR with an immediate effective date.

The WDNR and WDSPPS have developed guidance for the stage 2 vapor recovery decommissioning process. This guidance recommends careful and environmentally appropriate removal of the stage 2 vapor recovery equipment using nationally recognized techniques (PEI/RP300-09) and checklists to be used by qualified service personnel. A quality stage 2 vapor recovery removal procedure is critical to ensure accidental fuel leakage and uncontrolled vapor leaks are avoided during the decommissioning process. These procedures are also critical to ensure the continued integrity of the interconnected stage 1 vapor recovery components that ensure minimal loss of gasoline VOC emissions during the loading and

¹ "Guidance on Removing Stage II Gasoline Vapor Control Programs from State Implementation Plans and Assessing Comparable Measures", U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 27711, EPA-457/B-12-001, August 7, 2012

storage of fuel at most gasoline dispensing facilities. Removal of stage 2 vapor recovery technology in the former ozone nonattainment area is anticipated to span a 4 to 5 year period with approximately 20% removal by January 1, 2013 and 90% removal by January 1, 2016.

Stage 1 vapor recovery, as required under NR 420, Wis. Adm. Code, will remain in place and is part of Wisconsin's ozone maintenance plan for the former ozone nonattainment counties in Wisconsin. In addition, all gasoline stations in the state with monthly throughput of greater than 100,000 gallons are subject to equivalent stage 1 vapor control as part of the federal mobile sector hazardous air pollutant control program (*40 CFR Part 63, Subpart CCCCCC*).

Comparison of EPA Guidance-Based and Adjusted MOVES-Based VOC Offset Need

The WDNR pursued two methods to calculate the activity, emissions and lost VOC inventory reduction credits associated with removal of stage 2 vapor recovery as an incremental control to ORVR controls on the motor vehicle fleet. The first approach, pursued prior to finalization of the U.S. EPA's August 7, 2012, assessment (i.e., the widespread use finding) guidance, used MOVES model output adjusted to account for changes to refueling emissions assumed in the model (version 2010b). The second approach used a standardized set of fleet efficiency transition and energy conversion metrics to craft an assessment from the same input vehicle miles traveled (VMT) data as the MOVES assessment following the U.S. EPA's widespread use guidance.

Under both approaches, the resultant estimate of incremental benefit drops rapidly between 2012 and 2015, transitioning to a net benefit with stage 2 vapor recovery removal in 2016. Results of the two approaches were nearly identical, with the major differences occurring as a result of some refueling emission factor simplification within the U.S. EPA guidance. The adjusted MOVES assessment results in a slightly higher uncontrolled base emission level and a slightly higher controlled inventory for the nine counties in the program assessment. The more conservative core results depend on the adjusted MOVES assessment and indicate a need for slightly greater offset than the guidance-based assessment.

Stage 2 Decommissioning Process – Maximum Timeframe

The U.S. EPA has identified a window of time between its formal widespread use finding (effective 2012) and a future year in which the net refueling emissions from a fleet with ORVR technology fall below those from a combined ORVR fleet and standard stage 2 vapor recovery system with a substantial fraction of non-compatible hybrid vacuum assist systems. For Wisconsin, we estimate that year will be 2016, assuming fleet turnover continues at its current fraction combined with the lower effectiveness estimate for the stage 2 vapor recovery program.

Therefore, a 4 year period between 2012 and 2015 is set as the intended timeframe for fully decommissioning the large majority of the non-compatible stage 2 technology. Wisconsin is initiating a simple database to track and ensure that facilities subject to the stage 2 program, a requirement of the current ozone SIP, and not subject to NR 445, Wis. Adm. Code, based on throughput, fully decommission their non-compatible equipment. While non-regulatory, the system allows facilities to demonstrate appropriate decommissioning, receive a final inspection after a final system integrity test and, with adequate throughput characterization, remove themselves from further stage 2 vapor recovery control obligation under either federal law or NR 420.045, Wis. Adm. Code.

VOC Emissions Associated with Stage 2 Vapor Recovery Decommissioning in Wisconsin

The WDNR estimates that approximately 85% of the gasoline consumption in the nine former ozone nonattainment counties occurs from vehicles equipped with ORVR technology. This percentage is projected to rise to 92% in 2015, 95.4% in 2018 and 96.6% in 2022 as shown in Tables 1 and 2.

Table 1: Summary of Motor Vehicle Summer Weekday Activity

Area	Year	VMT	Total Energy Consumption (BTU*10 ⁶)	Gasoline Consumption (gallons)	Average Miles per Gallon
Six SE Counties	2012	47,760,004	298,297	2,538,064	18.8
	2013	48,317,751	296,835	2,525,625	19.1
	2015	49,449,852	292,253	2,486,639	19.9
	2018	51,148,594	282,425	2,403,017	21.3
	2022	52,721,080	270,064	2,297,844	22.9
Three NE Counties	2012	7,232,367	43,069	366,453	19.7
	2013	7,297,873	42,856	364,641	20.0
	2015	7,431,365	42,193	359,000	20.7
	2018	7,600,979	40,323	343,089	22.2
	2022	7,828,644	38,542	327,935	23.9
All Nine Counties	2012	54,992,371	341,366	2,904,518	18.9
	2013	55,615,624	339,691	2,890,266	19.2
	2015	56,881,217	334,446	2,845,639	20.0
	2018	58,749,573	322,748	2,746,106	21.4
	2022	60,549,724	308,606	2,625,779	23.1

Note: The Six SE Counties are: Kenosha, Milwaukee, Ozaukee, Racine, Washington and Waukesha. The Three NE Counties are: Kewaunee, Manitowoc and Sheboygan.

Table 2: Projected ORVR Penetration and Stage 2 Gasoline Consumption from MOVES - Summer Weekday Fractions (% of Nine Counties Total)

Year	ORVR %	Stage 2 %
2012	84.4%	92.5%
2013	87.6%	92.5%
2015	92.0%	92.5%
2018	95.4%	92.5%
2022	96.6%	92.5%

Table 3 summarizes the WDNR's calculations in accordance with the U.S. EPA's widespread use guidance. These calculations indicate a maximum potential loss of 0.02 – 0.70 tons per summer day (tpsd) from 2012 through 2015, were the decommissioning to occur completely during a specified year. However, decommissioning is expected to occur within a four year window from 2012 through 2015. This extended period accounts for the costs associated with replacement equipment and the decommissioning cost process. Based on the percent of gasoline stations decommissioned, the WDNR estimates that 0.018 – 0.140 tpsd of VOC emission reductions will be lost from 2012 through 2015. The WDNR used a factor of 320 to convert the tons per summer day estimates to annual emission estimates. This is consistent with past actions approved by the U.S. EPA.

Table 3: VOC Emissions Offsets Needed in Wisconsin

Wisconsin Statistic	2012	2013	2015
Cumulative # of Facilities Assumed Decommissioned	180	450	810
Maximum Potential Loss of VOC Emission Credits (tpsd)	0.67 – 0.70	0.40 – 0.42	0.021 - 0.022
Percent Stage 2 Throughput Decommissioned	20%	50%	90%
Tons per Summer Day Lost VOC Credit (tpsd)	0.134 - 0.140	0.200 - 0.210	0.019 - 0.020
Tons per Year Lost VOC Credit (based 320 days multiplier)	42.9 – 44.8	64.0 – 67.2	6.1 – 6.4

Note, the more specific calculations and inputs used to determine these values are presented in Appendix A of this document.

Details on Wisconsin Specific Calculations and Ozone SIP History

At the time of program adoption (1993-94) and incorporation in the Ozone 15% Control Plan, Wisconsin used the U.S. EPA's early estimates of control program effectiveness. The stage 2 vapor control technology was designed for a 95% control efficiency for the vapor loss at the nozzle/fill neck (car) interface. Actual program effectiveness for refueling-related emissions at a gas station has to be reduced to account for other smaller emission points – fugitive loss from the nozzle, spillage and excess vapor loss from slightly pressurized underground tanks. Additional program effectiveness discounts occur when exemptions from the program are considered and to account for some level of inadequate maintenance of various portions of the control systems. For the installed systems, the initial 95% control was discounted to an average 90% control with excellent maintenance oversight and somewhat lower levels with reduced frequency inspections and more typical maintenance.

The WDNR initially estimated its core program refueling emissions control effectiveness for the earlier stage 2 vapor control technology predominantly employed within the state areas at approximately 84%. This reflected a lost program effectiveness of approximately 6% associated with the standardized small business and low throughput exemptions allowed for and recommended in the U.S. EPA's original stage 2 SIP planning guidance. As the ORVR technology has penetrated the motor vehicle fleet, the incremental reduction effectiveness assumed to occur, in addition to the stage 2 vapor recovery only system, somewhat declined due to the predominant use of non-ORVR compatible hybrid vacuum-assist systems in many states, including Wisconsin. Additionally, maintenance assessments indicated a somewhat lower impact.

The U.S. EPA estimated a lost benefit at an additional 5 to 7% due to the predominant use of vacuum-assist rather than balance systems for the earlier generation technology used in Wisconsin. The U.S. EPA also recommends the use of a lower current overall program effectiveness estimate under the most typically approved state systems, which have not, in most cases, been able to maintain the high initial compliance oversight resource assumptions. A 77% net default control is the working program benefit estimate for 2012 and was also the same value applied in the Ozone 15% Control Plan.

The 15% plan indicated a baseline, uncontrolled emission level for the refueling sector of 11.66 tons VOC per summer (ozone) day (tpsd) in 1990 and dropped that baseline to 10.04 tpsd once lower volatility gasoline became mandatory in 1992. A 77% net reduction from the 1990 baseline before growth and before the introduction of reformulated gasoline (RFG) was credited at 7.7 tpsd in the Ozone Attainment Demonstration SIP for 2007. While the refueling activity growth projections somewhat eroded program benefits over the period, the introduction of RFG in 1995 and the second phase of RFG in 2000 lowered the overall baseline level of uncontrolled gasoline system evaporative emissions. By 2012, net reduction from the stage 2 vapor recovery program averaged 79% (isolated from ORVR), net reduction from the ORVR system averaged 82% (isolated from stage 2) and the combined effect, discounted for the incompatibility disbenefit, equaled 89% (See Appendix A).

The U.S. EPA's August 7, 2012 guidance indicates a need to ensure "current" program credit estimates using adjustments to the MOVES emission model in place of MOBILE6.2 and more current VMT activity data. The revised estimates for 2012 through 2015 indicate the need for VOC reduction credits to address CAA Section 110(l) requirements.

Identifying Sources for VOC Make-up Emissions

The U.S. EPA guidance indicates Wisconsin needs to supplement its SIP with additional real, permanent and enforceable ozone plan reduction credit to account for lost credit within the standing SIP under the provisions of the CAA Section 110(l) [*non-interference clause in regard to attainment/maintenance of the ozone standard*]. These credits can be excess VOC or nitrogen oxide (NO_x) reductions (with appropriate control ratios per modeling) and must be fully realized to function as substitute reductions.

On June 6, 2012, the WDNR submitted a SIP revision related to the state's vehicle inspection and maintenance (I/M) program. As part of this submittal, the WDNR established VOC and NO_x make-up emissions to address the removal of vehicle tailpipe testing for older vehicles. These make up emission

credits were from facilities located in southeastern Wisconsin that had recently closed and no longer have an air emissions permit. As shown in Table 5 of the I/M SIP submittal (Page 11), the WDNR has the following excess emission make-up credits from 2012 through 2015:

Table 4: Available VOC and NO_x Emission Credits for the Stage 2 Vapor Recovery Program

Year	VOC (tons)	NO _x (tons)	Equivalent VOC (tons) *
2012	42.02	46.42	53.63
2013	86.07	97.17	110.36
2014	130.12	147.92	167.10
2015	174.18	198.66	223.85

* Based on 4:1 NO_x to VOC Ratio (i.e., 4 tons of NO_x = 1 ton of VOC)

As shown in Table 5, the available VOC emission credits are more than adequate to cover the interim stage 2 vapor recovery shortfall.

Table 5: Make-up of Stage 2 Vapor Recovery Program Emissions Shortfall

Year	VOC Emissions Shortfall (tons)	Available VOC Emissions Credit (tons)	Difference (Shortfall – Credit) (tons)
2012	42.9 – 44.8	53.63	- 8.83
2013	64.0 – 67.2	110.36	- 43.16
2014 *	47.0 – 49.6	167.10	- 117.50
2015	6.1 – 6.4	223.85	- 217.45

* The VOC emissions shortfall was interpolated between 2013 and 2015 since MOVES modeling was not done specifically for this year. The same methodology was used as shown in Table 3.

APPENDIX A – EXPANDED MOVES MODELING RESULTS AND WISCONSIN SPECIFIC CALCULATIONS BASED ON U.S. EPA GUIDANCE

Table A1: Expanded WI Results Using MOVES2010b Model, Adjusted Using EPA Widespread Use Guidance (August 7, 2012)
Emission Units: Tons per Summer Weekday

Area	Year	VOC Refueling Displacement Emissions and Percent Reduction from Baseline				VOC Stage 2 Reductions*, as an Increment to ORVR Reduction		
		Results from MOVES model only, without considering U.S. EPA Guidance				MOVES, adjusted by Vacuum Assist Disbenefit per U.S. EPA Guidance	MOVES model only, without U.S. EPA Guidance	MOVES model, adjusted by Vacuum Assist Disbenefit per U.S. EPA Guidance
		Baseline (Uncontrolled)	Stage 2 Impact Only	ORVR Impact Only	Stage 2 and ORVR Impact	Adjusted State 2 and ORVR Impact		
Six SE WI Counties	2012	8.67	1.73 (80%)	1.55 (82%)	0.31 (96%)	0.95 (89%)	1.24	0.60
	2013	8.67	1.73 (80%)	1.27 (85%)	0.25 (97%)	0.91 (90%)	1.01	0.36
	2015	8.60	1.72 (80%)	0.86 (90%)	0.17 (98%)	0.83 (90%)	0.69	0.03
	2018	8.37	1.67 (80%)	0.56 (93%)	0.11 (99%)	0.77 (91%)	0.44	-0.22
	2022	8.03	1.61 (80%)	0.43 (95%)	0.09 (99%)	0.73 (91%)	0.35	-0.29
Three NE WI Counties	2012	1.76	0.48 (73%)	0.31 (82%)	0.08 (95%)	0.21 (88%)	0.23	0.10
	2013	1.76	0.48 (73%)	0.26 (86%)	0.07 (96%)	0.20 (89%)	0.19	0.06
	2015	1.75	0.47 (73%)	0.17 (90%)	0.05 (97%)	0.18 (90%)	0.13	-0.01
	2018	1.68	0.45 (73%)	0.11 (93%)	0.03 (98%)	0.16 (91%)	0.08	-0.05
	2022	1.62	0.44 (73%)	0.09 (95%)	0.02 (99%)	0.15 (91%)	0.06	-0.06
All Nine WI Counties	2012	10.44	2.21 (79%)	1.86 (82%)	0.39 (96%)	1.16 (89%)	1.47	0.700
	2013	10.43	2.21 (79%)	1.52 (85%)	0.32 (97%)	1.11 (89%)	1.20	0.415
	2015	10.35	2.19 (79%)	1.03 (90%)	0.22 (98%)	1.01 (90%)	0.81	0.021
	2018	10.06	2.13 (79%)	0.67 (93%)	0.14 (99%)	0.93 (91%)	0.53	-0.269
	2022	9.65	2.04 (79%)	0.52 (95%)	0.11 (99%)	0.88 (91%)	0.41	-0.357

*Reduction benefit for fully implemented program. Decommission will not occur entirely until after 2016.

85% of the nozzles assumed to be vacuum assist, as specified in the U.S. EPA Guidance released August 7, 2012. All of these vacuum assist nozzles are assumed to be non-ORVR compatible.

Table A2: Activity Data for Gasoline-Powered Vehicles on a Summer Weekday

Area	Year	VMT	Total Energy Consumption (BTU*10^6)	Gasoline Consumption (Gallons)	Average Miles Per Gallon (MPG)
Equation Identifier	-	-	-	F	-
Six SE WI Counties	2012	47,760,004	298,297	2,538,064	18.8
	2013	48,317,751	296,835	2,525,625	19.1
	2015	49,449,852	292,253	2,486,639	19.9
	2018	51,148,594	282,425	2,403,017	21.3
	2022	52,721,080	270,064	2,297,844	22.9
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	2015	7,431,365	42,193	359,000	20.7
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	2022	7,828,644	38,542	327,935	23.9
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	2013	55,615,624	339,691	2,890,266	19.2
	2015	56,881,217	334,446	2,845,639	20.0
	2018	58,749,573	322,748	2,746,106	21.4
	2022	60,549,724	308,606	2,625,779	23.1

Note: U.S. EPA Energy Equivalents for a Gallon of Gasoline: 124 Megajoules (MJ) & 117,529 BTU

Table A3: Calculations Supported By U.S. EPA Guidance – Part 1

Area	Year	Displacement Emission Factor (g/gal) [RFG Sensitive]	VOC Emissions (Grams)	VOC Uncontrolled Emissions (TPD)	Gasoline VMT Fraction of ORVR Vehicles	Gasoline Dispensed to ORVR Vehicles	Gasoline Dispensed using Stage 2	Vacuum-Assist Nozzle Fraction of All Gasoline	In-Use Stage 2 Control Efficiency (Non- ORVR)
Equation Identifier	-	G	-	-	-	E	B	C	A
Six SE WI Counties	2012	3.00	7,614,193	8.39	86.7%	84.4%	93.6%	85%	85.5%
	2013	3.00	7,576,875	8.35	89.9%	87.6%	93.6%	85%	85.5%
	2015	3.00	7,459,917	8.22	94.3%	92.0%	93.6%	85%	85.5%
	2018	3.00	7,209,052	7.95	97.7%	95.4%	93.6%	85%	85.5%
	2022	3.00	6,893,531	7.60	98.9%	96.6%	93.6%	85%	85.5%
Three NE WI Counties	2012	3.90	1,429,168	1.58	86.8%	84.5%	85.0%	85%	85.9%
	2013	3.90	1,422,100	1.57	90.0%	87.7%	85.0%	85%	85.9%
	2015	3.90	1,400,099	1.54	94.5%	92.2%	85.0%	85%	85.9%
	2018	3.90	1,338,047	1.47	97.7%	95.4%	85.0%	85%	85.9%
	2022	3.90	1,278,947	1.41	98.9%	96.6%	85.0%	85%	85.9%
All Nine WI Counties	2012	3.11	9,043,361	9.97	86.7%	84.4%	92.5%	85%	85.2%
	2013	3.11	8,998,975	9.92	89.9%	87.6%	92.5%	85%	85.2%
	2015	3.11	8,860,016	9.77	94.3%	92.0%	92.5%	85%	85.2%
	2018	3.11	8,547,098	9.42	97.7%	95.4%	92.5%	85%	85.2%
	2022	3.11	8,172,478	9.01	98.9%	96.6%	92.5%	85%	85.2%
Source:		EPA Guidance	WI-Specific	WI-Specific	WI-Specific	MOVES WI-Specific	WI-Specific	EPA Guidance	WI-Specific

Table A4: Calculations Supported By U.S. EPA Guidance – Part 2

Area	Year	EPA Compatibility Factor (using 0.0777 constant)	EPA ORVR In-use Efficiency	EPA Increment	Tons per Summer Day Incremental Impact - Stage 2	Decommissioned Fraction	Excess VOC Tons per Summer Day	Ozone Season VOC Offsets
Equation Identifier	-	D	-	Key Eqn. # 1	Key Eqn. #2	-	-	-
Six SE WI Counties	2012	0.0656	98%	0.069	0.580	20%	0.116	17.7
	2013	0.0681	98%	0.041	0.346	50%	0.173	26.4
	2015	0.0715	98%	0.003	0.027	90%	0.024	3.7
	2018	0.0741	98%	-0.026	-0.208	95%	-0.198	-30.3
	2022	0.0751	98%	-0.037	-0.278	98%	-0.272	-41.7
Three NE WI Counties	2012	0.0657	98%	0.057	0.090	20%	0.018	2.8
	2013	0.0681	98%	0.032	0.050	50%	0.025	3.8
	2015	0.0716	98%	-0.004	-0.006	90%	-0.005	-0.8
	2018	0.0741	98%	-0.029	-0.043	95%	-0.041	-6.3
	2022	0.0751	98%	-0.039	-0.055	98%	-0.054	-8.2
All Nine WI Counties	2012	0.0656	98%	0.067	0.670	20%	0.134	20.5
	2013	0.0681	98%	0.040	0.396	50%	0.198	30.3
	2015	0.0715	98%	0.002	0.022	90%	0.020	3.1
	2018	0.0741	98%	-0.027	-0.252	95%	-0.239	-36.6
	2022	0.0751	98%	-0.037	-0.333	98%	-0.327	-50.0

Key Equations based on Tables A2 – A4

1 Incremental Benefit for Stage 2 Added to ORVR By Year (Per U.S. EPA Guidance)

$$\text{Increment} = [B \cdot (1-E) \cdot A] - (C \cdot D)$$

2 – Tons Benefit Associated With Stage 2 In Addition To ORVR Controls

$$\text{Tons Per Summer Day} = (F \cdot G \cdot \text{Eqn. \#1}) / (453.59 \text{ g/lb} \cdot 2000 \text{ lb/ton})$$

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