Diesel Anti-Idling Program

Summary:
Implementation of Act 124 of 2008, the Diesel-Powered Motor Vehicle Idling Act, and DEP's related regulation.

Other Involved Agencies:
The Pennsylvania State Police and local law enforcement agencies are authorized to enforce this Act..

Act 124:
On October 8, 2008, the General Assembly enacted the Diesel-Powered Motor Vehicle Idling Act, Act 124. Governor Rendell signed Act 124 into law on October 9, 2008, and it went into effect on February 6, 2009. Act 124 restricts diesel idling to 5 minutes in any continuous 60-minute time period for diesel-powered vehicles with a gross weight of 10,001 pounds or more engaged in commerce. It offers exemptions for safety and practical concerns, as well as for the efficient movement of traffic.

Idling restrictions would also derive a co-benefit by reducing the amount of fuel that diesel-powered commercial motor vehicles consume. Not only would vehicle owners and operators realize cost savings by complying with Act 124, they would also be contributing to the commonwealth's energy independence.

Act 124 is primarily an air pollution control measure, and reductions in fuel use and CO_2 emissions are incidental. The Act does not specify how the trucking industry should comply. DEP believes that most trucking companies will choose options that will reduce idling and save fuel at the same time, while meeting the requirements of this air quality control measure. Technology options may exist in the near future, where acceptable idling practices outlined in the Act may be met, but no reduction in fuel consumption would be realized. For instance, the Act would allow for main engine idling in a diesel-powered commercial motor vehicle if the engine met an alternative "clean idling" air emission standard. In this particular case, no fuel savings would result.

Potential GHG Reductions and Economic Costs:

Table 1. Estimated GHG Reductions and Cost-effectiveness

GHG emission savings (2020)	.072	$MMtCO_2e$
Net present value (2013–2020)	-$	$million
Cumulative emissions reductions (2013–2020)	0.548	$MMtCO_2e$
Cost-effectiveness (2013–2020)	-$215	$/tCO_2e$

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent. Negative numbers indicate costs savings.

The total annual heavy-duty vehicle idling emissions (0.125 $MMtCO_2e$) are based on the report prepared for the EQB, *Quantification of Pennsylvania Heavy-Duty Diesel Vehicle Idling and Emissions—Final Report*, Michael Baker Jr., Inc, (March 2007). To reduce these idling emissions by 50 percent, anti-idling technologies will need to be installed in Pennsylvania. It is assumed that idling cannot be reduced without providing the services that previously were met with idling, typically either heating or cooling. The two technologies considered in this analysis are truck stop electrification (TSE) and auxiliary engine installation (APU). The analysis divides the use of these technologies evenly (50 percent for each). The number of hours spent idling in Pennsylvania was estimated based on total idling emissions. Because a heavy-duty truck burns about 1 gallon of diesel fuel per hour of idling, the number of idling hours in PA was estimated to be 3.58 million hours (Stodolsky et al., 2000). The average vehicle idles 6.05 hours per day. Therefore, the number of vehicles idling in the state is estimated to be 5,073 (Baker, 2007).

Both TSE and APUs result in GHG emissions of their own (electricity emissions from TSE and diesel combustion from auxiliary engines). However, in both cases, these emissions are lower than traditional engine idling. TSE represents an 83 percent reduction in overall CO_2 emissions to provide the same services, whereas auxiliary engines provide a 73 percent emission reduction (Stodolsky et al., 2000). To achieve a 50 percent reduction in emissions, more than 50 percent of all vehicles require modifications that reduce idling. Table 2 shows the business-as-usual idling rate and the emission reductions estimated in the policy.

Table 2. GHG Savings from Truck Idling Reduction

Year	MtCO2e From Idling	Gallons Consumed, Auxiliary Engines	Million Gallons Saved, Auxiliary Engines	MWh Spent, TSE	Million Gallons Saved, TSE	GHG Emissions, Anti-Idling Technologies	Net GHG Savings, Anti-Diesel Idling ($MMtCO_2e$)
2013	125,715	0.95	3.6	13,443	3.6	0.017	0.063
2014	125,636	0.95	3.6	13,443	3.6	0.017	0.063
2015	125,556	0.95	3.6	13,443	3.6	0.017	0.063
2016	125,477	0.95	3.6	13,443	3.6	0.017	0.063
2017	125,398	0.95	3.6	13,443	3.6	0.017	0.063
2018	125,239	0.95	3.6	13,443	3.6	0.017	0.063
2019	125,239	0.95	3.6	13,443	3.6	0.017	0.063
2020	125,239	0.95	3.6	13,443	3.6	0.017	0.063
Total							**0.50**

CO_2 = carbon dioxide; GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; TSE = truck stop electrification.

The costs of TSE are estimated based on the costs of electricity, of vehicle modifications, and of truck stop modifications. Electricity costs were estimated to be 2,670 kilowatt-hours per year (kWh/yr) per space. The number of spaces was estimated to be 5,037 based on the hours of idling the policy is seeking to reduce (estimated from fuel consumption) divided by 710 hours, the average amount of use an electrified space receives in a year. These spaces cost an average of $3,517 to operate annually. Modifications to individual trucks cost $2,393 multiplied by the number of trucks using TSE technology, estimated to be 1,620. This estimate came from the number of long-haul trucks idling in the state (5,073 in 2009), multiplied by the percentage of trucks in the program (32 percent), in order to achieve the 50 percent idling reduction goal. The modifications for trucks and spaces occur only for the initial purchase in the first year of the program, as can be seen in Table 3.

The costs of auxiliary power units (APUs) are estimated based on the average costs of APUs ($7K-$9K), annualized over 5 years. These costs are annualized because it is assumed that these auxiliary engines only last 5 years, after which they will need to be replaced. Using a capital recovery factor (CRF) and a discount rate of 5 percent, the annualized cost is therefore $1,867. This figure is then multiplied every year by the number of trucks requiring this modification. This is calculated based on the number of trucks idling in the state (5,073 in 2009) multiplied by the percentage of trucks in the program to achieve the reduction goal (32 percent). Added to these costs are the costs of fuel for the APUs. The combined costs for the APUs are shown in Table 3. The cost savings from anti-idling measures are realized in the fuel savings from reduced engine idling, also shown in Table 3.

Table 3. Costs of and Cost Savings from Truck Idling Reduction

Year	Total Cost of TSE ($MM)	Total Cost of Auxiliary Engines ($MM)	Net Diesel Gallons Saved (Millions)	Idling Reduction Fuel Savings ($MM)	Net Cost of Truck Anti-Idling ($MM)
2013	$1.2	$6.4	6.2	$25.0	-$13.7
2014	$1.2	$6.5	6.2	$26.1	-$14.9
2015	$1.3	$6.6	6.2	$26.7	-$15.5
2016	$1.3	$6.6	6.2	$26.7	-$15.8
2017	$1.3	$6.6	6.2	$26.7	-$16.1
2018	$1.4	$6.6	6.2	$26.8	-$16.3
2019	$1.4	$6.6	6.2	$26.9	-$16.4
2020	$1.4	$6.6	6.2	$26.9	-$16.6
Total					**-$125.6**

$MM = million dollars; TSE = truck stop electrification.

<u>Reduced School Bus Idling:</u>

There are approximately 31,000 school buses in Pennsylvania based on estimates provided by the Pennsylvania Department of Motor Vehicles (DMV) (PA DMV, 2009). The number of school buses was increased based on the growth in school buses between 1999 and 2008 (2.2 percent annual growth). EPA’s National Idle-Reduction Campaign calculator was used to estimate the potential fuel savings and fuel costs for a school bus idle reduction campaign. An idling reduction of 30 minutes per day would result in 45 gallons per year in saved diesel fuel. The GHG savings of applying these savings to all school buses are shown in Table 4. The buses were assumed to install engine block preheaters to be used in cold weather. These preheaters cost approximately $1,500; fuel costs are 1/16 those of traditional engine idling (EPA, 2009). Engine costs are considered as an annualized cost over 20 years, with a 5 percent discount rate. Because reduced engine idling also reduces engine wear, there would likely be savings in the cost of maintenance. These savings are not considered in this analysis. The costs and cost savings of reduced school bus idling are shown in Table 5.

Table 4. Greenhouse Gas Benefits from Reduced School Bus Idling

Year	Implementation Path	PA School Buses	School Buses in Program	Bus Savings (thousand diesel gals)	Emission Reduction (MMtCO_2e)
2013	18.2%	34,336	6,243	263	0.003
2014	22.7%	35,086	7,974	336	0.004
2015	27.3%	35,853	9,778	413	0.005
2016	31.8%	36,636	11,657	492	0.006
2017	36.4%	37,437	13,614	574	0.006
2018	40.9%	38,255	15,650	660	0.007
2019	45.5%	39,091	17,769	750	0.008
2020	50.0%	39,946	19,973	843	0.009
Total					**0.048**

Gals = gallons; MMtCO_2e = million metric tons of carbon dioxide equivalent.

Table 3-5. Costs of School Bus Idling Program

Year	Fuel Cost Savings (Million $)	Installation Costs (Million $)	Net Costs
2013	0.9	$0.8	-$0.2
2014	1.2	$1.0	-$0.3
2015	1.5	$1.2	-$0.4
2016	1.8	$1.4	-$0.4
2017	2.2	$1.6	-$0.5
2018	2.5	$1.9	-$0.6
2019	2.9	$2.1	-$0.8
2020	3.3	$2.4	-$0.9
Total			**-$4.1**

Negative numbers indicate cost savings.

Implementation Steps:

The Diesel Vehicle Idling regulation has been in effect since February 2009. DEP air inspectors, Pennsylvania State Police, and local police can all enforce this regulation. DEP will work with trucking companies and truck plaza owners and managers to develop the needed level of compliance and corresponding amount of GHG reductions.

Key Assumptions:

The analysis assumes that a 50 percent idling reduction can be achieved through the use of TSE and auxiliary engines. Other technologies exist to provide the same services, but these two are used to demonstrate the overall cost-effectiveness of anti-idling programs.

It was assumed that school bus figures will increase at the rate seen in 1999–2008. If effective land-use policies are put into place in the next decade, fewer school buses will be required; thus, this may be an overestimate.

Key Uncertainties:

It is also assumed that the average number of trucks idling can be determined based on the average idling taking place every day in Pennsylvania. However, this is likely an underestimate, because trucks leave the state in through traffic (travel which neither begins nor reaches its destination in Pennsylvania). If some estimate of the total number of different trucks idling in Pennsylvania could be found, that would improve the analysis and possibly would the cost-effectiveness of the option.
It is possible that an idle reduction program will be less successful if trucking companies cannot get carbon offsets by installing APUs and electrification equipment.

Much of the cost-effectiveness of this option has to do with the CRF chosen. If a 5-year payback is used, then capital costs are significant, and cost-effectiveness goes down. If a longer payback period is used, then a significant portion of the costs is occurring outside of the time period of the analysis, which makes the option seem more cost-effective.

Additional Benefits and Costs:

Reductions in idling will also reduce emissions of toxics, NO_x, and particulate matter (PM). The primary co-benefits for Pennsylvania of this policy will be in reducing PM-2.5 (particulate matter 2.5 micrometers in diameter and smaller) precursor emissions, such as PM-2.5 and NO_x emissions in the state's PM-2.5 NAAQS nonattainment areas. Pennsylvania currently has two designated PM-2.5 nonattainment areas around Pittsburgh and Philadelphia. Initial implementation of this policy option should be in those areas.

Reducing fine-particle pollution, according to EPA studies, will mean improved health due to fewer cases of asthma, lost workdays, hospital visits, and premature deaths. Idle emission reductions will reduce wear from engine operation, thus leading to a cost savings from reduced maintenance costs.

Potential Overlap:
Biofuel Development and In-state Production Incentive Act.

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