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GUIDANCE FOR QUANTIFYING AND USING LONG DURATION TRUCK IDLING EMISSION REDUCTIONS

September 16, 2003

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GUIDANCE FOR QUANTIFYING AND USING LONG DURATION TRUCK IDLING EMISSION REDUCTIONS

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LIST OF ABBREVIATIONS

APU	Auxiliary Power Unit
BACT	Best Available Control Technology
BART	Best Available Retrofit Technology
CAA	Clean Air Act
ECM	Engine Control Module
g/bhp-hr	Grams per brake horsepower hour
g/kW-hr	Grams per kilowatt hour
g/hr	Grams per hour
g/mile	Grams per mile
hp	Horsepower
hr	Hour
GPS	Global Positioning System
lbs	Pounds
LAER	Lowest Achievable Emission Rate
NESHAPS	National Emission Standard for Hazardous Air Pollutants
NOx	Nitrogen Oxides
NSPS	New Source Performance Standards
NSR	New Source Review
PM	Particulate Matter (2.5 and 10)
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
ROP	Rate of Progress
RPM	Revolutions Per Minute
SIP	State Implementation Plan
TIP	Transportation Improvement Program
TSE	Truck Stop Electrification
VOCs	Volatile Organic Compounds

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Guidance for Quantifying and Using Long Duration Truck Idling Emission Reductions

(Note: As used in this document, the terms "we", "us" and "our" refer to EPA. The terms "you" and "your" refer to a state air pollution control agency, state or local transportation agency, or private entity.)

Section A: Background Information

1. What is the purpose of this guidance?

The purpose of this document is to provide you with guidance on quantifying emission reductions from technologies which reduce long duration truck idling emissions from Class 8 vehicle on-road mobile sources. You may wish to use the emission reductions resulting from implementing an idling reduction technology for meeting emission reduction requirements such as RFP/ROP, attainment or maintenance SIP, transportation conformity determination, or as NSR offsets.

2. How does this guidance relate to existing Clean Air Act requirements?

This document is intended solely as guidance and does not represent final Agency action. It does not supersede or change any existing federal or state regulations or requirements, including those of an approved SIP. If you use this guidance you must still comply with all otherwise applicable CAA requirements pertaining to the crediting of emission reductions for your SIP, including all requirements pertaining to offsets required in the NSR program or emission reductions for your RFP/ROP, attainment or maintenance strategy. You must also continue to comply with CAA and transportation conformity regulation requirements as appropriate. If you decide to submit information to us that differs from the guidance in this document we will review the information and make a decision as to the appropriateness of its use on a case-by-case basis.

3. What are long duration truck idling emissions?

Long haul truck drivers will often rest for extended periods in their sleeper compartment. In fact, the Department of Transportation requires that a truck driver rest for at least 8 hours for every 10 hours of driving.[1] During this rest period, truck drivers will often idle their engines to operate the air conditioning, heat, or on-board appliances such as a television or microwave. Truck drivers will also idle their engines to keep their engine and fuel warm in cold weather. Another reason for long duration idling occurs while a truck driver waits (for example, at border

[1] New DOT hours of service, effective in 2004, will require 10 hours of rest after 14 hours of driving (68 FR 81, April 28, 2003).

crossings), or waits to load or unload their truck (for example, at a company loading dock, distribution center, or port).

4. What is an idle reduction technology?

An idle reduction technology for on-road mobile sources consists of the use of an alternative energy source in lieu of using the main truck engine for the purpose of reducing long duration truck idling. Some of these technologies are mobile and attach onto the truck (mobile auxiliary power units (APUs)) and provide air conditioning, heat, and power to operate auxiliaries such as a microwave.

Another technology involves electrifying truck parking spaces (stationary truck stop electrification) with or without modifying the truck. In general, this involves power from the electrical grid providing energy to operate stationary equipment or on-board truck equipment to provide cab heating, cooling, or other needs.

This guidance addresses emission reductions generated from both mobile and stationary technologies. EPA maintains a list of commercially available truck idle reduction technologies on its web site at the following address: http://www.epa.gov/otaq/retrofit/idlingtech.htm. This list is for informational purposes only, is not an endorsement or verification of any specific idle reduction technology, and is not intended as a complete list of all available idle reduction technologies.

5. What are the benefits from using technologies to reduce long duration truck idling emissions?

The primary purpose of this guidance is to quantify emission reductions in criteria air pollutants and their precursors. This guidance specifically addresses emission reductions of NOx and $PM_{2.5 \text{ and } 10}$[2]. In addition, there are other important benefits associated with reductions in long duration truck idling emissions including:

- Reductions in the emissions of toxic air pollutants such as formaldehyde, and trace metals such as nickel.
- Reductions in emissions of carbon dioxide.
- Reductions in fuel consumption which results in cost savings to the truck operator, decreased maintenance costs, and longer engine life.
- Reductions in noise levels.
- Decreased dependency on oil imports.

[2] Based on data collected, almost all diesel PM is submicron in size. Therefore, we believe it is reasonable to use this emission factor for both $PM_{2.5 \text{ and } 10}$. It is important to note that the emission factor and methodology for PM relies on MOBILE6 which EPA will officially release in the near future.

Local communities near truck stops, rest areas, and other areas, some of which are comprised of low income and minority populations, may benefit from the reduced pollution and noise levels as will truck drivers and truck stop employees.

Section B: Basic Requirements for Long Duration Truck Idling Emissions Reductions

6. What are the basic requirements for using emission reductions in SIPs, conformity or as NSR offsets?

In order to be approved as a measure which provides additional emission reductions in a SIP, conformity determination or as an NSR offset, a control measure reducing long duration truck idling emissions cannot interfere with other requirements of the CAA, and would need to be consistent with SIP attainment, maintenance, or RFP/ROP requirements. In addition, the control measure must provide emission reductions that meet the requirements described below.

(A) Quantifiable - The emission reductions from a control measure to reduce long duration truck idling emissions are quantifiable if they are reliably and replicably measured. Emission reductions must be calculated for the time period for which the measure is in use. Section D of this provides a methodology for quantifying reductions from truck idling emissions.

(B) Surplus - Emission reductions are surplus and can be used as long as they are not relied on to meet other applicable air quality requirements.

More specifically, to be surplus for NSR offset purposes only, the emission reductions cannot be required or assumed by an existing SIP or NSR permit and cannot otherwise be relied on or required to meet any of the following:

- A technology based requirement of the CAA, including, but not necessarily limited to, RACT, BACT, LAER, BART, NSPS limits, or NESHAPS limits.
- Emission reductions used to demonstrate transportation conformity.
- Emission reductions previously used or needed for offset or netting purposes.
- Other adopted state air quality programs not in the applicable SIP.
- Federal rules that reduce criteria pollutants (or their precursors) such as the Consumer Product Rule for reducing VOCs promulgated under section 183 of the CAA.

Therefore, emission reductions from long duration truck idling control measures cannot also be used for SIP or transportation conformity purposes if they are used as an NSR offset.

For both SIP and NSR purposes, to be considered surplus the emissions from long duration truck idling must be a part of the SIP's emissions inventory. For transportation conformity, the emissions from long duration truck idling must be part of the regional emissions analysis for the

conformity determination.

(C) Federally Enforceable - Depending on how the emission reductions are to be used, control measures to reduce long duration truck idling emissions must be enforceable either (1) through a SIP or SIP revision, (2) through a permit issued under a SIP approved permitting program, or (3) through a transportation conformity determination. Where the emission reductions are part of a rule, regulation, or permit, they are considered federally enforceable if they meet all of the following requirements:

- They are independently verifiable.
- Violations are defined, as appropriate.
- You and EPA have the ability to enforce the measure if violations occur.
- Those liable for violations can be identified.
- Citizens have access to all the emissions-related information obtained from the responsible party.
- Citizens can file suits against the responsible party for violations.
- Violations are practicably enforceable in accordance with EPA guidance on practicable enforceability.
- For SIPs and conformity only, a complete schedule to implement and enforce the measure has been adopted by the implementing agency or agencies.

If a SIP revision is approved under EPA's Voluntary Measures Policy[3], the reductions are not enforceable against a responsible party and may not be used for NSR offsets. Here, the state is responsible for assuring that the reductions credited in the SIP occur. The state would need to make an enforceable SIP commitment to monitor, assess and report on the emission reductions resulting from the voluntary measure and to remedy any shortfalls from forecasted emission reductions in a timely manner. Further, the total of all voluntary measures (including the idle emission reduction measures) may not exceed 3% of the total reductions needed to meet any requirements for ROP, attainment, or maintenance. In the circumstance where the actual emission reductions achieved are more than the amount estimated in the SIP, you may take credit for the additional emission reductions provided it does not exceed the 3% cap on voluntary measures and other aspects of the Voluntary Measures Policy are met. If you wish to have a SIP revision approved as a voluntary measure, consult the Voluntary Measures Policy for further information.

(D) Permanent - The emission reduction must be permanent throughout the term that the credit is granted.

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[3] Mobile Source Voluntary Measures Policy. For a description of this policy consult the following web site: http://www.epa.gov/otaq/transp/traqvolm.htm.

(E) Adequately Supported – Except when used for NSR offset purposes, the state must demonstrate that there is adequate funding[4], personnel, and other resources to implement the control measure on schedule.

7. What are the types of operational requirements that would generate emission reductions?

To generate emission reductions the following requirements should be met:

(A) Use an idle reduction technology to provide cab comfort needs (such as heat or air conditioning), in lieu of idling the main truck engine, and/or reduce idling during the truck driver's long duration rest or wait period;

(B) Use an idle reduction technology that is equipped with a non-resettable meter or data logger capable of measuring total hours it operated;

(C) Ensure the responsible parties comply with all necessary monitoring, recordkeeping, reporting, validation, and reconciliation requirements per Section E of this guidance.

(D) In the case of stationary idle reduction technologies:

(1) Ensure the technology is located in a nonattainment or maintenance area for the pollutant or precursor for which emission reductions are generated; and

(2) Prior to generating emission reductions, ensure the location owner has provided you with the following information for each truck stop location that will be generating emission reductions, including documentation such as survey methods or direct observation methods to support the findings:

(a) Percentage of truck parking spaces used at the location throughout the year (for example, annual occupancy rate);

(b) Of the percentage in (a) above, the percentage of those trucks which idle for long

[4] The Congestion Mitigation and Air Quality Improvement Program (CMAQ) is a U.S. Department of Transportation program that supports transportation programs and projects that reduce air pollution in nonattainment and maintenance areas. Additional information on using CMAQ funds for idling reduction projects can be found on the Federal Highway Administration web site at: www.fhwa.dot.gov/environment/cmaqpgs/index.htm.

duration periods of time (defined as 15 consecutive minutes or more at idle); and

(c)(1) Of the trucks in (b) above, the historic number of hours the trucks idled per day for a typical summer weekday in the nonattainment or maintenance area (if pursuing NOx emission reductions in an ozone nonattainment/maintenance area); or

(c)(2) Of the trucks in (b) above, the historic number of hours the trucks idled per day for an average annual weekday in the nonattainment or maintenance area (if pursuing PM or NOx emission reductions used in a PM nonattainment or maintenance area)

(E) In the case of mobile idle reduction technologies:

(1) Ensure the truck engine is equipped with a non-resettable meter or data logger capable of measuring the total number of engine idling hours (such as an engine control module);

(2) Ensure the truck engine is equipped with a global positioning system or another method that is capable of demonstrating that the truck is in the nonattainment or maintenance area throughout the time frame during which the emission reduction is quantified; and

(3) Prior to generating emission reductions, ensure the truck owner has provided you with the following information for each truck that will be generating emission reductions, including documentation such as data from a non-resettable meter and GPS to support the findings:

(a) The historic number of hours the trucks idled per day for a typical summer weekday in the nonattainment or maintenance area (if pursuing NOx emission reductions in an ozone nonattainment/maintenance area); or

(b) The historic number of hours the trucks idled per day for an average annual weekday in the nonattainment or maintenance area (if pursuing PM or NOx emission reductions used in a PM nonattainment or maintenance area).

(4) Prior to generating emission reductions, ensure the truck owner has provided you with the following information for the idle reduction technology: the manufacturer of the idle reduction technology, engine model, engine manufacture date, and daily horsepower load for the time period for which you will be generating emission reductions (for example, summer weekday period or average annual weekday).

Section C: Specific Requirements for Using Long Duration Truck Idling Emission Reductions

8. <u>What are the total long duration truck idling emissions included in the SIP's emissions inventory or the regional conformity analysis</u>?

Some fraction of long duration truck idling emissions are included in inventories based on MOBILE6 estimates through the model's use of conversion factors, but these emissions are not a distinct and separate category. In particular, MOBILE6 uses conversion factors to convert from g/bhp-hr to g/mile. The conversion factors were determined based on factors including fuel economy estimates. These fuel economy estimates came from the U.S. Census Bureau's 1992 Truck Inventory and Use Survey (TIUS) study. Many of the TIUS respondents reported fuel economy as long-term average fuel use per mile traveled, including fuel used during long duration truck idling. The incorporation of these numbers in the g/bhp-hr to g/mile conversion factors means that some fraction of long duration idling activity is included in the g/mile emissions factors produced by MOBILE6.

After reviewing the impact of fuel consumption on the conversion factor for class 8 trucks and the impact of the conversion factor on the g/mile emission factors for class 8 trucks produced by MOBILE6, we believe long duration truck idling emissions account for not more than 3.4% of the total emissions for class 8 trucks for any criteria pollutant or precursor in MOBILE6. Consequently, the total annual or average daily emissions reductions for all long duration idling controls in a nonattainment or maintenance area in any year is limited to an amount not to exceed 3.4 % of the total annual or average daily heavy duty diesel truck class 8 emissions for that year.[5]

To quantify the total allowable emission reductions, states must first determine the total emissions from heavy duty diesel class 8 trucks in the MOBILE6 emissions inventory or conformity analysis for the year in question and multiply that value by 3.4% (or 0.034%). For example, the total allowable emission reductions for NOx in 2010 would be 3.4% of the heavy duty diesel class 8 NOx inventory for 2010. Likewise, the total allowable emission reductions for $PM_{2.5 \text{ and } 10}$ in 2010 would be 3.4% of the heavy duty diesel class 8 $PM_{2.5 \text{ and } 10}$ inventory for 2010. Because MOBILE6 projects a decrease in emissions from heavy duty diesel class 8 trucks in future years, the total allowable emissions will decrease in future years. This applies to the total reductions a nonattainment or maintenance area can claim from all strategies to reduce long duration truck idling emissions, regardless of whether they are used for SIP, conformity, NSR offset purposes, or some combination thereof.

The MOVES model, currently under development and intended to replace MOBILE6, will address long duration truck idling separately from other truck emissions and will correct any discrepancies in the actual long duration truck idling inventory.

9. How can the estimated emission reductions be used for SIP purposes?

For a SIP attainment or maintenance strategy, you can use the emission reductions which are,

[5] The 3.4% limit on the total amount of emission reduction that can be used only applies where the on-road mobile source inventory is based on MOBILE 6 estimates. In those circumstances where the inventory is based on the latest EPA-approved EMFAC model, we will work with you on a case-by-case basis to determine the appropriate amount.

or expected to be, generated from the idling reduction technology based on applying the following criteria:

(A) Based on the historic idling hours as determined in question 7(D)(2) and 7(E)(3) above, your estimated and actual emission reductions per day from the idle reduction project should be a percentage of the historic idling hours per day. In the circumstance where the estimated or actual hours idled exceeds the historic idling hours, you will need to provide an explanation as to the reason for the difference. We will assess this explanation and make a decision as to the quantity of the emission reduction available on a case-by-case basis.[6]

(B) Where required, emission reductions must account for seasonality. For example, if your SIP only credits those reductions which take place during the summer ozone season, then only reductions in idling emissions which take place during that season may be credited.

(C) The total emission reductions from all controls on long duration truck idling for each criteria pollutant or precursor is not to exceed 3.4% of the class 8 truck SIP emissions inventory for a given year.

10. How can the emission reductions be used for transportation conformity purposes?

The transportation conformity regulation (40 CFR parts 51 and 93) describes the requirements for including emission reductions from control strategies in a conformity determination for a transportation plan, transportation improvement program (TIP), or transportation project. The conformity rule requires a regional emissions analysis be conducted for all non-exempt projects included in the transportation plan and TIP. In the regional emissions analysis, the emissions from future transportation activities are estimated or modeled, just as they are when creating or revising a SIP's motor vehicle emissions inventory ("budget").

To include NOx or PM emission reductions from a truck idling control measure in a regional conformity analysis, the appropriate jurisdictions must be committed to the measure. The appropriate level of commitment varies according to the requirements outlined in 40 CFR 93.122(a) which are described as follows:

(A) If the measure does not require a regulatory action to be implemented, it can be included in a conformity determination if it is included in the transportation plan and TIP with sufficient funding and other resources for its full implementation.

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[6] For both mobile and stationary idle reduction technologies, determining the historic idling hours forms the basis for estimating the potential emission reductions after the technology has been installed. Differences between the historic idling hours and estimated or actual idling hours may occur due to, for example, warmer or colder temperatures than the previous time period.

(B) If the measure requires a regulatory action to be implemented, it can be included in a conformity determination if one of the following has occurred:

(1) The regulatory action is already adopted by the enforcing jurisdiction (e.g., a state has adopted a rule to require a control measure);

(2) The strategy has been included in an approved SIP; or

(3) There is a written commitment to implement the strategy in a submitted SIP with a motor vehicle emissions budget that EPA has found adequate.

(C) If the measure is not included in the transportation plan and TIP or the SIP, and it does not require a regulatory action to be implemented, then it can be included in the conformity determination's regional emissions analysis if the conformity determination contains a written commitment from the appropriate entities to implement the measures.

Whatever the case, the emission reductions can only be applied in a conformity determination for the time period or years in which the truck idling control measure will be implemented. Written commitments must come from the agency with the authority to implement the measure. The latest emissions model and planning assumptions must be used when calculating emission reductions from the measure, according to 40 CFR 93.110 and 93.111.

Areas should utilize the conformity interagency consultation process to discuss the methods and assumptions used to quantify the reductions from the measure. The conformity determination should include documentation of the methodology, assumptions, and models that were used to calculate emission reductions from long duration truck idling measures, as well any commitments that are necessary to implement the project, as described above. The conformity determination should also document that the total emission reductions from all controls on long duration truck idling for a given pollutant or precursor is not to exceed 3.4% of the class 8 truck emissions in the regional conformity analysis for a given year.

11. How can the emission reductions be used for NSR offset purposes?

The federal new source review program requirements governing offsets do not distinguish between emission reductions generated by mobile sources and emission reductions generated by stationary sources. Consequently, mobile sources may generate emission reductions for major source offsetting purposes as long as the reductions meet the applicable SIP requirements for otherwise creditable NSR offsets. For the reductions to be creditable there must be an enforceable requirement on the part of the credit generator and/or the credit user to apply and use the specified idling reduction technology.

For NSR offsets, you can use the emission reductions which are expected to be generated from

the idling reduction technology based on applying the following criteria:

(A) In the case of stationary idle reduction technologies, ensure the location owner or lessee has the right through direct ownership, an agreement, or contract to operate the stationary idle reduction technology[7].

(B) Based on the historic idling hours as determined in question 7(D)(2) and 7(E)(3) above, your estimated and actual emission reductions per day from the idle reduction project should be a percentage of the historic idling hours per day. In the circumstance where the estimated or actual hours idled exceeds the historic idling hours, you will need to provide an explanation as to the reason for the difference. We will assess this explanation and make a decision as to the quantity of the emission reduction available on a case-by-case basis.

(C) Estimated emission reductions should be discounted by ten percent to address uncertainties associated with projecting the amount of time an emission idling reduction technology will actually displace historic idling time.

(D) Each year the emission reductions generated by the use of an idle reduction technology are to be verified and any shortfall should be reconciled in a timely manner, but not to exceed 3 months from the time of verification. Additional credits should not be granted until the shortfall is addressed.

(E) Emission reductions generated by the use of an emissions reduction technology cannot be banked and must be used during the year that they are generated.

(F) The total emission reductions from all controls on long duration truck idling for each criteria pollutant or precursor is not to exceed 3.4% of the class 8 truck emissions inventory for a given year.

12. <u>What are the additional criteria for using idling reductions for major source NSR offsets?</u>

In addition to the general requirements for emission reductions discussed above, emission reductions for use as NSR offsets must also meet the following criteria:

(A) In areas that are nonattainment for the ozone standard, reductions in ozone precursors

[7] For stationary technologies we refer to the location as the generator of the emission reduction. However, the generator of stationary technology emission reductions can be owned by the location owner or a third party who leases the space from the location owner, installs the technology, and controls its operation. Thus, the generator of the emission reduction will be case and fact specific, as determined by the state or local air pollution control agency.

may be used to comply with the NSR offset requirement, if at a minimum, all federal NSR offset provisions are met;

(B) An emission reduction that is generated or used to comply with any other CAA requirement (including title IV of the Acid Rain requirements) may not be used as a NSR offset;

(C) An emission reduction that is used as an NSR offset may not be used to meet any other CAA requirement (including title IV of the Acid Rain requirements); and

(D) An emission reduction used as an NSR offset must be federally enforceable.

(E) The NSR permit for the source using the reductions requires that at least one year prior to the date the truck or location emission reductions ceases to be generated, other offsets sufficient to replace the previously relied on reductions must be obtained. These offsets must undergo a public comment period equivalent to the public comment period for NSR permits.

Section D: Quantifying Long Duration Truck Idling Emission Reductions

The following steps describe how to estimate the emission reductions from a proposed idle reduction project. In addition, these same steps can be used to determine the actual emission reductions achieved from the project. Step 1 establishes the historic idling activity from which you will estimate an emission reduction. Steps 2 and 3 describe how to estimate the truck emissions that are reduced when using an idle control technology. Step 4 describes how to estimate the emissions associated with the idle reduction technology (this step is not necessary if using a stationary idle reduction technology). Steps 5 and 6 describe how to estimate the net reduction in emissions for the entire project. Finally, Steps 7, 8, and 9 describe how to determine how much of the net reduction is creditable in a SIP, NSR offset, or conformity determination. Appendix D provides a summary of Steps 1-6.

13. How do you quantify emission reductions from the use of an idle reduction technology?

***Step 1**: Determine the historic idling activity of the trucks involved in the project.*

For each truck using a mobile idle reduction technology, determine the historic idling hours as described in question 7(D)(2). Likewise, for each parking space with a stationary idle reduction technology installed, determine the historic idling hours as described in question 7(E)(3).

***Step 2**: Select the emission factor for the criteria air pollutant or precursor.*

In Appendix B and C, we provide the emission factors for NOx and PM. These emission factors represent average emissions from a long duration idling truck. For NOx emissions, the

emission factor is 135 g/hr. For PM emissions, the emission factor will range from 0.33 g/hr to 3.68 g/hr depending on the year in which the emission reduction is generated. Consult Appendix B and C for a full explanation of the basis for the emission factors. In the future, we may update these Appendices to revise the emission factors or include other criteria air pollutants or precursors.

***Step 3**: Multiply the emission factor in Step 2 by the number of hours per day the idle reduction technology is estimated to be used.*

In the case of a proposed project, you must estimate the average number of hours per day of idling emissions to be eliminated in a given year by the use of the idle reduction technology. In the case of mobile technologies, estimate the number of hours that the technology will be used in place of idling for each truck. For stationary technologies, estimate the number of hours to be eliminated in a given year for each truck in each parking space using the stationary system and not idling. When determining the actual emission reductions from an existing project, use the actual hours the technology was used for both mobile and stationary technologies.

When estimating the number of hours of idling per day you need to consider the particular pollutant or precursor and how the idling may vary by season or annually (for example, typical summer weekday or average annual weekday) as described in question 7(D)(2) and 7(E)(3).

Thus, to determine the emissions (g/day) from an individual truck prior to the use of an idle reduction technology use the following equation:

$$\text{Emission Per Day} = [(EF_{BASE})\ (AL_{IRT})]$$

Where,

EF_{BASE} = Truck baseline emission factor (NOx or PM g/hr) (See Appendix B or C)

AL_{IRT} = Estimated activity level of idle reduction technology (hr/day)

***Step 4(a):** Determine emission factor for the mobile idle reduction technology. Skip Step 4 when using a stationary idle reduction technology.*

You will now determine the emission factor associated with the idle reduction technology used. If the idle reduction technology is an EPA certified diesel fueled non-road engine, use the emission factor provided for that engine family by the manufacturer as part of its certification application under 40 CFR Part 89. This factor is in g/kW-hr or g/bhp-hr and is publicly available (in Step 4(b) you will convert this factor to g/hr so the terms are consistent with Step 3). You will need to know the manufacturer's name, year of manufacture, and 12-character EPA engine family number. This information is available on the engine label. You can obtain the emission data by

contacting EPA's Office of Transportation and Air Quality (Certification and Compliance Division) or consulting the certification data at http://www.epa.gov/otaq/certdata.htm (search under "Non-Road Compression Ignition Engine" and "Engine Family General Information" for the engine's manufacture date).

In the case of a truck stop electrification project, typically there are no emissions from the project. Consequently, the emission factor for this technology will be zero and you can proceed to step 6. However, the possibility exists that electrical generation and emissions may slightly increase at local power plants. For the purpose of this guidance, it may be presumed that all emissions from power plants (including any increase in demand resulting from an electrification project) will be accounted for in projections of, or limits on, overall power plant emissions in the SIP's emission inventory. Therefore, emission changes at power plants need not be considered when quantifying the emission reductions associated with a truck stop electrification project.

If the truck stop electrification project does not rely on energy from the electrical grid, but instead is using an alternative energy source, then you will need to provide data that demonstrates the emissions associated with that energy source. The data should comply with EPA regulations regarding the measurement of emissions from that energy source. If no regulations exist, provide all emissions data available to you for the energy source. We will review this information and determine its appropriateness for use on a case-by-case basis.

Step 4(b): *When using a mobile idle reduction technology, multiply emission factor from 4(a) by the daily horsepower load of the mobile idle reduction technology.*

The technology's daily horsepower load refers to the power usage of the idle reduction technology for the time period for which you will be generating emission reductions. You need to use either the typical summer weekday (for NOx emission reductions in an ozone nonattainment or maintenance area) or average annual weekday (for NOx or PM emission reductions in a PM nonattainment or maintenance area) horsepower load as a means to determine the g/hr factor. For mobile auxiliary power units (including generator sets), the typical daily horsepower load ranges from 4-8 hp. You will need to contact the technology manufacturer to determine the precise daily horsepower load within this range. If the technology emission factor is in kW, you will need to convert this to horsepower by multiplying the kW by 1.34. Multiplying the emission factor by the daily horsepower load gives a gram per hour emission factor for the engine.

Step 4(c): *When using a mobile idle reduction technology, multiply the g/hr factor by the number of operating hours (per day) it is estimated to be used.*

Thus, to determine the emissions (g/hr) for the idle reduction technology you should follow the following equation:

$$\text{Idle Reduction Technology Emission} = (EF_{IRT})\ (HP)\ (AL_{IRT})]$$

Where,

EF_{IRT} = Idle reduction technology emission factor (NOx or PM g/bhp-hr)

HP = Daily HP load

AL_{IRT} = Activity level of idle reduction technology (hr/day)

Step 5: *Determining the net emission reduction for the mobile technology. Skip this step for a stationary idle reduction technology.*

To determine the net emission reduction, subtract the emissions associated with the idle reduction technology as determined in Step 4 from the truck emissions as determined in Step 3. The equation is as follows:

$$NER = [(EF_{BASE})\ (AL_{IRT}) - (EF_{IRT})\ (HP)\ (AL_{IRT})]$$

Where,

NER = Net emission reduction grams per day

EF_{BASE} = Baseline emission factor (NOx or PM g/hr)

AL_{IRT} = Activity level of idle reduction technology (hr/day)

EF_{IRT} = Idle reduction technology emission factor (NOx or PM g/bhp-hr)

HP = Average annual HP load

AL_{IRT} = Activity level of idle reduction technology (hr/day)

Net average daily emissions reduced can be converted from grams to pounds by dividing by 454. If necessary for estimating annual reductions of NOx or PM, average daily emissions reduced can be converted to annual emissions reduced by multiplying by 365.

Step 6: *Sum all emission reductions for the project.*

For a truck stop electrification project, the sum would include the emission reductions associated with the use of all the electrified spaces. For mobile technologies the sum would include all the participating trucks.

Step 7: *Make sure net average daily emissions reduced from the idling reduction project do not exceed the historic idling activity of the trucks involved in the project as determined in Step 1.*

The net average daily emissions reductions per day from the idle reduction project should be a percentage of the historic idling hours per day. In the circumstance where the actual hours idled exceeds the historic idling hours, you will need to provide an explanation as to the reason for the difference. We will assess this explanation and make a decision as to the quantity of the emission reduction available on a case-by-case basis.

Step 8: *Make sure net average daily emissions reduced from all idling reduction programs do not exceed the total long duration idle emissions accounted for in the SIP's regional inventory or regional conformity analysis.*

Net average daily emissions reduced for all existing and new long duration truck idling reduction programs in a nonattainment or maintenance area should be summed to determine the total reductions from all programs for a given year. The total reductions claimed for all programs cannot exceed 3.4 % of the emission estimate for class 8 heavy duty diesel trucks for any criteria air pollutant or precursor used in the applicable SIP inventory or conformity analysis for the calendar year in question. See Section C for detailed discussion.

Step 9: *Apply a discounting factor of 10% for estimating emissions if reductions are to be used for NSR offset purposes. In quantifying actual emissions no discount factor is needed for NSR offsets generated.*

14. How do you quantify emission reductions for other criteria air pollutants or precursors?

To quantify emission reductions for other criteria air pollutants or precursors you can follow the same steps outlined in this section, substituting the appropriate emission factors for that pollutant or precursor. Once we have identified an emissions factor for use, such as those listed or referenced in this document, it may subsequently be used in the same manner without additional review by us.

Section E: Verification and Penalties

15. What are the monitoring, record keeping, reporting, and reconciliation requirements for including truck idling emission reductions in SIPs or as NSR offsets?

(A) For each truck or location generating emission reductions, the responsible party is to record and submit the following information for each time period for which an emission reduction is generated:

(1) For mobile and stationary technologies, the number of hours the idle reduction technology operated while the main truck engine did not idle, using a non-resettable meter

or data logger capable of recording total hours operated on each truck.

(2) For mobile technologies only, the GPS or other method to demonstrate that the information provided in (1) above occurred in the nonattainment or maintenance area.

(3) For NSR offset purposes, no later than thirty days after the end of each emission reduction generation period, submit the information recorded in (1) and/or (2) above to the state or local air pollution control agency.

(B) All information required to be recorded and submitted in accordance with this guidance for existing SIP and NSR offset requirements is to be maintained by the responsible party for a period of no less than five years.

(C) Other requirements may apply for SIP purposes depending upon how the control measure was established in the SIP, for example, through a rule or regulation, the Voluntary Measures Policy, economic incentive policies, or other EPA policies or regulations.

16. What kind of validation and reconciliation is required for emission reductions in SIPs and NSR??

(A) Once the control measure is in place emission reductions should be reviewed by you as required to validate the activity level. If the review indicates that the activity level reported is not consistent with the originally estimated emission reductions, then the amount of credit should be adjusted appropriately, and shortfall penalties may be assessed as described below.

(B) For NSR offsets only, the activity level should be validated by you within thirty days after the reported activity level is submitted.

17. What types of penalties can be assessed for not complying with CAA requirements?

(A) Use of this guidance does not relieve you of any obligation to comply with all otherwise applicable CAA requirements, including those pertaining to the crediting of emission reductions for your SIP, such as offsets required in the new source review program or emission reductions for your attainment or maintenance strategy. Violations of CAA requirements are subject to administrative, civil, and/or criminal enforcement under Section 113 of the CAA, as well as to citizen suits under Section 304 of the CAA. The full range of penalty and injunctive relief options would be available to the federal or state government (or citizens) bringing the enforcement action.

(B) Any person who submits false information to you or fails to implement or comply with provisions pursuant to this guidance necessary to demonstrate compliance with CAA

requirements, should be subject to one or more of the following actions:

(1) Disapprove the application for emission reductions.

(2) Void all previously issued emission reductions.

(3) Designate the responsible party to be ineligible to generate emission reductions.

(4) Assess a penalty (see paragraph A above).

Section F: The SIP Process for Using Long Duration Truck Idling Crediting Reductions

18. What must a state submit to EPA to meet the requirements for incorporating a source specific control measure in a SIP?

The state must submit to EPA a written document which:

(A) Identifies and describes the truck idling measure and its implementation schedule to reduce long duration truck idling emissions within a specific time period;

(B) Contains estimates of emission reductions attributable to the measure. In the circumstance where you use your own methodology for quantifying the emission reductions, you must provide all relevant technical support documentation, including the information and quantification uncertainties used to calculate emission reductions. You must rely on the most recent information available at the time the SIP or NSR offset is developed;

(C) Contains federally enforceable requirements to implement, track, and monitor the measure as applicable;

(D) Enforceably commits to monitor, evaluate, and report the resulting emissions effect of the measure as applicable;

(E) Enforceably commits to remedy any SIP emission shortfall in a timely manner as described above if the measure does not achieve estimated emission reductions; and

(F) Meets all other requirements for SIP revisions under sections 110 and 172 of the CAA.

Section G: Contact Information

19. Who should you contact for additional information?

State agencies, the regulated community and members of the public with questions

concerning a case-specific application of this guidance should contact the EPA Regional Office with responsibility for air quality planning in the area where the idle reduction technology is located. A contact list of your EPA Regional Office is available at the following web address: http://www.epa.gov/epahome/locate2.htm

For general questions regarding the quantification of truck idling emissions reductions, please contact Paul Bubbosh of EPA's Office of Transportation and Air Quality at (202) 564-9322 or David Solomon of EPA's Office of Air Quality Planning and Standards at (919) 541-5375..

For general questions concerning the use of truck idling emissions reductions in SIP on-road mobile emissions inventories or in transportation conformity, please contact Meg Patulski of EPA's Office of Transportation and Air Quality at (734) 214-4842.

For general questions concerning the use of truck idling emission reductions as an NSR offset, please contact Nancy Mayer of EPA's Office of Air Quality Planning and Standards at (919) 541-5390.

Appendix A

DEFINITIONS

For the purposes of this guidance only, the following definitions apply:

(A) AUXILIARY ENGINE means an engine that provides cab comfort needs (e.g, heat to engine), but does not provide power to propel the truck.

(B) CLASS 8 TRUCKS means a truck with a gross vehicle weight rating (GVWR) of 33,001 pounds and over. GVWR is the weight of the truck and its payload, plus fuel and driver.

(C) GLOBAL POSITIONING SYSTEM means a satellite-based radio navigation receiver capable of providing the time, date, and position of the truck or stationary technology.

(D) LONG DURATION TRUCK ENGINE IDLING means the operation of a main drive engine of a Class 8 vehicle for a period greater than 15 consecutive minutes at a time at which the main drive engine is not engaged in gear.

(E) IDLE REDUCTION TECHNOLOGY means a currently available technology or device that provides cab comfort needs, or otherwise reduces the need for long-duration truck idling.

Appendix B

NOx Emission Factors for Long Duration Idling Heavy Duty Diesel Vehicles

NOx

Year	Emission Factor (g/hr)
2002-2020	135

The emissions of trucks engaged in long duration idling vary due to factors such as engine manufacturer, age of vehicle, rpm at idle, and ambient temperature which influences the use of auxiliaries such as air conditioning or heat. Based on an analysis of emission test data[8], we have determined that, for NOx emissions, an emission rate of 135 grams per hour is a reasonable average rate for long duration truck idling.

At this time, the impact of future NOx emissions standards on long duration idling emissions is uncertain. Control measures, such as catalytic converters, intended to reduce running emissions of diesel trucks in the future, may likely be less effective at controlling long duration idle emissions. As a result we have concluded that it is reasonable to use the emission rate of 135 grams per hour for NOx for analyses of both current and future calendar years. We will review this assumption as emissions data on diesel trucks with more advanced control technology become available.

[8] See http://www.epa.gov/otaq/retrofit/idling.htm for EPA's comprehensive idling emission test report.

Appendix C

PM Emission Factors for Long Duration Idling Heavy Duty Diesel Vehicles

$PM_{2.5 \text{ and } 10}$.

Year	Emission Factor (g/hr)
2002	3.68
2003	3.35
2004	2.91
2005	2.67
2006	2.47
2007	2.30
2008	1.97
2009	1.69
2010	1.45
2011	1.26
2012	1.07
2013	0.93
2014	0.73
2015	0.59
2016	0.53
2017	0.47
2018	0.39
2019	0.36
2020	0.33
2021	0.31
2022	0.29
2023	0.28

2024	0.26
Year	Emission Factor (g/hr)
2025	0.25
2026	0.24
2027	0.24
2028	0.23
2029	0.22
2030	0.22

Based on an analysis of emission test data[9], we have determined that an emission rate of 3.68 g/hr is a reasonable average total direct PM emission factor from long duration idling in 2002. Based on data collected, almost all diesel PM is submicron in size. Therefore, we believe it is reasonable to use this emission factor for both $PM_{2.5 \text{ and } 10}$ calculations for 2002.

As in the case of NOx emissions, there is some uncertainty about the impact of future PM emissions standards on long duration idling. However, the control technologies used to control running PM emissions are based on filters and traps which are more likely to show increased effectiveness under long duration idling conditions. Therefore, we expect long duration idling emissions to decline in the future at a rate similar to the expected decline in running emissions. We will review this assumption as emissions data on diesel trucks when more advanced control technology become available. In the meantime, emission factors from the following table should be used for a given year to estimate long duration idling $PM_{2.5 \text{ and } 10}$ emissions from Class 8 trucks.

[9] Storey, J., Thomas, J., *et at.*, "Particulate Matter and Aldehyde Emissions From Idling Heavy-Duty Diesel Trucks," Society of Automotive Engineers, Inc. Publication 2003-01-0289 (2001).

Appendix D

Quantification Summary

The purpose of this quantification summary is to provide a concise formula to calculate the net emission reduction for long duration truck idling. Use of this summary should be consistent with the more detailed requirements in Section D.

$$NER = (EF_{BASE} * AL_{IRT} / CF_{G/LBS}) - (EF_{IRT} * HP * AL_{IRT} / CF_{G/LBS})$$

Where,

NER =	Net emission reduction
EF_{BASE} =	Truck baseline emission factor (NOx or PM g/hr)
AL_{IRT} =	Estimated activity level of the idle reduction technology (hr/day)
$CF_{G/LBS}$ =	Conversion factor for grams to pounds which is 454
EF_{IRT} =	Idle reduction technology emission factor (NOx or PM g/bhp-hr)
HP =	Daily horsepower load (ranges from 4-8 hp depending on the technology; consult the technology manufacturer)
AL_{IRT} =	Activity level of the idle reduction technology (hr/day)

There are three essential parts to this formula. First, you determine the emissions from the truck by selecting the emission factor for the pollutant or precursor for reduction, multiply this factor by the number of hours you estimate the technology will reduce long duration idling emissions. This number is divided by the conversion factor to derive a grams per hour number. The second part is to determine the emissions associated with the idle reduction technology (this step does not apply to stationary idle reduction technologies). This requires determining the emissions associated with the technology, multiplying this by the horsepower to derive a grams per hour number, multiplying this number by the number of hours the technology will operate, and then dividing this number by the conversion factor. The final part is simply subtracting the emissions from the second part (idle reduction technology emissions) by the first part (truck's baseline emissions) to arrive at the net emission reduction.

Appendix E

Example Quantification

Mobile Idle Reduction Technology

In this example we will estimate the NO_x emission reductions from idling Class 8 heavy-duty diesel vehicles using a mobile idle reduction technology in 2007 in a large ozone nonattainment area based on historical idling documentation. On average 100 vehicles are estimated to use this technology 7 hours per day in the nonattainment area. This is the only long duration truck idle reduction project in the nonattainment area. Total class 8 heavy duty diesel truck NOx emissions projected in the ozone SIP for the nonattainment area in 2007 are 80 tons per day.

For the idle reduction technology, we will use an auxiliary power unit (APU). The APU allows an idling truck to be shut down by providing air conditioning, heat, and electrical power to operate auxiliaries such as the television and microwave.

Per the steps outlined in this document, the NO_x emission reduction associated with the use of the APU is calculated as follows:

Step 1*: Determine the historic idling activity of the trucks involved in the project.*

You should follow the discussion provided in question 7(E)(3) in this guidance to derive the historic number of hours the trucks idled for a typical summer weekday in the nonattainment or maintenance area. In this example, we determined a truck idled an average of 7 hours per day. (1 * 7 = 7 hours).

Step 2*: Select the emission factor for the criteria air pollutant or precursor.*

We are evaluating NOx emission reductions so the emission factor is 135 grams per hour.

Step 3*: Multiply the emission factor in Step 2 by the number of hours per day the idle reduction technology is estimated to be used.*

The average daily emissions reduced is 135 grams/hr * 7 hours/day = 945 grams/day

Step 4(a): *Determine emission factor for the mobile idle reduction technology.*

In this example, the APU uses a 2003 Kubota engine (EPA engine family

3KBXL.719KCB)[10] which was certified under 40 CFR Part 89. By examining the certification data for this engine family, we find the certified NOx emission level is 4.7 g/bhp-hr.[11]

Step 4(b): *When using a mobile idle reduction technology, multiply emission factor from 4(a) by the daily horsepower load of the mobile idle reduction technology.*

According to the APU manufacturer, the daily horsepower load for this engine during typical summer weekdays is 5 hp. The grams per hour emission rate of the auxiliary power unit is 4.7 g/bhp-hr * 5 hp = 23.5 g/hr.

Step 4(c): *When using a mobile idle reduction technology, multiply the g/hr factor by the number of operating hours (per day) it is estimated to be used.*

In this example, all of the trucks in the program are using the same type of APU. As a result, the total average daily emissions of the APUs are 23.5 grams/hr * 7 hours/day = 164.5 grams/day.

Step 5: *Determining the net emission reduction.*

The estimated net emissions reductions from this program are 945 grams/day - 164.5 grams/day = 780.5 grams/day or 1.72 lbs/day.

Step 6: *Sum all emission reductions for the project.*

In this example, we add the total amount of idling for all participating trucks in the project, 100 trucks which is 100 * 780.5 = 78,050 grams/day or 171.9 lbs/day.

Step 7: *Make sure net average daily emissions reduced from the idling reduction project do not exceed the historic idling activity of the trucks involved in the project as determined in Step 1.*

This step involves taking your estimate of idling activity (or the actual emission reduced) and reconciling this estimate (or actual number) with your historic idling hours from Step 1 (following question 7(E)(3)). If the estimate (or actual number) exceeds the historic idling hours, you will need to explain this increase.

Step 8: *Make sure net average daily emissions reduced from all idling reduction programs do*

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[10] For purposes of this example we have selected an engine model to better illustrate the APU's emissions. EPA confers no endorsement of this company product.

[11] In some circumstances, the NOx emission factor is reported as a combined NOx + HC emission factor. You will need to contact the engine manufacturer to determine the NOx only value.

not exceed the total long duration idle emissions accounted for in the regional inventory used in the SIP.

In this example, total class 8 heavy duty diesel truck NOx emissions projected in the ozone SIP for the nonattainment area in 2007 are 80 tons per day. The long duration idle portion of the 2007 inventory for this area is assumed to be not more than 3.4% of 80 tons per day = 2.7 tons per day. This is well over the estimated net reductions from this program of 171.9 pounds per day so full credit for the program can be taken in the SIP, assuming all other SIP requirements are met.

Step 9: *Apply a discounting factor of 10% for estimating emissions if reductions are to be used for NSR offset purposes. In quantifying actual emissions no discount factor is needed for NSR offsets generated.*

If evaluating the project for NSR offsets, you will need to multiply the discount factor by the total emission reductions as follows: .9 * 78,050 = 70,245 grams/day.

Appendix F

Example Quantification

Stationary Idle Reduction Technology

In this example we will estimate the NO_x emission reductions from an idling Class 8 heavy-duty diesel vehicle using a stationary idle reduction technology for an ozone conformity determination. In this example, 200 truck stop parking spaces are to be electrified. On average these spaces are estimated to be used 8 hours per day in 2007 based on historic idling documentation. This is the only long duration idle reduction project in the nonattainment area. Total class 8 heavy duty diesel truck NOx emissions projected in the regional emissions analysis for the conformity determination area in 2007 are 80 tons per day.

Per the steps outlined in this guidance document, the NO_x emission reduction associated with electrifying these truck stop spaces is calculated as follows:

Step 1*: Determine the historic idling activity of the trucks involved in the project.*

You should follow the guidance provided in question 7(D)(2) above to derive the historic number of hours the trucks idled at the location for a typical summer weekday in the nonattainment area. Based on documentation, the estimated number of hours per day of idling is 1 spaces * 8 hours per day = 8 hours per day.

Step 2*: Select the emission factor for the criteria air pollutant or precursor.*

We are evaluating NOx emission reductions so the emission factor is 135 grams per hour.

Step 3*: Multiply the emission factor in Step 2 by the number of hours per day the idle reduction technology is estimated to be used.*

The average daily emissions reduced is 135 grams/hr * 8 hours/day = 1,080 grams per day or 2.37 pounds per day.

Step 4, 5:

Since this example involves truck stop electrification, we presume that the electrical generation and emissions may slightly increase at local power plants and that all emissions from power plants (including any increase in demand resulting form an electrification project) will be accounted for in projections of, or limits on, overall power plant emissions in the state's attainment demonstration. Therefore, emission changes at power plants need not be considered when quantifying the emission reductions associated with a truck stop electrification project. Therefore, you can skip steps 4 and 5 for this example.

Step 6: *Sum all emission reductions for the project.*

In this example, we add the total amount of idling for all participating trucks in 200 parking spaces which is 200 * 1,080 = 216,000 grams/day or 475.8 pounds/day.

Step 7: *Make sure net average daily emissions reduced from the idling reduction project do not exceed the historic idling activity of the trucks involved in the project as determined in Step 1.*

This step involves taking your estimate of idling activity (or the actual emission reduced) and reconciling this estimate (or actual number) with your historic idling hours from Step 1 (following question 7(D)(2)). If the estimate (or actual number) exceeds the historic idling hours, you will need to explain this increase.

Step 8: *Make sure net average daily emissions reduced from all idling reduction programs do not exceed the total long duration idle emissions accounted for in the regional inventory used in the SIP or conformity determination.*

In this example, total class 8 heavy duty diesel truck NOx emissions projected using MOBILE6 in the regional conformity analysis in 2007 are 80 tons per day. The long duration idle portion of the 2007 inventory for this area is assumed to be not more than 3.4% of 80 tons per day = 2.7 tons per day. This is well over the estimated net reductions from this program of 475.8 pounds per day so full credit for the program can be taken in the conformity, assuming all other conformity requirements are met.

Step 9: *Apply a discounting factor of 10% for <u>estimating</u> emissions if reductions are to be used for NSR offset purposes. In quantifying <u>actual</u> emissions no discount factor is needed for NSR offsets generated.*

If evaluating the project for NSR offsets, you will need to multiply the discount factor by the total emission reductions as follows: .9 * 216,000 = 194,400 grams/day.

Note: If both example projects as described in Appendix E and F were in place, the area would for Step 8 compare the long duration idle emissions of the SIP inventory and regional conformity analysis (in this case 2.7 tons per day) to the sum of the estimated emission reductions from the two programs = 171.9 pounds per day + 475.8 pounds per day = 647.7 pounds per day assuming that the trucks with APUs always park in non-electrified spaces. Again, the combined reductions from both programs is below 2.7 tons of NOx per day for the year 2007. If the estimated benefits from all programs to reduce long duration idling in this area exceeded 2.7 tons per day, a maximum of 2.7 tons per day could be claimed as credit in 2007.