United States Environmental Protection Agency

Office of Transportation and Air Quality

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Guidance for Quantifying and Using Long Duration Switch Yard Locomotive Idling Emission Reductions in State Implementation Plans

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Transportation and Regional Programs Division
Office of Transportation and Air Quality

and

Air Quality Strategies and Standards Division
Office of Air Quality Planning and Standards

U.S. Environmental Protection Agency

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

AC	Air Conditioning
APU	Auxiliary Power Unit
CAA	Clean Air Act
g/bhp-hr	Grams per brake horsepower hour
g/kW-hr	Grams per kilowatt hour
g/hr	Gram per hour
hp	Horsepower
hr	Hour
lbs	Pounds
NO_x	Nitrogen Oxides
PM	Particulate Matter (2.5 and 10)
RPM	Revolutions per minute
RFP	Reasonable Further Progress
ROP	Rate of Progress
SIP	State Implementation Plan
SYL	Switch Yard Locomotive

Guidance for Quantifying and Crediting Locomotive 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.)

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 switch yard locomotive (SYL) idling emissions. You may wish to use the emission reductions resulting from implementing an idling reduction technology for meeting emission reduction requirements such as an RFP/ROP, attainment or maintenance SIP.

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

This document provides guidance to state air pollution control agencies and the general public on how control measures to reduce truck idling emissions may be used to meet SIP requirements. SIP requirements can be found in Sections 110(a)(2) and 172(c) of the CAA. This document does not substitute for those provisions, nor is it a regulation itself. Unless otherwise indicated, it does not impose binding, enforceable requirements on any party. Further, it does not assure that EPA may approve all instances of its application, and thus the guidance may not apply to a particular situation based upon the circumstances. The EPA and state decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. Any decisions by EPA regarding a particular SIP demonstration will only be made based on the statute and applicable regulations, and will only be made following notice and opportunity for public review and comment. Therefore, interested parties are free to raise questions and objections about the appropriateness of the application of this guidance to a particular situation; EPA will, and states should, consider whether or not the recommendations in this guidance are appropriate in that situation. This guidance is a living document and may be revised periodically without public notice. The EPA welcomes public comments on this document at any time and will consider those comments in any future revisions of this guidance document.

Readers of this document are cautioned not to regard statements recommending the use of certain procedures as either precluding other procedures or information or providing guarantees that using these procedures will result in actions that are fully approvable. As noted above, EPA cannot assure that actions based upon this guidance will be fully approvable in all instances, and all final actions may only be taken following notice and opportunity for public comment.

3. What are switch yard locomotive idling emissions?

SYL engines are designed or used solely for the purpose of propelling railroad cars a short distance within a confined area. They usually idle their engines when not in use, and they idle for a variety of reasons, such as maintaining engine operating temperature during cold weather to avoid engine freezing (most locomotive engines do not have anti-freeze). Other reasons for idling include immediate engine availability, preventing start-up engine damage, maintaining air brake pressure, and in some cases, company policy or habit.

4. What is an idle reduction technology?

An idle reduction technology consists of the use of an alternative energy source in lieu of using the main SYL engine or a device designed to reduce long duration idling. Some of these technologies are mobile and attach onto the SYL (mobile auxiliary power units (APUs)), and provide heat or electrical power.

Another technology involves electrifying SYL parking spaces (stationary locomotive parking electrification) and modifying the SYL. In general, this involves installing electric powered heating systems on SYL which connect to the electrical grid and provide energy to operate on-board equipment.

This guidance addresses emission reductions generated from both mobile and stationary technologies. EPA maintains a list of commercially available 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 SYL 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 NO_x and $PM_{2.5}$ and PM_{10}.[1] In addition, there are other important benefits associated with reductions in long duration SYL 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, decreased maintenance costs, and longer engine life which results in cost savings to the locomotive owner.
- Reductions in noise levels.
- Decreased dependency on oil imports.

Local communities near switch yards, some of which are comprised of low income and minority populations, may benefit from the reduced pollution and noise levels as will SYL operators and switch yard staff.

[1] Based on data collected, almost all diesel PM is submicron in size. Therefore, we believe it is reasonable to use the same idling emission factor for both $PM_{2.5}$ and PM_{10}.

Section B: Basic Requirements for Long Duration Switch Yard Locomotive Idling Emissions Reductions

6. What are the basic requirements for using emission reductions in SIPs?

In order to be approved as a measure which provides additional emission reductions in a SIP, a control measure reducing long duration SYL 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 SYL idling emissions are quantifiable if they can be reliably and replicably measured. Emission reductions must be calculated for the time period for which the reductions will be used. Section D of this document provides you with a method acceptable to us for quantifying emission reductions. You can also submit your own quantification protocol which we will review and make a decision as to the appropriateness of its use on a case-by-case basis.

(B) Surplus - Emission reductions are generally surplus and can be used as long as they are not otherwise relied on to meet other applicable air quality attainment and maintenance requirements. In the event that the measure to reduce long duration SYL idling emissions are relied on by you to meet such air quality related program requirements, they are no longer surplus and may not be used for additional credit. In addition, to be considered surplus the emissions from long duration SYL idling must be a part of the SIP's emissions inventory.

(C) Federally Enforceable - Depending on how the emission reductions are to be used, control measures to reduce long duration SYL idling emissions must be enforceable through a SIP or SIP revision. Where the emission reductions are part of a rule or regulation, 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.
- 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, 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 RFP/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 meets the other requirements of the Voluntary Measures Policy. If you wish to have a SIP revision approved under the Voluntary Measures Policy consult that policy for further information.[2]

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

(E) Adequately Supported – The state must demonstrate that it has adequate funding, personnel, and other resources to implement the control measure on schedule.

7. <u>What are the types of operational requirements that would generate emission reductions?</u>

To generate emission reductions the following requirements should be met (or similar requirements capable of insuring accurate measurements and implementation of the emission reductions to our satisfaction):

(A) Use a commercially available idle reduction technology to provide SYL needs (such as engine and oil heat), and/or reduce idling during the operator's long duration rest or wait period, in lieu of idling the main locomotive engine;

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

(C) Comply with all necessary monitoring, recordkeeping, reporting, validation, and reconciliation requirements as described in Section E of this guidance.

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

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

(2) If any SYL that is included in the idle reduction project leaves the nonattainment or maintenance area, the responsible party should notify you of this occurrence so the emission

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[2] For a description of this policy consult the following web site: http://www.epa.gov/otaq/transp/traqvolm.htm.

reductions are adjusted appropriately to reflect this change;[3] and

(3) Prior to quantifying emission reductions, determine the historic idling activity for each SYL that will be generating emission reductions.[4] This information should include sufficient documentation, such as data from an event recorder to determine the following information:

(a) The historic number of hours the SYL idled per day for an average summer weekday for the past year (if pursuing NO_x emission reductions in an ozone nonattainment/maintenance area); or

(b) The historic number of hours the SYL idled per day for an average annual weekday for the past year (if pursuing PM or NO_x emission reductions in a PM nonattainment or maintenance area).[5]

(3) Prior to generating emission reductions, you will need the following information for the mobile idle reduction technology only: the manufacturer and manufacture date of the idle reduction technology, its engine model, and average daily horsepower load for the time period for which you will be generating emission reductions.

(E) 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 quantifying emission reductions, determine the historic idling activity for each SYL location that will be generating emission reductions. This information should include sufficient documentation, such as survey or direct observation methods to determine the following information:

(a) Number of SYLs operating at the location throughout the year;

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[3] If any SYL leaves due to routinely scheduled maintenance and will return to the same rail yard (or another rail yard within the same nonattainment or maintenance area), the responsible party should not have to notify you. In this case, the meter or logger should account for the engine time period not operating.

[4] The historic idling activity will be used to estimate the idling emission reductions to be achieved from the use of an idle reduction technology. This estimate will be compared with the actual emission reductions achieved after the monitoring period, as discussed in Section E.

[5] If dealing with large numbers of vehicles, you can use fleet idling averages to determine the historic idling activity.

(b) Of the number in (a) above, the percentage of those SYLs which idle for a long duration (defined as 15 consecutive minutes or more at idle); and

(c)(1) Of the SYLs in (b) above, the historic number of hours the SYLs idled per day for an average summer weekday for the past year (if pursuing NO_x emission reductions in an ozone nonattainment/maintenance area); or

(c)(2) Of the SYLs in (b) above, the historic number of hours the SYLs idled per day for an average annual weekday for the past year (if pursuing PM or NO_x emission reductions in a PM nonattainment or maintenance area).[6]

Section C: Specific Requirements for Using Long Duration Switch Yard Locomotive Idling Emission Reductions

8. Are SYL idling emissions part of the state's emission inventory?

You must demonstrate that the emissions from the SYLs (from which the emission reductions will take place) are accurately included in the SIP emissions inventory. In addition, the crediting of the emission reductions must also be consistent with the assumptions in the emission inventory upon which the attainment or maintenance demonstration is based. If they are not already in the SIP inventory, no credit can be given for idling emission reductions unless the SIP inventory baseline is reassessed to include such emissions at its current level.

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

For your SIP RFP/ROP, attainment or maintenance strategy, you can use the emission reductions which are, or expected to be, generated from the idling reduction technology by applying the following criteria:

(A) Based on the historic idling hours as determined in question 7(D)(3) and 7(E)(2) above, the 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 if you decide to seek credit for the additional amount (that is, the actual amount). We will evaluate the reason for the difference and make a decision as to the quantity of the emission reduction available on a case-by-case basis.[7]

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[6] If dealing with large numbers of SYLs, you can use fleet idling averages to determine the historic idling activity.

[7] For both mobile and stationary idle reduction technologies, determining the historic idling hours forms the basis for estimating the potential emission reductions. Differences between the historic idling hours and estimated or actual idling hours may occur due to, for

(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 SYL idling for each criteria pollutant or precursor is not to exceed the amount in the state's air emissions inventory for SYL emissions in the year or years the emission reductions are relied upon.

Section D: Quantifying Long Duration Switch Yard Locomotive 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 SYL 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 usually 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 and 8 describe how to determine how much of the net reduction is creditable in a SIP. Appendix C provides a summary of Steps 1-6. Appendix D provides a quantification example for a mobile technology.

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

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

For each SYL using a mobile idle reduction technology, determine the historic idling hours as described in question 7(D)(3). Likewise, for each SYL space which will have a stationary idle reduction technology installed, determine the historic idling hours as described in question 7(E)(2).[8]

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

In Appendix B, we provide emission factors for NO_x and PM. These emission factors represent average emissions from a long duration idling SYL. For NO_x emissions, the emission factor is 800 g/hr (2 stroke engine) or 620 g/hr (4 stroke engine). For PM emissions, the emission factor is 26 g/hr (2 stroke engine) or 32 g/hr (4 stroke engine). Consult Appendix B for a full explanation of the basis for the emission factors. In the future, we may update the emission factors or include other criteria air pollutants or precursors.

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example, warmer or colder temperatures than the historic time period.

[8] If dealing with large numbers of SYLs, you can use fleet idling averages to determine the historic idling activity.

***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.*

You must estimate the average number of hours per day of idling emissions to be eliminated by the use of the idle reduction technology. The estimated hours should be a percentage of the historic idling activity as determined in Step 1. In the case of mobile technologies, estimate the number of hours that the technology will reduce long duration idling for each SYL while in the nonattainment/maintenance area. For stationary technologies, estimate the number of hours that the technology will reduce long duration idling for each parking space. When determining the actual emission reductions from an existing project, using a mobile or stationary technology, use the actual hours the technology was used.

When estimating the number of reduced 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, average summer weekday or average annual weekday) as described in question 7(D)(3) and 7(E)(2).

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

$$\text{Emission Per Day} = EF_{BASE} * AL_{IRT}$$

Where,

EF_{BASE} = SYL baseline emission factor (NO_x or PM in g/hr) (See Appendix B)

AL_{IRT} = Estimated hours of use of idle reduction technology (hr/day)

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

In the case of stationary locomotive parking electrification project, for the purpose of this guidance, it may be presumed that all emissions from power plants (including any increase in demand resulting from a stationary project) will be accounted for in projections of, or limits on, overall power plant emissions in the SIP's emission inventory. Therefore, related stationary project emissions at power plants need not be considered when quantifying the emission reductions associated with a stationary project.[9]

If a stationary project does not rely on energy from the electrical grid, but instead is using an alternative source of electricity (for example, a portable generator), then you will need to provide data

[9] To the extent that there may be a concern that the power plant emission increases resulting from a stationary project are not otherwise reflected in the state's overall consideration of power plant emissions, then the power plant increases in the nonattainment/maintenance area from a stationary project, where quantifiable, should be considered when quantifying the amount of emission reductions.

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.

You will now determine the emission factor associated with the mobile idle reduction technology used. If the mobile idle reduction technology is an EPA certified diesel fueled non-road engine, as is the case with many APUs, 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 engine 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" using the engine's manufacture date).

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

Since the mobile idle reduction technology emission factor is usually in g/bhp-hr, you should convert this emission factor to g/hr by multiplying by the average daily horsepower load. This step involves determining the average daily horsepower load which refers to the power use of the technology. This power use will differ during different times of the year depending on power needs (AC or heat). For mobile auxiliary power units, the average daily horsepower load ranges from 5-10 hp. You should contact the idle reduction technology manufacturer (not the engine manufacturer) to determine the average daily horsepower load within this range for the time period considered. If the technology emission factor is in g/ kW-hr, you should convert this to g/hp-hr by multiplying the kW by 0.746. 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. Skip this step for a stationary idle reduction technology.*

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 (NO_x or PM in g/bhp-hr)

HP = Average daily HP load

AL_{IRT} = Estimated hours of use of idle reduction technology (hr/day)

Step 5: *Determine 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 SYL 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 reductions in grams per day

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

AL_{IRT} = Estimated hours of use of the idle reduction technology (hr/day)

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

HP = Average daily HP load

AL_{IRT} = Estimated hours of use of the idle reduction technology (hr/day)

Net average daily emission reductions can be converted from grams to pounds by dividing by 454. If necessary for estimating annual reductions of NO_x or PM, average daily emissions reduced can be converted to annual emissions reduced by multiplying by the number of days in the year it is assumed the technology will be used.

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

For a stationary project, the sum would include the emission reductions from the use of all the electrified parking spaces. For mobile technologies, the sum would include the emission reductions from all the participating SYLs.

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

The daily emission reductions per day from the idle reduction project should be a percentage of the historic idling hours per day. For SIPs only, 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 to credit the additional reduction. We will evaluate the reason for the difference and make a decision as to the quantity of the emission reduction available on a case-by-case basis. Where verified, the additional emission reduction may be credited.

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

The net average daily emission reductions for all existing and new long duration SYL idling reduction projects 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 is not to exceed the emission estimate for SYLs for any criteria air pollutant or precursor used in the applicable SIP inventory for the calendar year in question. See Section C for detailed discussion.

11. <u>How do you quantify emission reductions for other criteria air pollutants or precursors?</u>

To quantify emission reductions for other criteria air pollutants or precursors (such as hydrocarbon emissions), you can follow the same steps outlined in this section, substituting an EPA approved idling emission factor for that pollutant or precursor. Once we have identified an idling emissions factor for use, similar to those listed or referenced in this document, it may subsequently be used in the same manner without additional review by us. If no idling emission factor has been identified, you can submit data supporting an idling emission factor and we will review this data on a case-by-case basis and make a decision as to the appropriateness of its use.

Section E: Verification and Penalties

12. <u>What are the monitoring, record keeping, and reporting requirements for including long duration SYL idling emission reductions in SIPs?</u>

(A) For each SYL or stationary location generating emission reductions, you are to record and submit the following information for each time period for which an emission reduction is generated (or other information capable of demonstrating the emission reductions to our satisfaction):

(1) For mobile and stationary technologies, the number of hours the idle reduction technology operated while the main SYL engine did not idle, recorded by a non-resettable meter, data logger, or computerized data acquisition system capable of recording total hours operated on each SYL.

(2) For mobile technologies only, demonstrate that the SYLs are located in a nonattainment or maintenance area for the pollutant or precursor for which emission

reductions determined in (1) above occurred in the nonattainment or maintenance area.

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

13. What kind of validation and reconciliation should occur for emission reductions in SIPs approved under the Voluntary Measures Policy?

The SIP submission for a voluntary measure should contain a description of the evaluation procedures and time frame(s) in which the evaluation of SIP reductions will take place. Once the voluntary control measure is in place emission reductions should be evaluated by you as required to validate the actual emission reductions. You should submit the results of your evaluation to EPA in accordance with the schedule contained in the SIP. If the review indicates that the actual emission reductions are not consistent with the estimated emission reductions, then the amount of credit should be adjusted appropriately and applicable remedial measures should be taken under the Voluntary Measures Policy. See the EPA's Voluntary Measures Policy for further information regarding validation and reconciliation requirements for such measures.

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

Use of this guidance does not relieve the responsible party 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 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.

Section F: The SIP Process for Using Long Duration SYL Idling Emission Reductions

15. 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 idle reduction project and its implementation schedule to reduce long duration SYL idling emissions within a specific time period;

(B) Contains a quantification methodology to estimate the emission reductions from the idle reduction project. You can follow the quantification methodology provided in Section D of this document or you can submit your own. If you submit your own quantification 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 is developed;

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

(D) Under the Voluntary Measures Policy only, enforceably commits to monitor, evaluate, and report the resulting emission reductions 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 H: Contact Information

16. 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 switch yard 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 SYL idling emissions reductions, please e-mail your questions to the EPA SmartWay Transport Partnership at:

smartway_transport@epa.gov

or contact Anthony Erb of EPA's Office of Transportation & Air Quality at (202) 343-9259 or David Solomon of EPA’s Office of Air Quality Planning & Standards at (919) 541-5375.

Appendix A

DEFINITIONS

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

(A) ACTUAL IDLING EMISSION REDUCTIONS means the emission reductions achieved from an idle reduction project.

(B) ESTIMATED IDLING EMISSION REDUCTIONS means the projected emission reductions from an idle reduction project which is based on a percentage of the historic idling activity.

(C) GLOBAL POSITIONING SYSTEM means a satellite-based radio navigation receiver capable of providing the time, the date, and position of the switch yard locomotive.

(D) HISTORIC IDLING ACTIVITY means the demonstrated past long duration idling of a switch yard locomotive, or past long duration idling from switch yard locomotives at a particular location, in the nonattainment or maintenance area.

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

(F) LOCOMOTIVE SWITCHER means a locomotive designed or used solely for the primary purpose of propelling railroad cars a short distance.

(G) LONG DURATION IDLING means the operation of a switch yard locomotive's propulsion engine for a period greater than 15 consecutive minutes at a time at which the main drive engine is not engaged in gear.

Appendix B

NO_x and PM Emission Factors for Long Duration Switch Yard Locomotives

Two Stroke Locomotive Engines

NO_x g/hr	PM g/hr
800	26

Four Stroke Locomotive Engines

NO_x g/hr	PM g/hr
620	32

Emission factors listed above are derived from various sources.[10] In some cases, multiple trials or replicate measurements were reported for the idle mode for individual locomotives. Before deriving the final means, all replicates for individual locomotives were averaged to give a single mean for each locomotive, to give each locomotive equal weight in the resulting emission rate.

Throughout, measurements obtained for locomotives on "special settings" were not included. Special settings included retarded timing and continuous throttle.

Measurements of particulate matter from Hare & Springer (1972) were not included in the calculation of the PM emission rate. The apparatus used for particulate measurement in that study was experimental, and the resulting measurements are not considered reliable.

[10] Fritz, S.G., J.C. Hedrick, V.O. Markworth, M.B. Treuhaft, and J.F. Wakenell. *Diesel Fuel Specification and Locomotive Improvement Program: Tenth Research Phase Final Report*. AAR Report No. R-771. Engine and Vehicle Research Division, Southwest Research Institute. San Antonio, TX. December, 1989; Fritz, S.G., V.O. Markworth and R.L. Mason. *Locomotive Exhaust Emission Field Tests: Phase 1, EMD SD40-2 and GE C40-8 Locomotives*. Final Report, AAR Report No. R-877, Association of American Railroads, Research and Test Department, Washington, DC; SwRI Project No. 03-4171, Southwest Research Institute, San Antonio, TX. October, 1994; Fritz, S.G. *Emission Measurements for Locomotives: Final Report*. SwRI 5374-024. Southwest Research Institute, San Antonio, TX. August, 1995; Hare, C.T., and K.J. Springer. *Exhaust Emissions from Uncontrolled Vehicles and Related Equipment Using Internal Combustion Engines: Final Report, Part I, Locomotive Diesel Engines and Marine Counterparts*. Contract No. EHS 70-108. Southwest Research Institute, Antonio, TX. October 1972.

Appendix C

Quantification Summary

The purpose of this quantification summary is to provide a concise formula to calculate the net emission reduction for long duration switch yard locomotive (SYL) idling. This summary is intended to be consistent with the more detailed step-by-step process in Section D.

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

Where,

NER =	Net emission reduction
EF_{BASE} =	SYL baseline emission factor (NO_x or PM in g/hr)
AL_{IRT} =	Estimated hours of use 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 (NO_x or PM in g/bhp-hr)
HP =	Average daily horsepower load (ranges from 5-10 hp depending on the technology; consult the technology manufacturer)
AL_{IRT} =	Estimated hours of use of the idle reduction technology (hr/day)

There are three essential parts to this formula. First, you determine the emissions from the SYL 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 typically 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 (switch yard locomotive's baseline emissions) to arrive at the net emission reduction.

Appendix D

Example Quantification

This example is for the purpose of illustrating the quantification steps only, and it does not address the additional requirements necessary which must be met to credit the reductions generated. In this example we will quantify the NO_x long duration idling emission reductions from a two stroke locomotive engine using a mobile idle reduction technology. In the nonattainment area, 10 SYLs will use this technology 8 hours per day.

For the idle reduction technology, we will use an auxiliary power unit (APU). The APU allows an idling SYL to be shut down by heating and circulating the coolant and oil, charging the batteries and powering the cab heaters It is important to note that not all idling can be eliminated. In certain circumstances, such as when the wait from active use to active use is not long, the operator may decide to keep the SYL engine idling.

Per the steps outlined in this guidance 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 SYL involved in the project.*

You should follow the discussion provided in question 7(D)(3) in this guidance to derive the historic number of hours the SYL idled for an average summer weekday in the nonattainment or maintenance area. In this example, we determined a SYL's long duration idling occurred an average of 10 hours per day.

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

We are evaluating NO_x emission reductions for a two stroke SYL so the emission factor is 800 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.*

We estimated that the APU will reduce 8 of the 10 hours of long duration idling. Therefore, the average daily emissions reduced is 800 grams/hr * 8 hours/day = 6,400 grams/day.

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

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

2L5XL1.86LWS)[11] which was certified under 40 CFR Part 89. By examining the certification data for this engine family, we find the certified NO_x emission level is 6.69 g/kW-hr.[12]

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

Since the emission factor is in kW, we begin by converting this to hp:

(6.69 g/kW-hr * .746 = 4.99 g/bhp-hr). According to the APU manufacturer, the average daily hp load for this engine during typical summer weekdays is 8 hp. So the grams per hour emission rate of the auxiliary power unit is 4.99g/bhp-hr * 8 hp = 40 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.*

As a result, the total average daily emissions of the APUs are 40 grams/hr * 8 hours/day = 320 grams/day.

Step 5: *Determine the net emission reduction.*
The estimated net emissions reductions from this program are 6,400 grams/day - 320 grams/day = 6080 grams/day or 13.4 lbs/day.

Step 6: *Sum all emission reductions for the project.*
In this example, we estimate that all SYLs will operate in a similar manner. In practice, each SYL could have its own idling emission reductions. We add the total amount of idling for all 10 participating SYLs in the project, which is 10 * 6080 = 60,800 grams/day or 134 lbs/day.

Step 7: *Make sure the net average daily emission reductions from the idling reduction project do not exceed the historic idling activity of the SYLs 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

[11] For purposes of this example we have selected a specific engine model to better illustrate the APU's emissions. The use of this engine model does not confer any endorsement of this company or its products.

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

question 7(D)(3)). If the estimate (or actual number) exceeds the historic idling hours, you will need to explain this increase. In this example, the estimate does not exceed the historic idling activity.

Step 8: *Make sure the net average daily emission reductions from all idling reduction projects do not exceed the total long duration idle emissions accounted for in the regional inventory used in the SIP.*

In this example, you will need to assess the total SYL NO_x emissions projected in the inventory for the year or years the emission reductions are to be relied upon, and ensure that the estimated emission reductions do not exceed this amount.