California Environmental Protection Agency

Air Resources Board

Update on the Implementation of the 2005 ARB/Railroad Statewide Agreement

U.S. EPA Tier 2 Standard - GE Evolution Interstate Line Haul Locomotive
(BNSF 5730)

Release Date: July 18, 2007

Front Cover Photo Details

Manufacturer:	General Electric (GE) Company
Model:	GE “Evolution” (2003 pre-production *AC4400CW)*
Locomotive Type:	Road or Line Haul
Emission Standard - U.S. EPA Tier 2:	NOx=5.5, PM=0.20; HC=0.30, CO=1.5, (g/bhp-hr)
Size:	73’2” L x 10’8” W x 15’6” H
Weight:	420,000 pounds
Max Speed:	75 MPH
Engine Type (cycle):	Four Stroke Diesel
Horse Power:	4,400
Total Engine Displacement :	~ 6.7 cubic feet (ft^3) or ~ 190 Liters (L)
Number of Cylinders:	12
Single Cylinder Displacement:	~ 950 cubic inches (in^3) or ~ 15.7 Liters (L)
Rated Engine Speed:	1,050 RPM
Tractive Effort (pulling force starting):	180,000 pounds
Tractive Effort (@ 10-11 MPH):	145,000 pounds
Fuel Tank Volume:	5,000 gallons (diesel)
Engine Cooling Fluid:	440 gallons (water)
Engine Oil:	470 gallons

State of California
California Environmental Protection Agency
AIR RESOURCES BOARD
Stationary Source Division

Update on the Implementation of the 2005 ARB/Railroad Statewide Agreement

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Table of Contents

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I. SUMMARY

A. Introduction

On June 24, 2005, the Executive Officer of the Air Resources Board (ARB or Board) entered into a statewide railroad pollution reduction agreement (Agreement) with Union Pacific Railroad (UP) and BNSF Railway (BNSF). This Agreement was developed to implement near term measures to reduce diesel particulate matter (PM) emissions in and around railyards by approximately 20 percent.

On January 27, 2006, the Board heard public testimony, accepted clarifications to the Agreement, received a status report on implementation of the Agreement, and directed staff to return with status reports every six months. On July 20, 2006, the Board received the second semi-annual status report on the implementation of the Agreement. This status report evaluated the implementation efforts over the first year, with an emphasis on the prior six months. On January 25, 2007, the Board received the third semi-annual status report on the implementation of the Agreement. This status report evaluated implementation efforts over the first eighteen months of the Agreement, with an emphasis on the prior six months.

This document provides the fourth semi-annual status report on the implementation of the Agreement covering a period of twenty four months, with an emphasis on the implementation efforts that have occurred over the past six months.

B. Progress on Implementation of the Agreement

Board staff (staff) and the railroads began implementing the Agreement in July 2005. A summary of the status of the key implementation requirements is provided in Table 1. As Table 1 illustrates, the railroads and staff have met, or are on schedule to meet, each of the requirements specified for the second year of implementation. Details on the progress made to implement the program elements are provided in Chapter II. Details on other efforts are provided in Chapter III.

1. Implementation Activities

Summarized below are the key implementation milestones that have been accomplished within the past six months.

Install Idle Reduction Devices on 70 Percent of Unequipped Intrastate Locomotives by June 30, 2007:

- Since January 25, 2007, 92 new idle reduction devices have been installed on UP and BNSF's California-based locomotives. Adding these additional idle reduction devices to those reported previously, represents 80 percent of the intrastate locomotive fleet that was unequipped in 2005, satisfying the 70 percent requirement by June 30, 2007. As of July 1, 2007, ARB staff believes both railroads are on schedule to meet the 99 percent requirement by June 30, 2008.
- To date, a total of 383 out of the California's 450 intrastate locomotives are now equipped with idle reduction devices which represents 85 percent of California's intrastate fleet. This is more than twice the rate of installations that have occurred to date in the rest of the country.
- When the Agreement was initially implemented in 2005 there was an estimated 428 intrastate locomotives. The total number of intrastate locomotives has increased by 22 from 428 in 2005 to 450 in 2007. Even with the increase in number of intrastate locomotives, both railroads have continued to meet or exceed the requirements for the number of idle reduction devices installed on intrastate locomotives.

Dispense CARB Diesel for all Intrastate Locomotives and a Minimum of 80 Percent Low Sulfur Diesel for Locomotives by January 1, 2007:

- ARB staff review of diesel fuel data from both railroads indicates that both railroads continue to comply with:
  - The CARB diesel fuel regulation for intrastate locomotives which became effective on January 1, 2007.
  - The Agreement's requirements to dispense a minimum of 80 percent low sulfur (15 ppmw) diesel fuel which became effective on January 1, 2007.
- In regards to the CARB diesel fuel regulation, intrastate locomotives consume about 7 percent of the diesel fuel dispensed annually by both railroads. Over the past year, both railroads combined have dispensed CARB diesel volumes approaching 70 percent. This level of CARB diesel fuel dispensed exceeds by nearly ten times the volumes needed by the railroads to comply with the CARB diesel fuel regulation.
- ARB staff estimates that both railroads' dispense greater than 99 percent by volume[1] of low sulfur (15 ppmw) diesel fuel to locomotives fueled in California exceeding the required levels for interstate locomotives under the Agreement.

1. Volumes are expected to fluctuate based on fuel market conditions and business practices.

Visible Emission Reduction

- Under the Agreement, the railroads are required to achieve a 99 percent compliance rate for visible emissions over a calendar year. Over the past six months, more than 12,300 visible emission inspections were performed by railroad personnel resulting in more than 39,000 visible emission inspections performed since June 2005. Overall, both UP and BNSF have achieved a 99 percent compliance rate for 2006. Over the prior six months, UP and BNSF have maintained a 99 percent compliance rate.
- Overall, about 4,200 employees in numerous classifications (e.g., managers, supervisors, dispatchers, etc.) have received visible emission evaluation training.

Health Risk Assessments at Designated Yards

- Under the Agreement, sixteen new health risk assessments at designated railyards are to be completed in two phases; nine in the first phase and seven in the second phase.
- Staff completed the first nine draft health risk assessments in May 2007. Public meetings were held in the affected communities in May and June 2007 to release and explain the draft assessments. Each initial meeting was followed about one month later by a second meeting to allow for questions and public comments and to discuss possible mitigation.
- The draft assessments show that the diesel PM emissions from the railyards result in significantly higher pollution risks in nearby communities. The largest impacts are associated with the four railyards in Commerce. The combined potential cancer risk from these four railyards is about 700 per million for an exposed population of 5,000 people and about 200 per million for an exposed population of about 80,000 people. The draft assessments for the other railyards have lower potential cancer risks and expose fewer people, but are still significant and need to be reduced.
- The draft assessments also estimated pollution risks from other sources around the railyards. The staff found that the most significant source of toxic emissions is diesel truck traffic (not associated with the railyards) within a one to two mile zone surrounding the railyards. Generally, offsite diesel PM emissions from trucks result in similar or higher diesel PM exposures than the railyard-related emissions.
- After considering the public comments, staff will complete the health risk assessments. In addition, the staff will begin a public process to more fully address the noncancer impacts around the railyards and to identify and evaluate potential mitigation options needed to reduce the risk.
- Drafts of the next seven health risk assessments are scheduled to be completed by the end of 2007.

Locomotive Remote Sensing Pilot Program

- Assembly Bill (AB) 1222, authored by Assemblyman Jones, was signed into law in 2005, and requires the ARB, in consultation with an advisory group, to develop a locomotive remote sensing pilot program.
- Staff has been working with an advisory group on a three phase test program to assess the ability of remote sensing to effectively and accurately measure locomotive emissions. The first phase of test program was designed to ensure that the equipment will work in practice. This first phase was conducted at a locomotive test track in Pueblo Colorado and was completed in March 2007. The testing indicated that there were some serious technical issues that needed to be resolved before full field testing could be conducted.
- To address the technical issues, a second round of testing was conducted at the Pueblo test track in May 2007. Although there were still technical issues identified, the advisory group felt that the Phase 2 field testing should be pursued. In this phase, the equipment will be located at specific sites either within a railyard or along a railroad track to test many passing locomotives. This testing is scheduled for late summer.
- Phase 3 testing involves comparing the remote sensing results to the approved federal locomotive test procedure to determine the accuracy of the measurements from the remote sensor.
- Staff anticipates completing a report to the Legislature in the fall of 2007.

Ongoing Evaluation of Other, Medium Term, and Longer Term Emission Control Measures

- Staff and the railroads agreed to cooperatively evaluate the feasibility of developing diesel particulate filters or diesel oxidation catalysts for use on a typical switch locomotive representative of the current California switcher fleet. UP and BNSF indicated they would commit up to $5 million towards this evaluation. About $3.7 million of this funding has been expended on prototype and demonstration testing at Southwest Research Institute (SwRI) through January 1, 2007. The current status of efforts is summarized below.

  - The UP diesel particulate filter equipped switch locomotive (UPY 1378) arrived in Oakland, California back in October 2006. It continues to perform revenue service for the UP Oakland railyard. It will return to SWRi's facilities later this year after 12 months of service for emission testing.
  - The BNSF diesel particulate filter equipped switch locomotive is BNSF 3703. This locomotive recently received a second generation diesel particulate filter manufactured by HUG. It is currently undergoing initial testing at the SwRI facility in San Antonio, Texas. It is anticipated to arrive in Los Angeles, California, later this year.
  - If the current in-use demonstration testing is successful, both UP and BNSF have committed to retrofit one additional switch locomotive each and operate these locomotives in California.

- The U.S. EPA and UP began a test program in 2006 to demonstrate and test a diesel oxidation catalyst with an existing line haul locomotive by retrofitting a 3,800 horsepower line haul locomotive (UP 2368), built in 1992 by EMD (Model SD-60M), with a diesel oxidation catalyst. This locomotive was assigned to helper/hauler service in the Los Angeles basin in November 2006. During the three month inspection, it was discovered that some sections of the steel supports for the catalyst broke loose due to stress and vibration. The catalyst support elements were repaired and re-installed. During the six month inspection of the catalyst elements, it was discovered the repairs had failed. In late May, the catalyst was removed from UP 2368 to perform the repairs while in California. In late June, UP 2368 was returned to service in the Los Angeles area with the catalyst re-installed.
- ARB Locomotive SCR Project – Staff initiated a contract with Southwest Research Institute (SwRI) to begin efforts to research and demonstrate the use of individual and integrated aftertreatment devices to reduce locomotive NOx and particulate matter (PM) emissions by up to 80 percent or more beyond levels proposed in the U.S. EPA locomotive rulemaking for retrofitting existing freight line haul locomotives. A particular focus will be placed on retrofitting existing locomotives with selective catalytic reduction (SCR) to reduce oxides of nitrogen (NOx) emissions and diesel oxidation catalysts (DOC) and diesel particulate filters (DPF) to further reduce locomotive PM.
- ARB and the railroads conducted the first semi-annual technology symposium on April 25, 2006, at the ARB offices in El Monte. The second symposium occurred on July 13, 2006, at the Cal/EPA building in Sacramento. A report summarizing the two symposiums was released in December 2006. The third technology symposium was held on June 6, 2007. A fourth technology symposium is scheduled for the fall of 2007. Again, a report summarizing the 2007 symposiums will be released by the end of the year.

Enforcement of the Agreement

- In the first half of 2007, the ARB Enforcement Division staff visited the 31 designated and covered railyards and inspected 964 locomotives and issued 40 notices of violations for improper idling. For comparison, the second round of inspections during the fall of 2006 ARB Enforcement staff inspected 645 locomotives and issued nine notices of violation for idling.
- A new element added to ARB's enforcement efforts in 2007 was testing of diesel fuel dispensed during railyard inspections. Enforcement staff collected twelve diesel fuel samples, mostly from railyards with high activity, and sent it to our Monitoring and Laboratory Division to test for aromatics and sulfur content. Results confirmed that both railyards complied with the aromatics, sulfur, and other requirements specified in the CARB diesel regulation and the 2005 statewide railroad agreement.

2. Other Activities

As discussed in Chapter III, ARB staff and the railroads have been engaged in activities not specifically required in the 2005 Agreement. These are summarized below.

Modernization of Locomotive Fleet

Mostly in response to the 1998 Railroad Agreement to reduce locomotive NOx emissions in the South Coast, both UP and BNSF have made significant progress to transition to advanced technology line-haul and switch locomotives that have or will operate in California. Together, they have done the following:

- Both railroads are currently operating about 9,100 new and rebuilt Tier 0, 1, and 2 locomotives. Of those, over 1,800 Tier 2 locomotives are expected to be in service by the end of 2007. In total, UP and BNSF have over 60 percent of their 15,000 national locomotive fleet meeting at least Tier 0 standards and 36 percent are equipped with idle reduction devices.
- Since 2005, 12 new electric-hybrid locomotives (Green Goats) have been placed into service in California. Location examples include BNSF Commerce, UP LATC, and UP Mira Loma railyards. These locomotives were recently recalled by the manufacturer (Railpower) to address a potential fire hazard that exists. An investigation by Railpower is ongoing. It is anticipated that these locomotives will be returned to service by the fall of 2007.
- UP has ordered sixty new gen-set switch locomotives which are scheduled to arrive in California. Twenty eight gen-sets have arrived and been assigned in Southern California railyards. The remaining gen-sets are scheduled to arrive by the end of 2007. By the fall of 2007, an additional ten gen-set switch locomotives are anticipated to be located in northern California for both BNSF and UP. These ten locomotives were co-funded under ARB's Carl Moyer Program**.** These new ultra low-emitting switch locomotives will provide up to a 90 percent reduction in NOx and diesel PM emissions when compared to the higher emitting older switch locomotives that are replaced.
- Today there are 28 gen-sets, 12 Green Goats, and 4 LNG locomotives in service. Another 42 gen-sets are expected to be in service by late 2007. A goal in the goods movement strategy is to upgrade the rest of the intrastate fleet by 2010.

Community Complaint Process

- Both railroads have established and implemented procedures to process, handle, and respond to community complaints. The systems operate 24 hours a day and 365 days a year. Mechanisms are in place to track and forward complaints to appropriate company staff to respond.
- In the last six months, both railroads have received a combined average of 27 idling complaint calls per month. By comparison, for the first six months of 2006 both railroads received a combined average of 36 idling complaint calls per month.

Table 1
Implementation Status of Individual Program Elements

PROGRAM REQUIREMENTS	2005	2006	2007					
			Jan	Apr	May	Jun	Sept	Dec
IDLING REDUCTION								
Program Coordinators	✓							
Locomotive Inventories	✓	✓		✓				
Community Reporting Process	✓							
Railroad Training Programs	✓							
Adjudicatory Appeal Process	✓							
Training Implementation Status	✓	✓		✓				
35 (June 06) & 70 (June 07) Percent Idle Reduction Device Install Requirement		✓				✓		
VISIBLE EMISSION (VE)								
Program Coordinators	✓							
Program Establishment	✓							
Community Reporting Process	✓							
Railroad Training Programs	✓							
VE Inspection Report	✓	✓		✓				
Training Implementation Status	✓	✓		✓				
Annual Program Review	✓	✓						
EARLY REVIEW OF EMISSIONS / MITIGATION								
Emission Inventory	✓							
Community Meetings ***(Due Date 10/31/05)***		✓						
Mitigation Plans	✓							
HEALTH RISK ASSESSMENTS								
Railroad Study Plan	✓							
Health Risk Assessment Guidelines		✓						
Draft Health Risk Assessments (two phases - Phase 1 & 2)					1	1		2
TECHNICAL ASSESSMENTS								
Continue Study of Diesel Particulate Filter and Diesel Oxidation Catalysts	✓	✓						
Diesel Particulate Filters and Diesel Oxidation Catalysts Use -Europe & U.S.	✓							
*Remote Sensing Pilot Program (Original Due Date 12/31/06)**	✓	✓					▪	
Public Meetings (Due Date 12/31/05)	✓	✓						
Joint Report on Public Meetings		✓						
COMPLIANCE								
Inspection / Program Review Protocols	✓							
Railyard Inspections - Idle Reduction Devices & Visible Emissions		✓			✓			

✓ = Satisfied or ongoing per Agreement requirements. (May have reoccurring future date requirements specified in Agreement), ▪ = Future milestone date.
* = AB 1222 Remote Sensing Pilot Program – Initiated by 12/31/05; Report to Legislature original due date 12/31/06, estimate completion by fall 2007.

II. UPDATE ON THE IMPLEMENTATION OF THE AGREEMENT

Staff and the railroads began implementing the Agreement in July 2005. As presented in Table 1, the railroads and staff have met the requirements that are specified for the first year and a half of implementation of the Agreement. The key program elements are identified below:

- Idle Reduction Program;
- Low Sulfur Diesel Fuel Program;
- Visible Emission Reduction Program;
- Health Risk Assessments at Designated Railyards Program;
- Ongoing Evaluation of Other, Medium-Term, and Longer-Term Emission Control Measures.

This chapter more fully describes the progress made to date with an emphasis on the last six months.

A. Idle Reduction Program

1. Requirements of the Agreement

Under the Agreement, intrastate and interstate locomotives must limit non-essential idling through the use of automated idle reduction devices or by manually shutting down engines to prevent non-essential idling in excess of 60 consecutive minutes. Essential idling is defined as idling necessary to:

- Ensure adequate air brake pressure for locomotive and railcars;
- Ensure other safety related purposes;
- Prevent freezing of engine coolant;
- Ensure compliance with federal guidelines for occupied locomotive cab temperatures; and
- Engage in necessary maintenance activities.

The preferred method of all parties to reduce non-essential idling is the use of automated idle reduction devices. Under the Agreement, where locomotives are equipped with idle reduction devices, non-essential idling is limited to no more than 15 consecutive minutes. For locomotives not equipped with idle reduction devices, locomotives are to be shutdown as soon as it is clear that essential idling is not required and, in no case, is non-essential idling to exceed more than 60 consecutive minutes. In those situations where there is uncertainty over the expected duration of idling, the railroads are obligated to make efforts to notify their train crews if the anticipated wait time could be greater than 60 consecutive minutes so that train crews can shut down their locomotive(s). Railroad training programs are required to inform and educate train crews and other railroad operational employees about the need to faithfully observe the restrictions on idling.

2. Installation of Idle Reduction Devices

The railroads are on schedule to meet the commitments to install idle reduction devices on their intrastate locomotive fleets. Specifically, the railroads were to install idle reduction devices on their unequipped locomotives with the final goal of installing idle reduction devices on at least 99% of these locomotives by June 30, 2008.

In the last six months, the railroads installed 92 idle reduction devices on unequipped locomotives. As shown in Table 2, these additional installations bring the total number of idle reduction devices installed on unequipped locomotives to about 80 percent by June 30, 2007. This installation rate is well above the 70 percent required by the Agreement.

Table 2
Annual Requirements for Installation of
Idle Reduction Devices on Unequipped Locomotives
July 2007

Year	Number of Unequipped of Locomotives	Number of Idle Reduction Devices Installed	Percent	Agreement Requirement
2005	311	0	-	None
2006	321	113	35%	35%
2007	333	266	80%	70%
2008			On Schedule	>99%

Based on the information provided by the railroads, there are now 450 intrastate locomotives operating in the State. This represents an increase in total intrastate locomotives from 428 in 2005 and 438 in 2006. As can be seen in Table 3, 85 percent of the 450 intrastate locomotives in California operation are now equipped with idle reduction devices. This is more than twice the rate of installations that have occurred to date in the rest of the country. Staff expects that the Agreement will ensure that progress in California will continue to be is accelerated relative to the rest of the nation.
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Table 3
Installation of Idle-Reduction Devices on
All California Intrastate Locomotives Relative to National Fleet

California Switcher & Local Fleet			National Switcher & Local Fleet		
Current Inventory	**Installed By June 30, 2007**	**Percent of Fleet***	**Current Inventory**	**Installed By June 30, 2007**	**Percent of Fleet***
450	383	85%	3,606	1,284	36%

3. Idle Reduction Training Programs

The training of locomotive operators and other appropriate railroad employees on the idling provisions and requirements of the Agreement is an ongoing process. Since some employees, such as dispatchers and potentially some train crews, are impacted by the Agreement but may not be stationed in California, a significant number of railroad employees outside of California that have also been trained on the idling provisions and requirements of the Agreement is included in this total. Nearly 7,400 railroad employees have been trained or have been scheduled for training by June 30, 2007, as provided in Table 4.

Table 4
Number of Railroad Employees Trained Regarding the Idle Reduction Program

Employee Classification	Idle Training by June 30, 2007
Managers	155
Supervisors	134
Dispatchers	46
Response Center	21
Train Crews	6,298
Mechanical	711
Other	18
Total Trained	**7,383**

B. Low Sulfur Diesel Fuel Program

Effective January 1, 2007, require both railroads are required to dispense CARB diesel fuel for the 450 intrastate locomotives. Under this regulation, about seven percent of the total diesel fuel dispensed to locomotives in California by both railroads is required to be CARB diesel. ARB staff estimates that both railroads have dispensed CARB diesel for nearly 70 percent of the diesel fuel dispensed to locomotives in California, or nearly ten times the volumes required under the regulation.

Under the 2005 Agreement, the railroads also agreed to dispense a minimum of 80 percent of low sulfur level (15 ppmw) diesel fuels, either CARB or U.S. EPA onroad, to locomotives fueled in California. This low sulfur diesel fuel requirement in the 2005 Agreement also became effective on January 1, 2007. ARB staff estimates that both railroads' dispensed 99 percent or greater volumes of low sulfur (15 ppmw) diesel fuel to their locomotives fueled in California over the past six months. Note that the diesel fuel types and volumes dispensed to locomotives can fluctuate based on fuel market conditions and business practices.

To ensure compliance ARB, staff reviewed both railroad’s diesel fueling records and discussed fuel shipments with California’s major pipeline operator. In addition, fuel

testing by ARB was able to confirm types and quality of diesel fuels dispensed in major railyards. Based on these assessments, staff is confident that the railroads continue to comply with both sets of California's locomotive diesel fuel requirements which became effective January 1, 2007.

C. Visible Emission Reduction Program

The railroads have been conducting visible emission inspections over the past year as specified under their visible emission reduction and repair programs as shown in Table 5. Locomotives operating in California and exceeding a steady state opacity measurement of 20 percent must be sent to maintenance facilities to determine whether repairs are needed to comply with applicable visible emission standards as set forth in the national railroad regulation.

Under the Agreement, the railroads are required to achieve a 99 percent compliance rate for visible emissions over a calendar year. The railroads became subject to the opacity compliance level on January 1, 2006. In the last six months, over 12,300 visible emission inspections were performed by BNSF and UP. Visible emission inspections for both BNSF and UP since June 2005 to now are compiled in Table 5. The overall compliance rate for the three types of visible emission inspections performed is 99 percent. The locomotives that failed were repaired to meet Federal opacity standards.

Table 5
Results of Visible Emission Inspections
Cumulative Total Since June 2005

BNSF & UP	Certified Opacity Meter	Certified U.S. EPA Method 9	Non-certified Visible	Total	Overall Compliance Rate
# Inspected	3,607	24,309	11,219	39,135	99%
# passed*	3,539	24,142	11,152	38,833	

* Opacity not greater than 20 percent

1. Visible Emission Reduction Training Programs

Similar to the idle reduction program, both railroads have submitted information on the development of their visible emission reduction and repair training programs, and their plans to train appropriate railroad staff regarding the programs. Both railroads have been conducting their training programs over the past two years. The railroads have indicated they intend to train the same staff (i.e., managers, supervisors, dispatchers, response center, train crews, mechanical, and other) as trained on the provisions of the idle reduction program. Information on the railroads' visible emission reduction and repair training programs has been posted on the ARB railyard website under "Railroad Submittals" (www.arb.ca.gov/railyard/ryagreement/rrsubmittal.htm).

The number of employees trained by June 30, 2007, for both railroads is shown in Table 6. Employees outside of California are also being trained because they either work with or operate locomotives that operate in the State. Overall, since June 2005, over 4,000 employees in numerous classifications (e.g., managers, supervisors, dispatchers, etc.) have received visible emission evaluation training.

Table 6
Number of UP and BNSF Employees Trained
Cumulative Total Since June 2005

Certified U.S. EPA Method 9	Non-Certified VE Training	General Awareness Training	Total
221	431	3,519	4,171

D. Health Risk Assessments at Designated Yards Program

1. Requirements of the Agreement

In the 2005 Agreement, ARB staff and the railroads committed to prepare health risk assessments (HRAs or assessments) for 16 designated railyards. This was done to quantify pollution risk levels near railyards, identify specific emission sources, and to allow development of measures to reduce health risks. The assessments were to be completed in two phases; nine in the first phase and seven in the second phase. To facilitate this effort, draft health risk assessment guidelines were completed in July 2006.

For the first time for these railyards, the health risk assessments provide information to estimate potential lifetime cancer and non-cancer health risks. Health risk assessments do not gather information or health data on specific individuals, but provide estimates for the potential health impacts on a population at large. Consequently, the risk communicated is not actual risk but estimated theoretical risk. The health risk assessment process uses standardized general assumptions designed to assure that public health is fully protected. In this case, the assumptions used in the health risk assessments were a residential setting with the exposed population living at the same location for 70 years, doing moderate activity outdoors for 24 hours a day, for 350 days of the year. The information derived from the railyard health risk assessments can serve as a basis in the future to identify the greatest opportunities for future emission reduction measures.

One of the first tasks in performing a railyard health risk assessment is to quantify air toxic emissions released within a railyard and significant sources of air toxic emissions nearby the railyard. Railyard emission data are developed for the activities occurring in the railyards. These included emission estimates for line haul locomotives, switch locomotives, cargo handling equipment such as cranes and fork lifts, trucks, light duty vehicles, generators, off-road fueled equipment, and fuel storage tanks. Also the geographical and temporal distribution of these emissions are documented. To support

dispersion modeling, meteorological data are summarized. Dispersion modeling is then conducted and results are presented to ARB staff. The ARB used this data, in conjunction with other sources of information, to characterize the distributions of emissions within the railyards and significant sources of emissions nearby the railyard (e.g., freeways, refineries, trucks operating outside the railyard). Using all of this information, ARB will estimate air pollution exposure and develop the health risk assessments

2. Revised Schedule for Completion of Draft Health Risk Assessments

As detailed in the January 2007 update, ARB made a significant request for a change in inventory methodology to ensure that the best and most current data were included in the railyard health risk assessments. The effect of the request delayed the original release schedule. As a result the first nine draft health risk assessments anticipated by the end of 2006 were released in May 2007. The second group of draft heath risk assessments are scheduled to be completed by the end of 2007. Table 7 identifies the revised schedule for completion of the health risk assessments at the 16 designated railyards.

Table 7
Schedule for Completing Health Risk Assessments

Draft Health Risk Assessments Released in *May-June 2007*		**Draft Health Risk Assessments to be Completed by *December 31, 2007***	
Railyard	**Company**	**Railyard**	**Company**
Commerce (Eastern/Sheila)	BNSF	Barstow	BNSF
Hobart	BNSF	San Bernardino	BNSF
Richmond	BNSF	San Diego	BNSF
Stockton	BNSF	Colton	UP
Wilmington (Watson)	BNSF	Dolores (ICTF)	UP
Commerce	UP	Industry	UP
LA (LATC)	UP	Oakland	UP
Mira Loma	UP		
Stockton	UP		

3. Release of The First Nine Railyard Draft Health Risk Assessments

Draft assessments for nine designated railyards, and one additional non-designated railyard, were completed in May 2007. Staff prepared the health risk assessment portions of the draft HRAs. UP and BNSF provided the railyard emissions inventories and exposure modeling pursuant to ARB guidelines. These guidelines were developed with input from interested stakeholders and State health experts. The railyard HRAs are similar to the assessments for the UP Roseville Railyard (2004) and the combined Port of Los Angeles and Port of Long Beach (2006).

ARB staff and the railroads held public meetings to present the results of the first nine draft HRAs in May and June 2007. At the meetings, staff and the railroads discussed what we have learned, what is being done to reduce railyard pollution, and answered questions. The release of the draft HRAs was followed by a 30 day public comment period. Following the comment period, a second series of community meetings was held in late June and early July to: 1) allow another opportunity for comment and questions, and 2) to seek community suggestions on how best to further reduce emissions. Based on these results, ARB will finalize the HRAs and work with the railroads, local air pollution control districts, and communities to identify additional feasible mitigation measures that can be implemented to reduce diesel PM emissions.

4. Health Risks from Exposure to Toxic Air Pollutants

The ARB estimates that the excess cancer risk from all toxic air contaminants (TACs) in the South Coast Air Basin to be on average about 1,000 per million in the year 2000. Potential cancer risk in the San Francisco Bay Area and the San Joaquin Valley are about one-third lower. About 70 percent of the excess cancer risk from breathing ambient air is attributed to one TAC, diesel particulate matter (diesel PM). The average regional risk for diesel PM in urban areas was between 500 to 800 excess cancers per million in the year 2000.

Emissions from freight transport activities, also called goods movement, are a very significant sources of diesel PM in California. These sources include ships, trucks, locomotives, and cargo handling equipment. Some residential areas are in close proximity to ports, railyards, and freeways where many diesel fueled sources operate. In these areas, increases in cancer risk from nearby diesel sources are often significant and can, in a few cases, equal or exceed the regional background levels. However, the concentration of diesel PM in the air declines rapidly with distance from any one source and the impact of even a large facility is much smaller for those living a mile or more from the source area.

5. Results of the First Nine Railyard Draft Health Risk Assessments

The draft assessments show that the diesel PM emissions from the railyards result in significantly higher pollution risks in nearby communities. The largest impacts are associated with the four railyards in Commerce. Diesel PM emissions from these four yards (combined) were about 40 tons per year in 2005. This is about 0.5 percent of the regional diesel PM emissions, and much less than the emissions at the basin's ports. However, the Commerce yards emissions are concentrated and occur next to populated areas. They result in an estimated 70 percent increase in exposure to TACs (over regional levels) for about 5,000 local residents. Draft exposure increases from the other yards in the Los Angeles area are significantly less and fewer people are affected. Risk increases range from about 5 to 20 percent increase over regional levels.

The HRA results show the estimated excess cancer risks at the locations close to railyards are higher than other surrounding areas. Consistent with the findings of Roseville Railyard Study (ARB, 2004), the cancer risks decrease significantly within a one mile distance from railyards. The fact sheets summarizing the results are presented in Attachment A. Also included in Attachment A is a summary of activities underway to reduce emissions and risks from railyard activities.

In the draft assessments, staff also estimated pollution risks from other sources of diesel PM. The major emission source is diesel truck traffic in a one to two mile zone around each railyard. Generally, offsite diesel PM emissions result in similar or higher diesel PM exposure than railyard related emissions. A summary of diesel PM emissions from each railyard and air basin regional levels is presented in Table 8.

Table 8
Summary of Railyard, Port, Off-Site, and Air Basin Diesel PM Emissions (2005)

PORT OR RAILYARDS	**FACILITY** Diesel PM (Tons Per Year)	**OFFSITE*** Diesel PM (Tons Per Year)	**AIR BASIN** Diesel PM (Tons Per Year)
Los Angeles Region			
Port of LA and Long Beach	1,760	N/A	7,800
Four Commerce Yards Combined	40	113	
UP LATC	7	33	
UP Mira Loma	5	31	
BNSF Watson	2	5	
Other Areas			
UP and BNSF Stockton Combined	10	10	4,000
BNSF Richmond	5	20	4,600
UP Roseville	25[1]	N/A	2,400

* Off-site diesel PM emissions were estimated within 1 mile of the railyard boundaries, except for the four Commerce railyards in which diesel PM emissions were estimated within 2 miles of the railyard boundaries. [1] Locomotive diesel PM emissions only.

5. Actions to Reduce Diesel PM Emissions In and Around Railyards

Diesel PM levels, both regionally and near ports, freeways and railyards, need to be reduced. The Board identified diesel PM as a TAC in 1998. In 2000, the Board adopted a Statewide Diesel Risk Reduction Plan. Recognizing the problems posed by the rapid growth in freight movement, the Board adopted a Goods Movement Emission Reduction Plan in 2006. Together these plans contain strategies to reduce diesel PM emissions by 85 percent. To date, the Board has adopted 16 measures under these efforts that directly relate to reducing diesel PM emissions in and around railyards, and has another 11 in various stages of development.

At the public meetings to release the draft HRAs and the subsequent meetings to receive comments, the ARB staff and railroad representatives discussed existing and planned strategies to reduce diesel PM emissions in and around railyards. The ARB is pursuing a comprehensive approach to reduce locomotive and railyard emissions. Our efforts include voluntary agreements, state and federal regulations, and incentive mitigation programs, including early replacement of California's line haul and yard locomotive fleets. These efforts are explained in more detail in a Fact Sheet entitled "Strategies to Reduce Locomotive and Associated Railyard Emissions" May 2007 (see attachments). ARB staff estimates that these efforts have provided about a 15 percent reduction in railyard diesel PM emissions between 2005 and 2007. Measures to be applied between 2007 and 2010 are expected to provide another 30 to 50 percent reduction in that period.

E. Locomotive Remote Sensing Pilot Program

Assembly Bill 1222 became law in January 2006. Under the provisions of AB 1222, the ARB is required to design and implement a remote sensing pilot program in consultation with an advisory group consisting of up to 14 specified members. These members were appointed by the South Coast Air Quality Management District, Sacramento Metropolitan Air Quality Management District, UP, and BNSF. AB 1222 required a report to the legislature by December 31, 2006 on the feasibility and cost effectiveness of the use of remote sensing with locomotives.

The objectives of AB 1222 are to determine whether remote sensing devices can accurately and reliably determine, with a reasonable level of precision:

1. The levels of nitrogen oxides, particulate matter, and carbon monoxide emissions from locomotives;
2. Whether a locomotive is subject to tier 0, 1, or 2 federal certification standards; and
3. Whether the measured results can be calibrated to determine compliance with applicable federal emission certification levels.

To date, there have been 24 advisory group meetings. The members of the advisory group expressed a desire to take the time necessary to implement an effective and comprehensive pilot program. The design of the test program was more challenging than anticipated and the existing remote sensing technology needed to be adapted to measure locomotive emissions.

The ARB, in consultation with the Advisory Group, developed a three phase approach towards implementing and achieving the objectives of this bill. Phase 1 involved an initial field test to determine the ability of remote sensing devices to measure the emissions from locomotive exhaust stacks. This part of Phase 1 was conducted at the Transportation Technology Center Inc. (TTCi) in Pueblo, Colorado, in February 2007. Phase 2 includes installation of the remote sensing devices at several locations in Northern and Southern California and monitoring emissions of locomotives that travel

through these monitoring locations. The objective of Phase 2 is to assess the ability of the devices to evaluate locomotive emissions in the real world. Phase 3 is designed to compare measurements from remote sensing devices against U.S. EPA locomotive certification emission testing pursuant to 40 CFR Part 92. This phase is designed to determine the accuracy and precision of remote sensing devices as compared with the measurement of locomotive emissions required under the federal locomotive test procedures.

The Phase 1 work in Pueblo, Colorado was completed by March 2007. Phase 1 testing revealed problems with the line haul remote sensing device which resulted in its operation being discontinued. The yard extraction remote sensing system, however, provided more favorable operation and the advisory committee decided to go forward with further utilization of that system before being applied to mainline operation. The advisory group concluded that additional evaluation of the yard extraction remote sensing system was needed to resolve technical issues before implementation of field testing in Phase 2.

As a result, the Advisory Group agreed to create a pre-Phase 2 element (known as Phase 2a). This added Phase 2a testing element pushed back the project completion date from summer to fall 2007. Phase 2a testing occurred in May 2007. However, technical issues were still encountered in Phase 2a testing. The Advisory Group decided that these issues could be resolved during early testing in Phase 2. Phase 2 will begin in late August to September 2007. Phase 3 will be conducted jointly by Environmental Systems Products (ESP) and Southwest Research Institute (SwRI). Current plans are to complete all phases of the test program this fall. A final report is anticipated by late fall.

F. Ongoing Evaluation of Other, Medium-Term, and Longer-Term Emission Control Measures

1. Requirements of the Agreement

Under the Agreement, the ARB and the railroads agreed to continue to evaluate and implement other feasible mitigation measures. These measures included funding and research of diesel particulate filters and diesel oxidation catalysts studies and demonstrations for switch locomotives and additional measures to evaluate and demonstrate advanced technologies for locomotives and the use of alternative fuels. In addition, the ARB and railroads committed to conduct semi-annual technical evaluation meetings with the public to evaluate future potential emission reduction measures.

2. Diesel Particulate Filters and Oxidation Catalysts

Staff and the railroads have been cooperatively evaluating the feasibility of developing diesel particulate filters or diesel oxidation catalysts for use on a typical locomotive representative of the current California switcher fleet. UP and BNSF indicated they would commit up to $5 million towards this evaluation. About $3.7 million of this money

had already been expended for prototype and demonstration testing of a locomotive diesel particulate filter through January 1, 2007.

The next step in the diesel particulate filter locomotive demonstration is in-use durability testing in California. As part of the demonstration both BNSF and UP agreed to retrofit California switch locomotives. These older switch locomotives are powered by 1,500 horsepower roots blown engines that have operated for 35 years or more. The UP diesel particulate filter equipped switch locomotive arrived in Oakland, California, in December 2006. The BNSF diesel particulate filter equipped switch locomotive is scheduled to arrive in Los Angeles, California, in the last half of 2007. SwRI will evaluate the performance of the DPF configuration during the second half of 2007. If the in-use demonstration is successful, both UP and BNSF have committed to retrofit one additional locomotive each for a total of four diesel particulate filter switcher locomotives operating in California.

In a separate test program, UP recently collaborated with the U.S. EPA to test an older freight locomotive retrofitted with a diesel oxidation catalyst to reduce diesel PM emissions. UP 2368, a 3,800 horsepower line haul locomotive and originally built in January 1992, was retrofitted with a diesel oxidation catalyst. This locomotive arrived in California in November 2006 and began in-use testing in the Los Angeles area for approximately one year starting in early 2007. This locomotive was assigned to helper/hauler service in the Los Angeles basin. During the three month inspection, it was discovered that some sections of the steel supports for the catalyst broke loose due to stress and vibration. The catalyst support elements were repaired and re-installed. During the six month inspection of the catalyst elements it was discovered the repairs had failed. As a result, this locomotive was returned to SwRI's facility to receive a redesigned diesel oxidation catalyst. After installation of the new diesel oxidation catalyst, UP 2368 was returned to service in the Los Angeles area.

3. ARB Locomotive SCR Project

ARB staff has initiated a contract with Southwest Research Institute (SWRi) to begin efforts to research and demonstrate the use of individual and integrated exhaust aftertreatment devices. A particular focus will be placed on retrofitting existing locomotives with selective catalytic reduction (SCR) to reduce oxides of nitrogen (NOx) emissions and diesel oxidation catalysts (DOC) and diesel particulate filters (DPF) to further reduce diesel PM.

The proposed research effort is designed to take the first steps to determine whether aftertreatment devices can be retrofitted onto existing freight line haul locomotives. The initial research effort will consist of performance testing of a compact SCR device retrofitted onto EMD 710 engine. ARB staff hopes to secure participation by California's Class I freight railroads (UP or BNSF) to loan an existing freight line haul locomotive for in-use testing of the SCR and particulate matter control devices. This phase of testing would consist of full scale durability, maintenance, and reliability testing of the SCR device and the reductant (e.g., urea) on a freight line haul locomotive over a period of

one year (2008-2009). Baseline, 6 month, and one year emission testing also would be performed pursuant to 40 CFR Part 92 over the full line haul locomotive duty cycle. The results of this study could potentially reduce the NOx and diesel particulate matter emissions from Tier 0-3 freight line haul locomotives by up to 80 percent or more.

4. Symposiums to Evaluate Future Potential Measures

Under the Agreement, the ARB and railroads are required to conduct public semi-annual technical evaluation symposiums to identify and evaluate future emission reduction measures for locomotive and railyard emissions. The initial technical evaluation symposium was held on April 25, 2006 at the ARB offices in El Monte. The second symposium was held on July 13, 2006 at the Cal/EPA building in Sacramento. The ARB and railroads prepared a written report on progress and findings from the symposiums which was posted in December 2006. This report as posted on the ARB railyard website in December 2006 and is available at: http://www.arb.ca.gov/railyard/ryagreement/102006rpt_rrtech.pdf

A third symposium was held on June 6, 2007 at the Cal/EPA building in Sacramento where U.S. EPA summarized their proposed regulation and others provided information on aftertreatment devices (e.g., closed crankcase ventilation, diesel oxidation catalysts, selective catalytic reduction, and diesel particulate filters) that will be needed to meet U.S. EPA's proposed Tier 4 new line haul locomotive NOx and PM emission standards. A fourth symposium will be held this fall in Southern California with an emphasis on aftertreatment and emission controls that can be applied to existing locomotives.

5. U.S. EPA Rulemaking Activity Update

The U.S. EPA released its proposed draft Tier 4 locomotive and marine rulemaking in April 2007 with a public comment period until July 2, 2007. In July 2007 the ARB staff provided comments on the U.S. EPA proposed locomotive rulemaking and were supportive of most elements included in the April 3, 2007 proposal. However, we believe that several portions of the proposal should be strengthened, expanded or accelerated. Attachment B contains the ARB staff comments.

U.S. EPA's proposed locomotive rulemaking would set Tier 4 new line haul locomotive standards for PM in 2015 (85 percent reduction from Tier 2 standards) and NOx in 2017 (75 percent reduction from Tier 2 standards). In addition, Tier 3 new line haul locomotive standards for PM would be required in 2012 that would provide a 50 percent reduction beyond the Tier 2 PM standard. Existing Tier 0-2 line haul locomotives would be required to provide about a 50 percent PM reduction upon remanufacturing beginning in 2008 through 2013. Existing Tier 0 line haul locomotives would be required to provide about a 20 percent NOx reduction by 2010.

ARB staff provided comments on the U.S. EPA proposed locomotive rulemaking. ARB staff commented on the need to accelerate the Tier 4 NOx standard to as soon as

possible, but no later than 2015, and to provide a 50 percent reduction in NOx, as well as PM, for new Tier 3 locomotives as early as possible and not later than 2012. ARB staff has also commented on the need to accelerate the Tier 2 PM remanufacturing standard to at least 2011, and to provide a certification program for aftertreatment devices that can be applied to existing line haul locomotives at a future date.

G. ARB Enforcement Inspections

Consistent with the Agreement, ARB staff implemented an idling enforcement training program for ARB and local air district enforcement personnel, and coordination with the railroads to provide visible emission training to railroad employees. ARB staff conducted railyard inspections to evaluate compliance with the requirements specified in the Agreement.

1. Inspection Results and Preliminary Findings For 2007

Two statewide inspections occurred in 2006. As shown in Table 9, a third statewide inspection was completed by ARB Enforcement Division staff during the first half of 2007. Staff visited 31 designated and covered railyards and inspected almost 1,000 locomotives. In this third round of inspections staff inspected 964 locomotives and issued 40 notices of violation for idling. This is about a 96 percent compliance rate for the first half of 2007. For comparison, in 2006, over 1,300 locomotives were inspected during two separate rounds of railyard inspections. As a result of these inspections, staff issued 32 notice of violations for idling infractions and one notice of violation issued for a smoking locomotive. This is about a 98 percent compliance rate for the locomotives sampled for all of 2006.

During the first half of 2007 there were increased inspections of locomotives off-site. The Sacramento Valley inspections (non-railyard area) were part of this off-site effort and was the result of a UP bridge fire that destroyed 1,100 feet of mainline timber pile trestle bridge approach near the American River at Sacramento, California. The incident created severe traffic congestion at a railroad siding in Elk Grove, California. Staff became aware of the traffic congestion occurring in Elk Grove, California, after receiving several locomotive idling complaint calls from residents in the area. As a result, staff investigated and issued nine NOVs.

A new element added to ARB's enforcement efforts in 2007 was testing of diesel fuel dispensed during railyard inspections. Enforcement staff collected twelve diesel fuel samples, mostly from railyards with high activity, and sent it to our Monitoring and Laboratory Division to test for aromatics and sulfur content. Results for both complied with the requirements specified in the CARB diesel regulation and the 2005 statewide railroad agreement. Testing results ranged from 3-7 ppmw for sulfur levels, much below the 15 ppm standard, and aromatic levels ranged from 7-15 for CARB diesel and 25-35 percent for U.S. EPA onroad fuel.

Table 9
Inspection Results Summary 2006 & 2007

Air Basin	# of Railyards Visited	Idling Locomotives Observed	Non-Idling Locomotives Observed	Total Number of Locomotives Inspected	Notice of Violations
March – May 2007					
Mojave Desert	3	24	158	182	5
Mountain Counties	2	35	112	147	4
Sacramento Valley*	0*	9	10	19	9
San Diego	1	0	6	6	0
San Joaquin Valley	6	15	120	135	8
SF Bay Area	5	5	25	30	3
South Coast	14	12	433	445	11
2007 subtotal	31	100	864	964	40
2006 Total	31	372	948	1,320	33

* Non-Railyard area. UP bridge fire event – traffic congestion occurred at a railroad siding in Elk Grove, California.

III. OTHER IMPLEMENTATION EFFORTS

A. Modernization of the Locomotive Fleet

ARB and others have taken a number of actions to address the impacts of locomotive emissions throughout the State. This includes the 1998 Memorandum of Understanding with the railroads to reduce locomotive oxides of nitrogen (NOx) emissions in the South Coast, requirements for the use of cleaner fuel in intrastate locomotives, Carl Moyer funding by some local air districts, and the current Agreement. As a result, the railroads have undertaken a number of steps that will provide significant reductions in the emission impacts of railyards on local communities.

Both railroads are currently operating about 9,100 new and rebuilt Tier 0, 1, and 2 locomotives. Of those, over 1,800 Tier 2 locomotives are expected to be in service by the end of 2007. In total, UP and BNSF have over 60 percent of their 15,000 national locomotive fleet meeting at least Tier 0 standards and 36 percent are equipped with idle reduction devices.

Green Goats are electric hybrid switch locomotives that operate primarily through energy provided by over 300 lead acid batteries. Both railroads, combined, have placed twelve Green Goats into service in California over the past couple of years. However, after five electric hybrid switch locomotive lead acid battery fires across the country, all 59 electric hybrid locomotives were recently temporarily pulled from service. The manufacturer, Railpower, hopes to make the necessary repairs and begin to gradually place these locomotives back into service. The most recently built electric hybrid switch locomotives, referred to as third generation, will most likely be placed back into service prior to the first and second generation units and possibly as early as this fall.

Other railroad modernization efforts to reduce emissions include the introduction of gen-sets switch locomotives. These multi-engine switch locomotives achieve up to 90 percent reduction in NOx and diesel PM. The deployment of significant numbers of these locomotives in California is underway. UP ordered sixty new gen-set switch locomotives which are scheduled to arrive in 2007. As of July 2007, half of the 60 new gen-set switch locomotives have arrived and been assigned to South Coast Air Basin railyards. By late-2007, an additional ten gen-set switch locomotives are anticipated to be located in northern California for both BNSF and UP which were co-funded under ARB's Carl Moyer Program**.**

B. Community Complaint Process

This section discusses the railroads' implementation efforts to establish and implement a community complaint process for idling and smoking locomotives.

1. Pre-existing Railroad Complaint Process

Prior to the implementation of the Agreement, each railroad had established procedures to process, handle, and respond to community complaints. Under these procedures, each railroad utilizes a national phone call center to receive and record complaints regarding its operations instead of individual local phone centers. The national phone systems allow the railroads to utilize a centrally trained staff and existing mechanisms that allows the public to register complaints about idling or smoking locomotives from all locations in the state at any time. The systems operate 24 hours a day and 365 days a year, and utilizes computerized mechanisms to track and forward complaints to the appropriate company staff to respond.

The call center phone numbers for each railroad are:

- **Union Pacific Railroad**

  1-888-UPRRCOP or 1-888-877-7267

- **BNSF Railway**

  1-800-832-5452

While each railroads call center system is different, they are similarly structured in that calls received are logged and appropriate railroad employees are directed to respond.

2. Establishment of Railroad Complaint Process Under the Agreement

By August 31, 2005, both railroads submitted their plans to develop a process for informing members of the community on the results of their investigations of complaints. Under their programs, the railroads utilize their existing call centers and phone numbers for community members to report locomotive complaints by augmenting their national systems to be able to respond to and provide complaint resolution information to complainants. Each complaint is logged in a central database upon receipt, and generates a complaint report, which is forwarded to the appropriate railroad operations, environmental, or safety management personnel. Management reviews the complaints and based on the type of complaint and need for action, assigns the appropriate local railroad staff to investigate the complaint and correct the problem. Daily emails are now being automatically generated to environmental staff that must follow-up on the incidents and, in some cases, provide a response back to the individual who reported the complaint. The transition to the new system-wide protocols has been developed

and implemented. It will take time to evaluate and make any necessary program adjustments.

Staff continues to work with the railroads to evaluate the existing processes, and develop recommendations on how the system can be more responsive and accountable. This includes the establishment of protocols for better system tracking and recording of the complaint investigation process at the local level, and protocols for notifying individuals who file a complaint on the findings of the railroads' investigations, including any corrective actions taken.

3. Status of Railroad Complaint Process Under the Agreement

Table 10 summarizes complaint activity for the six month period from December 2006 through May 2007 and compares the activity to two previous periods. During the most recent six month period, UP and BNSF received a combined average of about 27 calls per month to their 800 numbers reporting idling locomotives. During this six month time period, there were two special events which affected the numbers of calls. One was a UP track renewal project on the Los Angeles Subdivision in January and February 2007 (for which UP set up a special 800 number to update local residents on scheduled crossing closures, etc.) and the second was a bridge fire near Sacramento that closed the UP east-west mainline for two weeks and affected rail traffic on both railroads. By comparison, in the two preceding six month reporting periods there were approximately 25 and 36 calls per month, respectively. To put the rate of 27 complaints per month in context, the railroads had thousands of locomotives operating in California each month.

Table 10
1-800 Call Summary 2005 thru 2007

	Dec 2006-May 2007	July 2006 – Nov 2006	Dec 2005-May 2006
Average Monthly Calls to 800 Numbers	27	25	36

Since the January 2007 staff report, both railroads have continued to track and improve on how the community 800 number calls are processed. As before, citizens, the ARB, local air quality districts, and other local government agencies have been using the call center phone numbers to register complaints they have regarding specific locomotive events. Each railroad has been utilizing this information source to address identified problems. Both railroads have developed a follow-up process providing feedback to the caller, as appropriate, detailing problems that were identified and what actions could be taken.

Both railroads continue to further improve the process for gathering the necessary information for timely close-outs.

4. Development of an ARB Railyard Website

On August 1, 2005, staff established a "Railyard Emission Reduction" website at: http://www.arb.ca.gov/railyard/railyard.htm. This website is intended to provide information to the public about the ARB's ongoing efforts to reduce the emission impacts of railyard operations, including staff's activities to implement the Agreement and other related railroad information. The release of the first nine draft health risk assessments in May 2007 can be found at http://www.arb.ca.gov/railyard/hra/hra.htm. In addition, the U.S. EPA released its proposed draft Tier 4 locomotive and marine rulemaking in April 2007 with a public comment period until July 2, 2007. In July 2007 the ARB staff provided comments on the U.S. EPA proposed locomotive rulemaking. These comments can be also be found at http://www.arb.ca.gov/railyard/railyard.htm under "What's New" and "Locomotives" links.

C. Other Outreach Efforts

Besides the community meetings required under the Agreement, the railroads have initiated a number of other outreach activities and events with the public. Table 11 lists all examples of the outreach activities conducted in the last six months.

Table 11
UP and BNSF Railroads' Other Outreach Events

Year 2007	California Outreach Events
January 17	Roseville – UP Diesel Oxidation Catalyst (DOC) Demonstration
February 20-28	**UP & GE Locomotive Technology Tour and Exhibits**
February 20	West Colton
February 21	Stockton
February 21	Fresno
February 22	Roseville
February 23	Oakland
February 24	Los Angeles Union Station
February 25	Port of Los Angeles (POLA)
February 26-28	Long Beach – Faster Freight Cleaner Air Convention
April 21	Port of Los Angeles (POLA) Centennial Celebration – Included a BNSF Tier 2 locomotive on display
May 23	Commerce – HRA Community Meeting – CARB, BNSF & UP
May 23	Port of Los Angeles (POLA) Future Clean Technologies Fair – included an exhibit of a UPRR Tier 2 locomotive
May 24	Los Angeles Union Station – GE Road Hybrid Demonstration
May 24	LATC – HRA Community Meeting – CARB & UP
May 24	Mira Loma – HRA Community Meeting – CARB & UP
May 25	Watson (Wilmington) – HRA Community Meeting - CARB & BNSF
June 5	Stockton – HRA Community Meeting – CARB, BNSF & UP
June 6	Sacramento – CARB Locomotive Technology Symposium
June 13	Richmond - HRA Community meeting – CARB & BNSF
June 26	Watson – HRA Community Meeting – CARB & BNSF
June 26	Commerce – Task Force meeting – BNSF
June 27	Commerce – HRA Community meeting – CARB, BNSF & UP
June 28	LATC – HRA Community Meeting – CARB & UP
June 28	Mira Loma – HRA Community Meeting – CARB & UP
July 11	Richmond – HRA Community Meeting – CARB & BNSF
July 12	Stockton – HRA Community Meeting – CARB, UP & BNSF

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Attachment A

Fact Sheets

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Fact Sheet

May 2007

California Environmental Protection Agency
Air Resources Board

Strategies to Reduce Locomotive and Associated Railyard Emissions

The Air Resources Board (ARB) has developed a comprehensive approach to reduce locomotive and railyard emissions through a combination of voluntary agreements, ARB and United States Environmental Protection Agency (U.S. EPA) regulations, funding programs, and early replacement of California's line haul and yard locomotive fleets. The information presented below summarizes California's key locomotive and railyard air pollution control measures and strategies.

South Coast Locomotive NOx Fleet Average Agreement: Signed in 1998 between ARB and both Union Pacific Railroad (UP) and BNSF Railway (BNSF), it requires the locomotive fleets that operate in the South Coast Air Quality Management District (SCAQMD) to meet, on average, U.S. EPA's Tier 2 locomotive emissions standards by 2010. Tier 2 locomotives became commercially available in 2005 and provide a 65 percent reduction in oxides of nitrogen (NOx) and 50 percent reduction in diesel particulate matter (PM) emissions. This Agreement will provide locomotive fleet benefits in southern California 20 years earlier than the rest of the country.

Statewide Railroad Agreement: ARB and both UP and BNSF signed a voluntary statewide agreement in 2005 which does not change any federal, state, or local authorities to regulate railroads. The Agreement has resulted in measures that have achieved an almost 20 percent reduction in locomotive diesel PM emissions in and around railyards since its adoption in June 2005. The measures in the Agreement include:

- Phase-out of non-essential idling on all locomotives without idle reduction devices (60 minute limit – fully implemented);
- Install idling devices on 440 California-based locomotives by June 30, 2008 (15 minute limit – 70 percent implemented);
- Identify and expeditiously repair locomotives with excessive smoke and ensure that at least 99 percent of the locomotives operating in California pass smoke inspections (implemented);
- Require all locomotives that fuel in the state use at least 80 percent federal or California ultra low sulfur (15 parts per million) diesel fuel by January 1, 2007, (six years prior to federal requirement – implemented, estimate is over 95 percent of diesel fuel is low sulfur);
- Prepare new health risk assessments for 16 major railyards, based on the UP Roseville Rail Yard health risk assessment (completed in 2004) and Office of Environmental Health Hazard Assessment (OEHHA) guidelines; (9 of the 16 will be released in May/June 2007); and
- Identify and implement future feasible mitigation measures based on the results of the railyard health risk assessments (ongoing).

ARB Diesel Fuel Regulations Extended to Intrastate Locomotives: This regulation, approved in 2004, requires intrastate locomotives that operate 90 percent of the time in the state to use only California ultra low sulfur (15 parts per million) diesel fuel. This diesel fuel provides on average a six percent reduction in NOx and 14 percent reduction in diesel PM emissions. The regulation took effect on January 1, 2007.

ARB Cargo Handling Equipment Regulations: This regulation, approved in 2005, requires the control of emissions from more than 4,000 pieces of mobile cargo handling equipment, such as yard trucks and forklifts that operate at ports and intermodal rail yards. This regulation is expected to reduce diesel PM and NOx emissions by up to 80 percent by 2020. The regulation took effect on January 1, 2007.

Heavy Duty Diesel New Truck Regulations: ARB and the U.S. EPA both have adopted emission standards for 2007 and subsequent model year heavy-duty diesel engines. These standards represent a 90 percent reduction of NOx emissions, 72 percent reduction of non-methane hydrocarbon emissions, and 90 percent reduction of PM emissions compared to the 2004 model year emission standards.

On-Road In-Use Truck Measure: The ARB is developing a control measure to reduce diesel PM and NO_x emissions from private fleets of on-road heavy-duty diesel-fueled vehicles. This measure will cover long and short haul truck-tractors, construction related trucks, wholesale and retail goods transport trucks, tanker trucks, package and household goods transport trucks, and any other diesel-powered trucks with a gross vehicle weight rating of 14,000 pounds or greater. The goals of this effort are: (a) by 2014, emissions are to be no higher than a 2004 model year engine with a diesel particulate filter, and (b) by 2020, emissions are to be no higher than a 2007 model year engine.

In-Use Port and Railyard Truck Mitigation Strategies: The ARB is developing a port truck fleet modernization program that will substantially reduce diesel PM and NOx emissions by 2010, with additional reductions by 2020. There are an estimated 12,000 port trucks operating at the 3 major California ports which are a significant source of air pollution, about 7,000 tons per year of NOx and 560 tons per day of diesel PM in 2005, and often operate in close proximity to communities. Strategies will include the retrofit or replacement of older trucks with the use of diesel particulate filters and a NOx reduction catalyst system. ARB staff will propose regulatory strategies for ARB Board consideration by the end of 2007 or early 2008.

ARB Tier 4 Off-Road Diesel-Fueled New Engine Emission Standards: In 2004, the ARB and U.S. EPA adopted a fourth phase of emission standards (Tier 4). New off-road engines are now required to meet aftertreatment-based exhaust standards for particulate matter (PM) and NOx starting in 2011 that are over 90 percent lower than current levels, putting off-road engines on a virtual emissions par with on-road heavy-duty diesel engines.

Transport Refrigeration Unit (TRU) Air Toxics Control Measure (ATCM): This ATCM is applicable to refrigeration systems powered by integral internal combustion engines used on trucks, trailers, railcars, and shipping containers. TRUs may be capable of both cooling and heating. Diesel PM emission factors for TRUs and TRU gen set engines will be reduced by approximately 65 percent in 2010 and 92 percent in 2020. California will also experience benefits from reduced NOx and HC emissions. The new rule became effective on December 10, 2004.

U.S. EPA Locomotive Emission Standards: Under the Federal Clean Air Act, U.S. EPA has sole authority to adopt and enforce new locomotive emission standards. Under U.S. EPA's rules, this preemption also extends to the remanufacturing of existing locomotives. The ARB is relying on the U.S. EPA to expeditiously require the introduction of the next generation or Tier 4 locomotive emission standards. ARB supports the introduction of Tier 4 locomotives built with diesel particulate filters and selective catalytic reduction, which combined, are expected to provide up to a 90 percent reduction in NOx and PM emissions. U.S. EPA released the draft Tier 4 rulemaking in March 2007. The final regulations are targeted for approval by the end of 2007.

ARB Goods Movement Emission Reduction Plan: Approved in 2006, this plan forecasts goods movement emissions growth and impacts. It contains a comprehensive list of proposed strategies to reduce emissions from ships, trains, and trucks and to maintain and improve upon air quality. The strategies in the plan, if fully implemented, would reduce locomotive NOx and diesel PM emissions by up to 90 percent by 2020.

California Yard Locomotive Replacement Program: One locomotive strategy being pursued is to replace California's older yard locomotives that operate in and around rail yards statewide. Yard locomotives represent only five percent of the statewide locomotive NOx and diesel PM emissions, but often occur in railyards located in densely populated urban centers. Multiple nonroad engine (gen-set) and electric-hybrid yard locomotives have demonstrated they can reduce NOx and diesel PM emissions by up to 90 percent as compared to existing locomotives. In January 2006, UP ordered 60 gen-set and 10 electric hybrid yard locomotives for deployment in southern California beginning in 2007. BNSF has been operating four liquefied natural gas (LNG) yard locomotives in downtown Los Angeles since the mid-1990s.

For information on California's locomotive emission reduction strategies, and details on locomotive emission control technologies for line haul and yard locomotives, please visit: http://www.arb.ca.gov/railyard/railyard.htm & http://www.arb.ca.gov/msprog/offroad/loco/loco.htm.

For information on the Goods Movement Emission Reduction Plan please visit: http://www.arb.ca.gov/gmp/gmp.htm.

For information on the On-Road In-Use Truck Measure, please visit: http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm.

For information on the In-Use Port and Railyard Truck Mitigation Strategies, please visit: http://www.arb.ca.gov/msprog/onroad/porttruck/porttruck.htm.

For information on the Transport Refrigeration Unit Air Toxics Control Measure, please visit: http://www.arb.ca.gov/diesel/tru.htm.

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Fact Sheet

May 2007

California Environmental Protection Agency
Air Resources Board

Health Risk Assessments for Railyards

The Air Resources Board (ARB) entered into the Statewide Railroad Agreement (Agreement) with the Union Pacific Railroad (UP) and BNSF Railway (BNSF) in June 2005. The Agreement requires a number of short-term and long-term actions to reduce diesel particulate matter emissions. As part of the Agreement, the railroad companies agreed to work with ARB to prepare health risk assessments for 16 large railyards. The information derived from the railyard health risk assessments will provide the public with information on risks associated with railyard emissions and most importantly identify the greatest opportunities for future emission reduction measures.

What is a Health Risk Assessment?

A health risk assessment is a tool that is used to evaluate the potential for a chemical to cause cancer or other illness. A risk assessment uses mathematical models to estimate the theoretical maximum health impacts from exposure to certain concentrations or levels of toxic air pollutants released from a facility or found in the air.

First Things First: Identifying the Air Pollution Sources

One of the first tasks in performing a railyard health risk assessment is to quantify air toxic emissions released within a railyard and significant sources of air toxic emissions nearby the railyard. UP and BNSF are responsible for providing information on the sources operating within the railyards. This includes both the emission inventory and air dispersion modeling data. The ARB will use these data, in conjunction with other sources of information, to characterize the distributions of emissions within the railyards and significant sources of emissions nearby the railyard (e.g., freeways, refineries, trucks operating outside the railyard). Using all of this information, ARB will estimate air pollution exposure and develop the health risk assessments.

What Information Does the Health Risk Assessment Provide?

Health risk assessments provide information to estimate potential lifetime cancer and non-cancer health risks. Health risk assessments do not gather information or health data on specific individuals, but provide estimates for the potential health impacts on a population at large. Consequently, the risk communicated is not actual risk but estimated theoretical risk. The health risk assessment process uses standardized general assumptions designed to assure that public health is fully protected. In this case, the assumptions used in the health risk assessments were a residential setting with the exposed population living at the same location for 70 years, doing moderate activity outdoors for 24 hours a day, for 350 days of the year.

- For **cancer** health effects, the risk is expressed as the maximum number of additional cases or chances in a population of a million people who might be expected to get cancer over a 70-year lifetime. The number may be stated as “10 in a million” or “10 chances per million”. Therefore, a potential cancer risk of 10 in a million means if one million people were exposed to a certain level of a pollutant or chemical there is a chance that as many as 10 of them may develop cancer over their 70-year lifetime. This would be new cases of cancer above the expected rate of cancer that might normally occur in the general U.S. population which is about 200,000 to 250,000 chances in a million (one in four to five people). In the Los Angeles basin, the regional cancer risk due to exposure to air pollution is estimated at 1,000 in a million. The statewide average cancer risk from breathing current levels of pollutants in California’s ambient air over a 70-year lifetime is estimated to be 720 in one million.

- For **noncancer** health effects, a reference exposure level or REL is used to predict if there will be certain identified adverse health effects, such as lung irritation, liver damage, or birth defects. These adverse health effects may happen after chronic (long-term) or acute (short-term) exposure. To calculate a noncancer health risk number, the REL is compared to the concentration that a person is exposed to and a "hazard index" (HI) is calculated. The greater the HI is above 1.0 indicates a greater potential for possible adverse health effects. If the HI is less than 1.0, then it is an indicator that adverse effects are not likely to happen.

Has There Been a Risk Assessment Done Before for a Railyard?

Yes, but only one. The ARB staff performed a health risk assessment related to locomotives and their activity at the J. R. Davis Yard (Yard) in Roseville, California. The study report can be found at: http://www.arb.ca.gov/diesel/documents/rrstudy.htm. The Yard is the largest service and maintenance railyard in the West with over 30,000 locomotives visiting annually. The results of the risk assessment show a large area impacted by the diesel particulate matter emissions associated with the operations and activities of the Yard. The potential cancer risk exceeded 500 in a million for some areas. The impact was spread over a very large area with elevated cancer risks of greater than 10 to a 100 in a million over most of the city.

Which Railyards Will Be Subject to Risk Assessments (and Estimated Completion Date)?

UP - Southern California
Commerce (Spring 2007)
LATC (Los Angeles) (Spring 2007)
Mira Loma (Spring 2007)
Dolores/ICTF (December 2007)
City of Industry (December 2007)
Colton (December 2007)

BNSF – Southern California
Hobart (Los Angeles Intermodal) (Spring 2007)
Commerce/Eastern (Spring 2007)
Watson/Wilmington (Spring 2007)
Sheila Mechanical (Spring 2007) (Not a designated yard, but supports Hobart and Commerce/Eastern)
Barstow (December 2007)
San Bernardino (December 2007)
San Diego (December 2007)

UP – Northern California
Stockton (Spring 2007)
Oakland (December 2007)
Roseville * (* UP Roseville was completed in 2004)

BNSF – Northern California
Stockton (Spring 2007)
Richmond (Spring 2007)

What are the Next Steps?

ARB staff will present the draft health risk assessments to the public for review and comment. Once the public review process has been completed, the railyard health risk assessment information will be used to evaluate and identify future mitigation measures that can be implemented at each of the railyards.

More information on California's railyard health risk assessments can be found at: http://www.arb.ca.gov/railyard/hra/hra.htm.

You may obtain this document in an alternative format by contacting ARB's ADA Coordinator at (916) 323-4916 (voice); TTY/TDD/Speech-to-Speech users may dial 7-1-1 for the California Relay Service.

Fact Sheet

May 2007

California Environmental Protection Agency
Air Resources Board

Release of California's Draft Railyard Health Risk Assessments

In the 2005 Statewide Railroad Agreement (Agreement), the Air Resources Board (ARB), Union Pacific Railroad (UP), and BNSF Railway (BNSF) committed to prepare health risk assessments (HRAs or assessments) for 16 designated railyards. This was done to quantify pollution risk levels near railyards, identify specific emission sources, and design measures to reduce health risks.

Draft assessments for nine designated railyards, and one additional non-designated railyard, will be released in May or June. Another seven are under development and will be ready in about seven months. ARB staff prepared the health risk assessment portions of the draft HRAs. UP and BNSF completed the emissions inventories and exposure modeling pursuant to ARB guidelines. These guidelines were developed with input from interested stakeholders and State health experts. The railyard HRAs are similar to the assessments for the UP Roseville Railyard (2004) and the combined Port of Los Angeles and Port of Long Beach (2006).

ARB and the railroads are holding public meetings to present the results of the draft HRAs. At the meetings, staff and consultants for the railroads will discuss what we have learned, what is being done to reduce railyard pollution, and will answer questions. The release of the draft HRAs will start a period in which public comments will be sought. This will be followed by a second series of community meetings. The purpose of these meetings will be twofold: 1) to allow another opportunity for comment and questions, and 2) to seek community suggestions on how best to further reduce emissions. Based on these results, ARB will finalize the HRAs and work with the railroads to identify additional feasible mitigation measures that could be implemented to reduce diesel PM emissions.

Health Risks from Exposure to Toxic Air Pollutants

Many chemical substances have been designated as toxic air contaminants (TACs). Some of these are found in California air at levels of concern, mostly due to their potential to increase the risk of cancer. Where sufficient data exist, the cancer risk due to breathing ambient air can be estimated. This risk is usually expressed as the number of additional cancer cases that might occur per million people exposed to a given concentration. Health risks are more likely to overestimate rather than underestimate risks for the average individual[1]. This leads to risk reduction efforts that are health protective for the more highly exposed individuals.

The ARB estimates that the excess cancer risk from TACs in the South Coast Air Basin was about 1,000 per million in the year 2000[2]. Excess risk in the San Francisco Bay Area and the San Joaquin Valley were about one-third lower. About 70 percent of the excess cancer risk from breathing ambient air is attributed to one TAC, diesel particulate matter (diesel PM). The average regional risk for diesel PM in urban areas was between 500 to 800 excess cancers per million in the year 2000.

Emissions from freight transport activities, also called goods movement, are a very significant source of diesel PM in California. These sources include ships, trucks, locomotives, and cargo handling equipment. Some residential areas are in close proximity to ports, railyards, and freeways where many diesel fueled sources operate. In these areas, increases in cancer risk from nearby diesel sources is often significant and can, in a few cases, equal or exceed the regional background levels. However, the concentration of diesel PM in the air declines rapidly with distance from any one source and the impact of even a large facility is much smaller for those living a mile or more from the source area.

[1] For example, exposure estimates are based on a lifetime (70-year) exposure to current levels and on breathing rates that represent active individuals.
[2] Reference ARB Almanac

Results from Railyard Health Risk Assessments

As expected, based on previous studies, the draft assessments show that the diesel PM emissions from several railyards result in significantly higher pollution risks in nearby communities. The largest impacts are associated with the four railyards in Commerce. Diesel PM emissions from these four yards (combined) were about 40 tons per year in 2005. This is about 0.5 percent of the regional diesel PM emissions, and much less than the emissions at the basin's ports[3]. However, the Commerce yards emissions are concentrated and occur next to populated areas. They result in an estimated 70 percent increase in exposure to TACs (over regional levels) for about 5,000 local residents[4]. Draft exposure increases from the other yards in the Los Angeles area are significantly less and fewer people are affected. Risk increases range from about 5 to 20 percent increase over regional levels, resulting in an increase of about 0.1% in overall cancer risk. The draft results are summarized in Table 1.

The draft assessments also estimate pollution risks from other sources of diesel PM. The major emission source is diesel truck traffic in a one to two mile zone around each railyard. Generally, offsite diesel PM emissions result in similar or higher diesel PM exposure than railyard related emissions. A summary of diesel PM emissions from each railyard and air basin regional levels is presented in Table 2.

Actions to Reduce Diesel PM Emissions In and Around Railyards

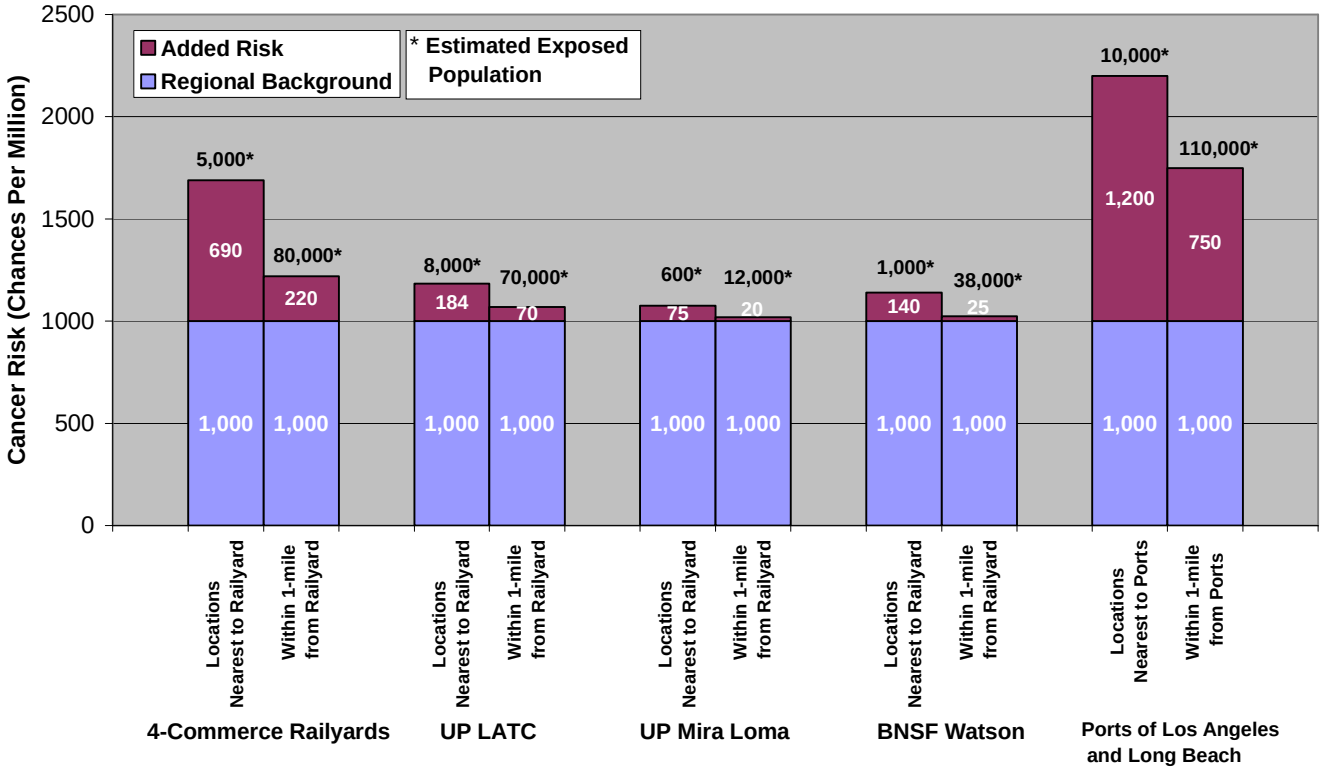
The ARB recognizes that diesel PM levels, both regionally and near ports, freeways and railyards, are far too high. The Board identified diesel PM as a TAC in 1998. In 2000, the Board adopted a Statewide Diesel Risk Reduction Plan. Recognizing the problems posed by the rapid growth in freight movement, the Board adopted a Goods Movement Emission Reduction Plan in 2006. Together these plans contain strategies to reduce diesel PM emissions by 85 percent. To date, the Board has adopted 16 measures under these efforts that directly relate to reducing diesel PM emissions in and around railyards, and has another 11 in various stages of development.

At the public meetings to release the draft HRAs, the ARB staff and railroad representatives will also discuss existing and planned strategies to reduce diesel PM emissions in and around railyards. The ARB is pursuing a comprehensive approach to reduce locomotive and railyard emissions. Our efforts include voluntary agreements, state and federal regulations, and incentive mitigation programs, including early replacement of California's line haul and yard locomotive fleets. These efforts are explained in more detail in a Fact Sheet entitled "Strategies to Reduce Locomotive and Associated Railyard Emissions" (May 2007). ARB staff estimates that these efforts have provided about a 15 percent reduction in railyard diesel PM emissions between 2005 and 2007. Measures to be applied between 2007 and 2010 are expected to provide another 30 to 50 percent reduction in that period.

[3] For comparison, the major source of diesel PM emissions in the South Coast Air Basin is the Port of Los Angeles/Port of Long Beach which combined are about 1,760 tons per year, or about 23 percent of the South Coast Air Basin diesel PM emissions. Emissions from all sources in the South Coast Air Basin were about 7,800 tons in the year 2005.

[4] Air pollution cancer risks are a small fraction of overall cancer risk. For example, the estimated 1,000 excess cancer risk per million people exposed over a 70 year lifetime of exposure (based on Los Angeles area air quality in the year 2000) represents a one tenth of one percent (0.1%) cancer risk increase. An individual lifetime risk of having cancer is about 25 percent. Thus, even where localized diesel PM emissions significantly increase cancer risk from pollution, the change does not produce a large increase in an individual's overall chance of cancer.

Table 1
Added Cancer Risks in Locations Nearest to and Within One Mile of Railyards
(2005)



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Fact Sheet

June 2007

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Air Resources Board

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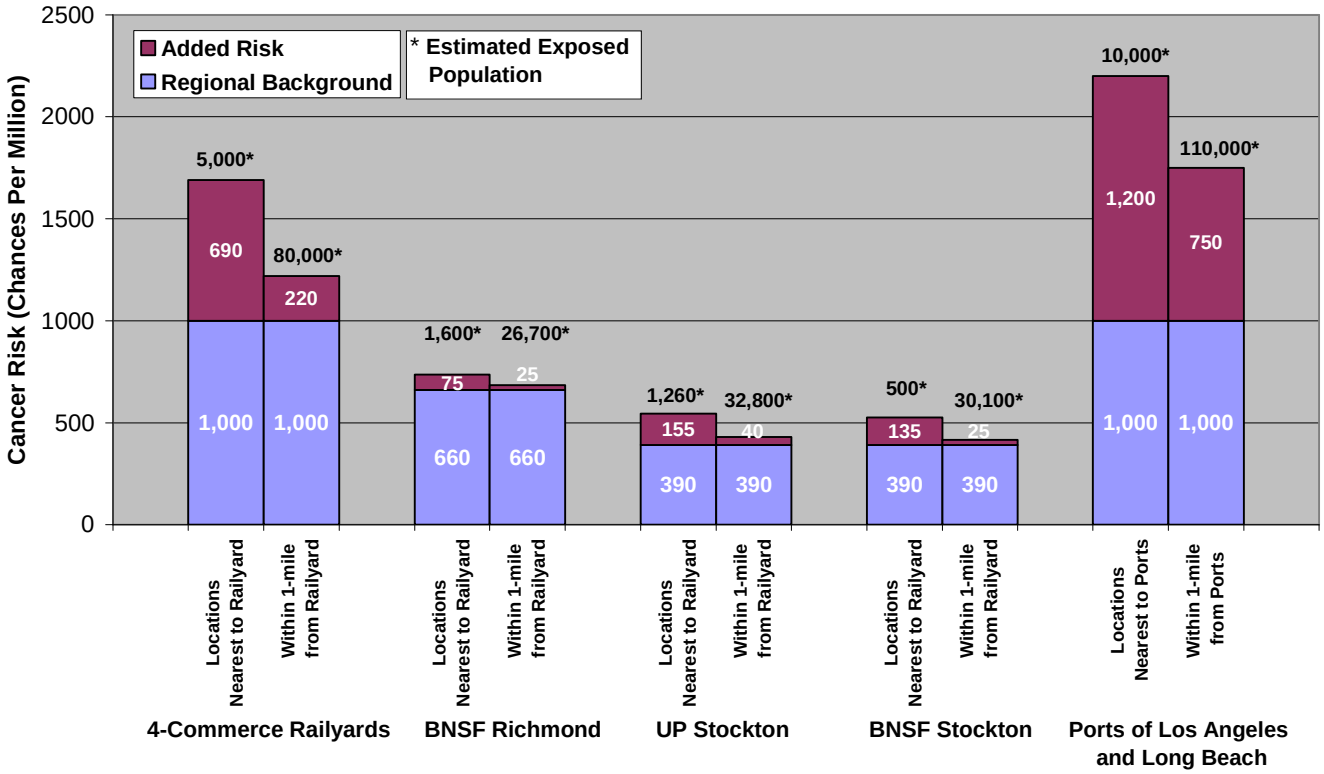

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Attachment B

Air Resources Board Staff Comments on U.S. EPA's Proposed Locomotive Rulemaking

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Linda S. Adams
Secretary for
Environmental Protection

Air Resources Board

Mrs. Barbara Riordan, Interim Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Arnold Schwarzenegger
Governor

July 2, 2007

U.S. Environmental Protection Agency
Air Docket, Mailcode 6102T
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460
Attn: Docket EPA-HQ-OAR-2003-0190

This letter provides the comments of the Air Resources Board (ARB) staff on the U.S. Environmental Protection Agency's (U.S. EPA) Proposed Rule "Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder" (published April 3, 2007, Docket ID No. EPA-HQ-OAR-2003-0190).

As discussed in detail in these comments, California needs the most effect and timely locomotive and marine engine controls possible. We believe the Clean Air Act requires U.S. EPA to establish stringent, aftertreatment based emission standards and encourage the agency to set and implement such standards as soon as feasible.

We are supportive of most elements included in the April 3, 2007 proposal. However, we believe that several portions of the proposal should be strengthened, expanded or accelerated. Our comments below expand upon the testimony provided by ARB staff at the May 8 hearing in Seattle on this proposal.

Summary of Elements Supported as Proposed

Major elements of the proposal that we support include the following:

- Setting Tier 4 locomotive and marine requirements based on the best possible emissions aftertreatment control technologies at emission reduction levels similar to those required on diesel engines in on-road trucks and off-road sources.

- Applying the most effective Tier 3 locomotive and marine standards possible while the Tier 4 technologies are being developed.

- Establishing rebuild requirements to ensure that the emissions performance of in-use engines is significantly improved at the time that rebuild occurs. The proposal to significantly reduce diesel particulate matter (PM) from Tier 0 through Tier 2 locomotives is particularly important to reduce community risk due to locomotive emissions.

- Ensuring that both new and in-use requirements are applied as soon as the technologies are available.

Summary of Suggestions to Strengthen the Proposal

The following summarizes ARB staff recommendations for strengthening the proposal:

1. Locomotive Engines

- Tier 4 oxides of nitrogen (NOx) standards for freight line haul locomotives should be applied concurrently with the introduction of the Tier 4 PM standards. Based on the time frame over which industry developed Tier 2 Standards and the research and experience gained from the application of diesel particulate filters (DPF) and selective catalytic reduction (SCR) to trucks and off-road engines, we believe that full compliance with Tier 4 levels will be feasible for locomotives produced in 2015, if not sooner.

- Tier 3 standards for line haul locomotive PM reductions of 50 percent no later than 2012 are appropriate, but a NOx reduction requirement of at least 50 percent should be required concurrently. We believe the Tier 3 NOx requirement should be applied when Tier 3 PM requirements are introduced. U.S. EPA has already determined that similar NOx reductions are technically feasible and cost effective for large engines in other off-road categories by 2011.

- The Tier 2 locomotives PM remanufacturing standard should be required earlier than the 2013 proposed date. The needed technologies will be available for the Tier 3 engines by 2012, if not earlier. Delaying the standard to 2013 means that some older Tier 2 locomotives could be rebuilt to the much less protective original PM standard.

- A retrofit certification process for Tier 0 through Tier 3 locomotives should be established. A certification process is needed so that the benefits of the retrofit technologies can be realized in voluntary programs, such as the Carl Moyer Incentive program. Such a process would also enable retrofit technologies to be appropriately considered in future U.S. EPA rulemakings.

2. Marine Engines

- U.S. EPA has proposed that final standards for Category 1 engines less than 600 kilowatt (kW) be set at Tier 3 levels only. Tier 4 after-treatment technology is 80 to 90 percent more effective. This substantially higher level of control is vitally needed for many California vessels that use engines sized less than 600 kW.

  Aftertreatment technology is feasible for less than 600 kW engines, as illustrated by demonstration projects with clean rebuild technology, diesel particulate filters, and selective catalytic reduction aftercontrol.

  These smaller engines represent a significant portion of California's harborcraft emissions. About 75 percent of California's ferry and excursion vessel engine population uses less than 600 kW engines, as do a significant percentage of other work vessels. Applying Tier 4 rather than Tier 3 standards to these vessels will reduce emissions by more than 80 percent on affected vessels. This would produce an additional 15 to 20 percent reduction from the fleet wide population of vessels that use Category 1 engines.

- The Tier 4 implementation schedule should be moved forward to match the implementation schedule for Tier 4 standards for off-road engines from which marine engines are derived.

  Remanufacture standards for existing Category 1 and 2 marine engines should be developed and could become effective by 2009. Reduced emission remanufacture kits are currently available for some marine engines. Remanufacture standards would greatly accelerate reductions from marine engines, many of which remain in use for 30 years or longer.

<u>Need for Emission Reductions from Locomotive and Marine Engines</u>

Strong and effective federal locomotive and marine emission reduction standards are essential. Emissions from locomotive and marine engines are major contributors to California's ozone and fine particle smog problems. They are also significant sources of elevated cancer risk and high PM exposure in many communities. Highly effective controls on both of locomotive and marine sources are an essential part of our efforts to attain federal ambient air quality standards and to protect community health.

ARB studies to quantify health risks from mobile source emissions of diesel PM have shown that living near a large port complex and living near major rail facilities result in elevated exposure to diesel PM. For example, the Health Risk Assessment for the

Los Angeles/Long Beach ports determined that the elevated cancer risk from all port-related PM emissions is greater than 500 cases per million for approximately 50,000 people who reside within up to two miles of the ports.

In addition to the elevated cancer risk, PM and NOx emissions also contribute to many other health impacts, such as premature death, hospital admissions due to respiratory and cardiovascular causes, asthma and other respiratory symptoms. California is not unique in this respect. Poor air quality plagues much of the nation. Locomotive and marine emissions are significant nationwide contributors to ozone and diesel PM exposures.

Conclusion

ARB staff appreciates the opportunity to comment on the Notice of Proposed Rule Making (NPRM). Additional detail and support for our recommendations is presented in the attachment to this letter. We urge U.S. EPA to establish the most stringent feasible standards for locomotive and marine engines. It is vital that the highly effective Tier 4 standards, as proposed in the NPRM, be adopted. In addition we recommend U.S. EPA strengthen the final rule to include our suggestions either through the changes we have proposed or by crafting equally effective and timely alternatives. Finally, we urge U.S. EPA to take final action on this proposal before the end of 2007.

If U.S. EPA staff has questions or desire more information regarding ARB staff comments, please contact me at (916) 322-2890 or via e-mail at mscheibl@arb.ca.gov.

Sincerely,

Michael H. Scheible
Deputy Executive Officer

Attachment

cc: See next page.

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Attn: Docket EPA-HQ-OAR-2003-0190
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(Continued next page.)

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Attachment to the July 2, 2007 letter
California Air Resources Board Staff Comments

Docket EPA-HQ-OAR-2003-0190 – Proposed Rulemaking on the Control of Emissions of Air Pollution from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder

Need for Locomotive and Marine Emission Reductions

Emissions from locomotive and marine engines are major contributors to California's ozone and fine particle smog problems. California locomotive and marine engines contribute 30 percent of smog forming oxides of nitrogen (NOx) and 35 percent of toxic diesel particulate matter (PM) from mobile sources that move goods around and through California.

Hundreds of thousands of Californian's live close enough to ports and rail facilities to suffer highly elevated exposures to this pollution. Millions of other Californian's live further downwind from these facilities but still have elevated risks. The ARB recently published studies to quantify risks from mobile source emissions of diesel PM. One study covers emissions from the combined ports of Los Angeles and Long Beach. The second covers one of California's largest railyards located in Roseville, a suburb northeast of Sacramento. We just released draft similar studies for ten additional railyards and are currently developing a study for the Port of Oakland to be released as a draft this fall. Seven additional railyard studies are scheduled to be completed by the end of this year.

The Health Risk Assessment (HRA) for the Los Angeles / Long Beach ports determined that the elevated cancer risk from all port-related PM emissions is greater than 500 cases per million cases for approximately 50,000 people who reside within up to two miles of the ports and a risk of greater than 10 cases per million for about eight million residents within about 60 miles. Category 1 and 2 marine engine emissions in commercial harbor craft produce a significant fraction of port-related exposure.

Category 1 and 2 marine engines, which will be addressed by this rulemaking, are used in harbor craft as both propulsion and auxiliary engines, and in ocean-going vessels as auxiliary engines. Our current statewide emissions inventory estimates that commercial harbor craft contribute about 4 tons per day (tpd) of PM and 90 tpd of NOx. Ocean-going vessel auxiliary engines contribute another 4 tpd of PM and 44 tpd of NOx. Of the combined 8 tpd of PM and 134 tpd NOx, approximately 40 percent of these emissions come from engines that are less than 600 kilowatts (kW). The HRA estimated that the commercial harbor craft contribution to these emissions produce an elevated cancer risk of greater than 200 cases per million for about 5,000 residents and greater than 10 cases per million for about 1.5 million residents.

The impact of emissions from Category 1 and 2 is greater than the statewide figures indicate because the emissions are concentrated in California's coastal non-attainment districts, particularly in port areas. The Los Angeles region (South Coast) is in

non-attainment for both PM 2.5 and ozone, and attainment requires extensive emission reductions from all sources.

California's Efforts to Reduce Locomotive and Marine Emissions

Air pollution from international trade and domestic goods movement in California is a major public health concern at both regional and community levels. Goods movement is now the dominant contributor to transportation emissions in the State. The ARB's "Emission Reduction Plan for Ports and Goods Movement in California" identifies the many actions necessary to reduce these emissions and protect public health. The basic strategies to reduce emissions include regulatory actions at both the State and federal level, incentive programs, lease agreements, careful land use decisions, and voluntary actions. The measures to address all significant emissions sources involved in international and domestic goods movement, including trucks, locomotives, marine vessels, harbor craft, and cargo handing equipment are under way. Rules for sources under ARB's direct authority have been adopted and more are under development. Also, a significant amount of existing incentive funds has been applied to goods movement emission sources and ARB has prioritized continued funding on this source of statewide significance.

For locomotives, the plan proposes to control NOx and PM by 90 percent. To achieve these air quality goals, the plan relies heavily on new U.S. Environmental Protection Agency (U.S. EPA) Tier 4 locomotive emission standards combined with accelerated fleet turnover of locomotives once U.S. EPA establishes new standards. Accelerating the introduction of Tier 4 locomotives into California service is a similar approach to the 1998 Memorandum of Understanding (MOU) we have with the Class 1 railroads for locomotives in the South Coast Air Basin. This MOU requires a Tier 2 NOx fleet average in the South Coast Basin by 2010. Because of the high growth of international trade through California's gateway ports, full control of locomotives, a federally preempted source, is vital.

For marine engines the Plan relies upon reductions of 25 percent in reactive organic gas (ROG), NOx, and PM by 2010 and 40 percent by 2020. Tier 4 standards for these engines are critical to meeting these goals.

The following sections discuss recommended improvements to the proposed locomotive and marine standards and provide support for the feasibility of such improvements.

1. Locomotives

There are a number of key areas where ARB staff recommends the proposal be strengthened, with a particular focus on freight line haul locomotives. The Notice of Proposed Rulemaking (NPRM) indicates a number of areas where U.S. EPA has stated there are alternative approaches it might consider. The NPRM has solicited comments on these options and we have a number of specific suggestions.

Tier 4 NOx and PM Freight Line Haul Locomotive Standards

Tier 4 oxides of nitrogen (NOx) standards for freight line haul locomotives should be applied concurrently with the introduction of the Tier 4 PM standards. General Electric (GE) and Electro-Motive Diesel, Inc. (EMD) were able to develop the redesigned Tier 2 line haul locomotives in the 1998-2004 timeframe. This process included time for extensive in-use testing in 2003 and 2004. This occurred while Tier 0 and Tier 1 locomotive engine upgrades and redesigns were accomplished simultaneously between 1999 and 2002. At the same time, GE and EMD and other manufacturers were developing numerous Tier 0 remanufacturing kits (over 90) for U.S. EPA to certify from 1994-2006.

The NPRM indicates that diesel particulate filter (DPF) and Selective Catalytic Reduction (SCR) have been demonstrated to be mature and cost-effective for other mobile sources. Further, the NPRM concludes that the research and experience gained from application of DPF and SCR to trucks and off-road engines can be applied, with some exceptions, to locomotives. Finally the NPRM indicates that the proposed Tier 4 aftertreatment can be accommodated within the size constraints of existing locomotives. Based on the above, ARB staff believes that within six years, by the end of 2014 at the latest, the necessary research (already underway), design, and bench and in-use testing should be completed so that new Tier 4 NOx and PM line haul locomotives are fully commercially available by 2015.

Tier 3 NOx for Line Haul Locomotives

Tier 3 standards for line haul locomotive PM reductions of 50 percent no later than 2012 are appropriate, but a NOx reduction requirement of at least 50 percent should be required concurrently. NOx reduction requirements should be applied when Tier 3 PM requirements are introduced in 2012. U.S. EPA has already determined that similar NOx reductions are technically feasible and cost-effective for large engines in other off-road categories by 2011. ARB staff believes a Tier 3 line haul locomotive NOx standard of 3.0 g/bhphr is feasible without aftertreatment, and that this standard would be an essential element of California's efforts to attain the ozone and PM standards.

Tier 0-3 PM Remanufacturing Line Haul Locomotive Standards

The proposed Tier 0 and Tier 1 PM remanufacturing standards are power assembly (i.e., pistons, rings, cylinder liners) upgrades that are currently certified or available and need minor improvements. The Tier 2 and Tier 3 PM remanufacturing upgrades (e.g., valve stem seals and closed crankcase ventilation system improvements) will take more effort, but these upgrades are not full engine redesigns. Tier 2 PM remanufacturing certifications should be available by the end of 2010 and should be required for Tier 2 rebuilds starting in 2011, the earliest date any significant number of Tier 2 units are expected to undergo their initial remanufacture. Further, the proposed Tier 3 PM only standard is equivalent to the Tier 2 remanufacturing standard, and will

not require a major engine redesign. ARB staff believes locomotive manufacturers have or can acquire the necessary resources to produce the Tier 0-3 remanufacturing upgrades by the end of 2010, and at the same time continue with new Tier 3 and 4 development. In addition there are other companies (e.g., CSX, Wabtec, NREC) that can help fill the remanufacturing niche for the Tier 0, 1, and 2 remanufacturing standards.

Diesel PM reductions from Tier 2 locomotives are especially important in California. Because of our emission reduction agreements with the railroads, California will have an accelerated introduction of Tier 2 locomotives by 2010. We believe the Tier 2 locomotives PM remanufacturing standard should be required earlier than the 2013 proposed date. The needed technologies will be available for the Tier 3 engines by 2012, if not earlier. Delaying the standard to 2013 means that some older Tier 2 locomotives could be rebuilt to the much less protective original PM standard. This delays health benefits another five to seven years, and makes little sense if a better option is nearly available. We believe acceleration of the initial compliance dates is technically possible, and needs to be required at the earliest feasible date.

Need for a U.S. EPA Locomotive Retrofit Aftertreatment Certification Process

We encourage the development of a retrofit certification process for Tier 0 through Tier 3 locomotives. A certification process is needed so that the benefits of the devices can be realized in voluntary programs, such as the Carl Moyer Incentive program, and such an effort would enable retrofit technologies to be appropriately considered in future U.S. EPA rulemakings.

ARB staff estimates that existing Tier 0 through Tier 3 line haul locomotives may represent 90 percent of the national locomotive emissions in 2020, based on the anticipated Tier 4 implementation schedule. Due to their long lives, these locomotives will represent the majority of freight line haul locomotives emissions well into the future. Therefore, we recommend U.S. EPA establish a retrofit certification process for highly effective aftertreatment devices on locomotives. ARB staff believes retrofit aftertreatment devices for existing U.S. locomotives can be technically demonstrated to be cost-effective within the next two to four years.

ARB is currently working on a research project to bench test a compact SCR device that could potentially provide up to 80 percent NOx and 50 percent PM reductions on existing freight line haul locomotives. In-use demonstration testing is planned for a freight line haul locomotive and it is possible this work could be completed by the end of 2008. Under this schedule, a retrofit SCR aftertreatment device could be ready for certification by 2009 or 2010.

As another example, there is current testing of a diesel oxidation catalyst (DOC), estimated to provide a 50 percent reduction in PM, on an existing in-service freight line haul locomotive. This locomotive has been operating for six months of a one year in-use demonstration testing program. If the testing proves successful, this aftertreatment device potentially could be verified by ARB or certified by U.S. EPA by 2009.

Switch Locomotive Standards

Switch locomotive standards should be set at levels at least as stringent as proposed, but we recommend alignment of the implementation dates with line haul locomotives. As noted in the NPRM, significant changes have occurred in the rail industry since the previous 1998 rulemaking that impact switch locomotives. Today's line haul locomotives (e.g., 4,000 hp versus 2,000 hp) are too large for practical use in switching service. Sales of new conventional switch locomotives in the United States are negligible and have been so for many years. Smaller builders have entered the market to sell refurbished locomotives using non-road engines, the most notable being the "gen-set" locomotive. The gen-set locomotive uses one to three newly built non-road diesel engines and are certified under 40 CFR Part 92 emission testing requirements. Current gen-set locomotives already exceed the proposed Tier 3 switch locomotive standards, and with aftertreatment are anticipated to meet Tier 4 levels before 2015.

We believe there will be a growing trend to provide financial incentives from federal and state agencies (e.g., California's Carl Moyer Program and Texas Emission Reduction Program) to replace older (40 years on average in California) switch locomotives with advanced technology switch locomotives that can provide up to 90 percent reduction in both NOx and PM, a 20 to 40 percent savings in diesel fuel consumption, and reductions in greenhouse gases. Further, the existing Tier 2 or 3 nonroad engines in the gen-set switch locomotives can be upgraded with future cleaner Tier 4 nonroad engines upon remanufacture. In addition, the gen-set switch locomotive has ample space and is more easily adaptable than traditional diesel-electric locomotive engines for retrofitting of aftertreatment devices such as DOC, DPF, and SCR.

Locomotive National Idle Reduction Device (IRD) Requirement

U.S. EPA requested comment on the need for a national locomotive idle reduction device requirement. We support the U.S. EPA's proposal to require idle reduction devices on all new Tier 3 and 4 locomotives. We also recommend requiring the installation (retrofit) of an idle reduction device on all existing regulated locomotives upon remanufacture. In general, purchases by railroads of Tier 0 through 2 locomotives were ordered with idle reduction devices. In California, because of our 2005 agreement with Class 1 railroads (BNSF and UPRR), nearly all intrastate locomotives in California will be equipped with idle reduction devices by June 30, 2008.

The fuel and emission benefits achieved through the use of idle reduction devices are widely recognized. The fuel savings alone, after several years of use, easily offsets the cost of the device. The cost benefits are even greater when accounting for the added benefit to public health from reduced emissions. However, freight interstate line haul locomotives move throughout the country and there needs to be a standard to ensure the full nationwide implementation of these cost-effective emission reductions. Therefore, we support the need for a national requirement of idle reduction devices on all new Tier 3 and 4 and other regulated line haul locomotives upon remanufacture.

U.S. EPA Locomotive Test Methods and Certification

U.S. EPA requested comments on revised provisions for testing, certification, and compliance. Current U.S. EPA test and certification methods are generally adequate for existing locomotives. However, there are two areas that would benefit from improvement, including accounting for transition and cold start emissions. ARB staff believes that some adjustments should be made in the existing 40 CFR Part 92 locomotive emission testing to account for transient emissions. Also, GE Smartburn (engine adjustments to lower NOx or PM tradeoffs within specific geographical regions), and use of Distributed Power Units (DPUs), Consist Management, and Trip Optimizers can provide emission reductions for specific locomotive operations. However, accounting for these emission reductions within the current 40 CFR Part 92 line haul duty cycle is problematic. We recommend that further research and investigation be done to account for these potential emission reductions in areas where they may occur.

2. Marine

There are three key areas where we believe the proposal should be strengthened for the marine standards. These improvements are needed to reduce health risks for communities near the nation's ports and are needed to meet ozone and PM air quality standards.

First, we recommend extending the Tier 4 marine engine requirements for full NOx and PM control to a larger segment of Category 1 engines. Second, we recommend application of Tier 3 and Tier 4 marine engine requirements on an accelerated schedule, similar to that applied to other non-road engines.

Third, we recommend establishing rebuild standards for marine engines, for the same reasons the U.S. EPA has proposed such standards for locomotives. Many marine engines have very long lives and can be rebuilt several times. We believe that substantial, cost-effective emission reductions will be possible at the time of rebuild. Where they are available, they should be required.

Tier 4 after-treatment technology is needed on Category 1 engines less than 600 kW.

California has a significant population of Category 1 marine engines that are less than 600 kW. About 90 percent of the engines in California's commercial harbor craft fleet are less than the 600 kW size cut point that U.S. EPA proposes to exclude from the Tier 4 standards. These engines account for about 40 percent of the total harborcraft emissions. About 75 percent of California ferry and excursion vessel propulsion engines fall into the less than 600 kW size range. This is also true for 87 percent of tow boat and 33 percent of tugboat propulsion engines. These types of ferries and tow and tug boats will continue to be used extensively in California's harbors and bays, working close to shore at a high percent load. Without Tier 4 standards for less than 600kW engines, overall PM and NOx emissions from harborcraft will be 15 to 20 percent greater than necessary.

One option for addressing this concern would be to require after treatment standards for less than 600 kw engines used in specific types of vessels that are used in goods movement and people transportation. Under this approach, engines less than 600 kW engines used in ferries, tugs, and tow boats would be subject to standards based on full use of feasible and cost-effective after treatment standards.

After-treatment technology is feasible for less than 600 kW engines.

The NPRM indicates that catalytic exhaust treatment systems pose several significant packaging and weight challenges for vessels that use smaller engines. We agree that aftercontol based Tier 4 standards may not appropriate for all categories of vessels, such as recreational and small commercial fishing vessels. While the number of fishing vessels are large (about 75 percent of California's commercial harbor craft fleet), their contribution to the emissions inventory is relatively small (25 percent) and declining. Additionally, our survey of commercial harbor craft indicated that fishing vessels do not spend a significant portion of their operating time inside the harbor and so pose less of a concern for health risk.

However, requiring Tier 4 standards for engine less than 600 kW for those vessel categories that work on a daily basis and spend a significant portion of their time within the harbor, such as ferries, tugs, and tow vessels, is essential. Establishing Tier 4 standards for engine less than 600 kW maximum power would ensure that new vessels are designed to accommodate aftercontrol technologies and would prevent the possibility that low emitting Tier 4 engines could be displaced by using several smaller Tier 3 engines instead of one or two larger Tier 4 engines. We believe that the use of after-treatment technology in these categories of harbor craft is feasible for new build applications, as well as retrofit in some cases.

One example of a successful retrofit of a smaller Category 1 engine (400 hp) is the rebuild and diesel particulate filter retrofit of a propulsion engine on a U.S. Navy workboat. In 2006, one of the two Detroit Diesel 12V-71 propulsion engines in a U.S. Navy workboat operating in the Suisun Bay was rebuilt with the Clean Cam Technology (CCT) system, including combustion chamber and injector modifications and addition of a turbocharger. The preliminary emissions test results indicated that the rebuilt engine reduced PM emissions by over 30 percent and NO_x by approximately 70 percent. This rebuilt engine was then retrofitted with a Rypos active diesel particulate. The CCT and Rypos active DPF, used in combination, achieved over 80 percent reduction of PM and over 70 percent reduction of NO_x. Durability testing of the system was successfully completed in late 2006.

An example of the successful use of selective catalytic reaction (SCR) exhaust aftercontrol on a new build vessel is the Solano of the Vallejo Baylink Ferry. The Solano is a high speed ferry designed and built with SCR exhaust aftercontrol, which reduces NOx by about 60 percent. This ferry has been in operation since 2004. Technologies such as compact SCR, currently being introduced into the marketplace, are facilitating a wider use of SCR in marine applications.

There are harborcraft that operate at low load for a significant portion of their operating time. For these harborcraft, the application of actively regenerating filters or hybrid technology could facilitate meeting cleaner Tier 4 standards. Foss Maritime Company, in partnership with the Ports of Los Angeles and Long Beach, is currently designing and building a hybrid tug which will operate on battery power during low load periods, such as idling, and on a combination of battery and diesel engine for high load operation. These modifications will produce the higher exhaust temperatures required by some aftercontrol technology. The hybrid design alone is estimated to reduce NOx and PM emissions by 44 percent, as well as sulfur dioxide, and carbon emissions. Foss believes that this hybrid tug design will be adaptable for retrofit to existing harbor tugs as well.

Wet exhaust systems have also been cited as providing a technical challenge for meeting aftercontrol based standards. Vessel and engine manufacturers may need to redesign these systems to introduce water in the exhaust downstream of emission controls, or to convert to an insulated dry exhaust design.

There are technical issues to overcome in applying Tier 4 aftercontrol based standards to smaller marine engines in some applications. Tier 4 standards may not be appropriate for all vessel categories, such as recreational and fishing. However, for vessel types that work daily and usually close to shore, such as ferries and tug/tow vessels, these standards must be established so that new vessel designs will evolve to include aftercontrol technology.

<u>The Tier 4 implementation schedule should be moved forward</u>

We support the proposed implementation timing for the Tier 3 standards but believe that the timing for the Tier 4 standards should be accelerated. Final Tier 4 standards for off-road engines over 25 hp come into effect between 2013 and 2015 with exhaust aftertreatment expected to be used to meet both NOx and PM standards. Engines used in vessels are marinized versions of these off-road engines. Therefore Tier 4 standards for these marine engines should be achievable in a similar time frame or shortly thereafter. Introducing Tier 4 standards for <600 kW engines alone in 2016 would provide, statewide, an additional 4 tpd NOx and nearly 0.1 tpd PM in 2020, and an additional 8 tpd NOx and about 0.15 tpd PM in 2025.

<u>Remanufacture standards for existing category 1 and 2 marine engines are needed</u>

ARB staff encourages the U.S. EPA to include remanufacture standards for existing Category 1 and 2 marine engines. We believe that remanufacture standards should become effective no later than 2009. Many marine engines remain in use for 30 years and longer and are rebuilt on a periodic basis. Remanufacture standards would greatly accelerate reductions from these engines. Tiered standards, allowing different levels of reductions, would allow flexibility in the standard. Reduced emission remanufacture kits are currently available for some marine engines which can provided 40 to 60 percent reductions in PM and NOx.

Support test procedures

We support the proposed revisions to the test procedures. Specifically, we support the revisions that allow for field testing and for other alternative test procedures to be used upon approval. Both of these provisions are expected to be very useful for determining comparable emission reductions for emission control devices that can range from simple passive diesel particulate filters to complex hybrid battery systems. The field testing provisions may be especially important for locomotive and marine application engines as they can be difficult to test within a laboratory. We are appreciative of the variety of ways that brake specific emission testing appear to be allowed based on the flow charts for the default test procedures of Section 1065.15.

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