

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 air pollution control measures and strategies:

- **South Coast Locomotive Oxides of Nitrogen (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 to meet, on average, the United States Environmental Protection Agency's (U.S. EPA) Tier 2 locomotive emissions standards by 2010. Tier 2 locomotives became commercially available in 2005 and provide a 65% reduction in NOx and 50% 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 that resulted in measures that have achieved a 20% reduction in locomotive diesel PM emissions in and around rail yards 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 99% of the 450 California-based locomotives by June 30, 2008 (15 minute limit, 95% implemented);
 - Identify and expeditiously repair locomotives with excessive smoke and ensure that at least 99% of the locomotives operating in California pass smoke inspections (fully implemented);
 - Require all locomotives that fuel in the state to use at least 80% ultra low sulfur (15 parts per million) diesel fuel by January 1, 2007 (six years prior to federal requirement);
 - Prepare new health risk assessments for 16 major railyards, based on the UP Roseville Railyard health risk assessment (completed in 2004) and Office of Environmental Health Hazard Assessment guidelines (nine of 16 finalized in November 2007); and
 - Identify and implement future feasible mitigation measures based on the results of the railyard health risk assessments.
- **ARB Diesel Fuel Regulations Extended to Intrastate Locomotives:** Approved in 2004, the regulation requires intrastate locomotives that operate 90% of the time in the state to use only California ultra low sulfur (15 parts per million) diesel fuel. ARB lower aromatics diesel's provides on average a 6% reduction in NOx and 14% reduction in diesel PM emissions as compared to U.S. EPA ultra low sulfur onroad diesel fuel. The regulation took effect on January 1, 2007.
- **ARB Cargo Handling Equipment Regulation:** Approved in 2005, the regulation 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, which took effect on January 1, 2007, is expected to reduce diesel PM and NOx emissions by up to 80% by 2020.
- **Heavy Duty Diesel New Truck Regulations:** Both ARB and U.S. EPA have adopted emission standards for 2007 and subsequent model year heavy-duty diesel engines. These standards represent a 90% reduction of NOx emissions, 72% reduction of non-methane hydrocarbon emissions, and a 90% reduction of PM emissions compared to the 2004 emission standards.
- **ARB Statewide Diesel Truck and Bus Regulation:** The ARB is developing a regulation to reduce diesel PM and NOx emissions from on-road heavy-duty diesel-fueled vehicles. This measure will cover long and short haul transport trucks, and other diesel-powered trucks with a gross vehicle weight rating of 14,000 pounds or greater. The goals of this effort are:

- By 2014, emissions are to be no higher than a 2007 model year engine with a diesel particulate filter,
 - By 2021, emissions are to be no higher than a 2010 model year engine.
- **ARB Regulation for Port and Intermodal Railyard Drayage Diesel Trucks:** The ARB developed a port truck fleet modernization program that will reduce diesel PM by 86% by 2010, and NOx by nearly 56% by 2014. There are an estimated 20,000 diesel trucks operating at California ports and intermodal railyards. These trucks are a significant source of air pollution, with about 3 tons per day of diesel PM and 61 tons per day of NOx in 2007. These trucks often operate in close proximity to communities. The ARB Board approved the regulation in December 2007.
- **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 PM and NOx starting in 2011. The Tier 4 standards will achieve over a 90% reduction over current levels by 2020, putting off-road engines on a virtual emission par with on-road heavy duty 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% in 2010 and 92% in 2020. California will also experience benefits from reduced NOx and hydrocarbon emissions. The ATCM became effective on December 10, 2004, and implementation will be phased-in beginning on December 31, 2008.
- **U.S. EPA Locomotive Emission Standards:** Under the Federal Clean Air Act, U.S. EPA has sole authority to adopt and enforce locomotive emission standards and this preemption also extends to the remanufacturing of existing locomotives. In April 2007, U.S. EPA released a proposed locomotive rulemaking that would reduce Tier 0 locomotive NOx emissions by 20% and Tier 0-3 remanufacture and new standards to reduce PM only by 50%. The ARB is relying on U.S. EPA to expeditiously require the introduction of the next generation or Tier 4 locomotive emission standards that requires Tier 4 locomotives built with diesel particulate filters and selective catalytic reduction. Combined, these exhaust aftertreatment devices are expected to provide up to a 90% reduction in PM and NOx emissions beginning in 2015 and 2017, respectively. The final U.S. EPA locomotive regulations are scheduled for approval in early 2008.
- **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. When fully implemented, plan strategies would reduce locomotive NOx and diesel PM emissions by up to 90% by 2020.
- **California Yard Locomotive Replacement Program:** Yard locomotives represent about 5% 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 a reduction of NOx and diesel PM emissions by up to 90% as compared to existing locomotives. By 2008, UP had deployed 60 gen-set and 12 electric hybrid yard locomotives in Southern California. BNSF has been operating four liquefied natural gas yard locomotives in downtown Los Angeles since the mid-1990s. UP and BNSF have ordered more gen-set locomotives for use in Northern California in 2008.

For Information on California's locomotive emission reduction strategies and emission control technologies, please visit: <http://www.arb.ca.gov/railyard/> & <http://www.arb.ca.gov/msoffroad/locomotive/locomotive.htm>. For information on the Goods Movement Emission Reduction Plan, please visit: <http://www.arb.ca.gov/gmp/gmp.htm>.

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