

	<u>Description</u>	<u>NOx Control Effectiveness</u>	<u>Cost Estimates</u>	<u>Cost Effectiveness</u>	<u>SIP/Technical Guidance</u>	<u>Incentives</u>	<u>Case Studies</u>	<u>Additional Notes</u>	<u>Lead Time</u>
Clean Diesel Strategies:									
Diesel Retrofits (including fuels)	Several retrofit strategies reduce NOx from highway and nonroad vehicles/engines: early replacement & retirement, rebuild, repower, clean fuels such as emulsified fuels and cetane enhancers, SCR system (1 technology verified for nonroad), lean NOx system (1 technology verified for onroad), EGR (1 technology verified for onroad). For descriptions of individual strategies, see: www.epa.gov/cleandiesel/ports/technologies.htm	Varies by strategy, but estimates are available for each EPA and CARB verified technology at: www.epa.gov/otaq/retrofit/retroverifiedlist.htm & www.arb.ca.gov/diesel/verdev/verifiedtechnologies/cvt.htm	Varies by strategy	Texas TERP grants have averaged \$5000/ton of NOx (capped at \$13,000); California's Carl Moyer grants have averaged \$3000/ton of NOx (capped at \$13,600); for information on PM cost-effectiveness see EPA's study at: www.epa.gov/cleandiesel/documents/420s06002.pdf	(1) SIP guidance - www.epa.gov/otaq/stateresources/transconf/policy/420b06005.pdf (2) retrofit module in EPA's National Mobile Inventory Model (NMIM) available at www.epa.gov/otaq/nmim.htm	CMAQ funds, EPA grants, state grant programs, revolving loan programs (public or public-private w/public buy-down of interest rates), SEPs, executive orders, contract incentives, MOUs with major fleets	Texas Emissions Reduction Program (TERP) nonroad retrofits could provide an estimated 25-50 tpd NOx reduction in 2009 (based on North Central Texas Council of Governments analysis). The following articles describe the political process and the sources of funding (including vehicle title fees & various surcharges on vehicle purchases/leases): (1) www.tceq.state.tx.us/AC/comm_exec/forms_pubs/pubs/pd/020/03-01/compliance.html (2) www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/pd/020/05-03/newlaws.html (3) www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/pd/020/05-01/incentivesprogram.html ----- Sacramento has pooled Carl Moyer funds with CMAQ, DMV fees, and sales tax to fund retrofits. More info availab	The Mid-Ohio Diesel Project coordinated by the Mid-Ohio Regional Planning Commission has developed a set of state-specific recommendations to implement diesel retrofits. Information is available at: airquality.morpc.org/diesel-subcmt.html	Varies

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Truck Stop & Terminal Electrification; Mobile Idle Reduction Technologies for Trucks	Long duration truck idling – idling that lasts for longer than 15 minutes – from long haul diesel trucks can be eliminated with two strategies: truck stop & terminal electrification (“TSE”) mobile idle reduction technologies such as auxiliary power units (APUs), generator sets, and direct-fired heaters (“MIRTs”)	TSEs 100%; APUs 80% (of long duration idling). Total reductions depend on idling rates (see additional notes). Idleaire technologies average 22 tpy per 50-space installation (minimum installation); and about 0.60 tpy of PM per 50-space installation. The technology has a service life of 15-20 years. Co-benefit of significant CO2 emission reductions (1,300 tpy for 50-space installation)	TSEs ~\$11,500 per space; APUs \$6000-\$8500	\$0/ton over the life of the equipment due to fuel savings; payback period for TSEs ~ 17 months; payback period for APUs ~18 months (depending on usage rates and cost of fuel).	(1) SIP guidance - www.epa.gov/otaq/smartway/documents/420b04001.pdf (2) FLEET model - www.epa.gov/smartway/smartway_fleets_software.htm (3) SmartWay Technology Package Savings Calculator www.epa.gov/smartway/calculator/loancalc.htm	All of the above, plus DOE discretionary grants.	CMAQ funds (over \$15M awarded to date), state grant programs (PA, MA), SEPs (IL, NJ, MO), DOT State Infrastructure Banks. For more details see: www.epa.gov/smartway/idle-demo.htm .	Total available reductions will depend on the extent of long duration idling in the local area e.g. # of hours of idling at trucks stops, terminals, and rest areas. EPA’s national model attributes 3.4% of all class 8 emissions to long duration idling, but there is evidence that idling may represent an even greater share of emissions. EPA’s next generation mobile model, MOVES, will take into account, directly, long duration truck idling emissions.	Varies
Locomotive Idle Reduction Technologies	Switcher engines idle approximately 60% of their engine operation time; line haul engines idle 38% of engine operation time. Technologies are available to reduce idling, including auxiliary power units, automatic shut-down/start-up systems, and diesel driven heating systems. Hybrid switcher engines are another option.	Total reductions depend on idling rates. When auxiliary engine is combined with automatic shut down system, 90% of idling can be eliminated. APU/Auto-Shut Down- averages 2.3 tpy per engine. Co-benefits include PM reductions (0.09 tpy), other air toxics, and greenhouse gas emissions.	APU/Auto Shut Down: \$35,000 per engine.	\$0/ton over the life of the equipment due to fuel savings.	SIP guidance - www.epa.gov/otaq/smartway/documents/420b04002.pdf	All of the above	See http://www.epa.gov/smartway/idle-demo.htm	Total available reductions will depend on the # of hours of idling at local railyards, including the # of switching engines. EPA/OTAQ SmartWay Transport Partnership has signed all Class I railroads as partners in the program. Two of the Class I railroads traveling in Ohio are CSX Transport and Norfolk Southern.	Technology installation time: 2-3 weeks.

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SmartWay Upgrade Kits	Installation of SmartWay Upgrade Kit on long haul trucks. Kit includes wide-based tires (or low rolling resistance tires), advanced aerodynamics on trailer, idle control, and after-treatment devices (DOCs or DPFs) (note: after-treatment devices reduce PM emissions but not NOx).	10-20% of total truck emissions, depending on features. Single wide tires -5%; APUs -8%; direct fire heaters -5%; trailer aerodynamic kit -5%; (DOCs -30%; DPFs -90% of PM)	Approximately \$10,000 depending on features. Single-wide tires - \$5600; APUs \$6000- \$8500; direct fired heaters -1500; trailer aerodynamic kit - \$2400; DOC - \$1200; DPF - \$5000	\$0/ton over the life of the equipment due to fuel savings; payback period for \$12,900 Kit with DPF, single wide tires, trailer aerodynamic kit, and direct fired heater -18 months (depending on usage rates and cost of fuel)	(1) FLEET model - www.epa.gov/smartway/smartway_fleets_software.htm (2) SmartWay Technology Package Savings Calculator www.epa.gov/smartway/calculator/loancalc.htm	All of the above	New programs in California, Oregon, Arkansas, and Minnesota.	SIP credit would be based on reductions from emissions generated when trucks are operating in the nonattainment area.	Technology installation time: 3-5 days.
Other:									
Commuter Programs	Best Workplaces for Commuters (BWC) is an EPA program that recognizes and supports employers who provide incentives to employees to reduce light-duty vehicle emissions. Employers implement a wide-range of incentives to affect change in employee commuting habits including transit subsidies, bike-friendly facilities, telecommuting policies, and preferred parking for vanpools and carpools.	The BWC survey found that, on average, employees at BWC workplaces emit 15% fewer emissions during their commute than employees at non-BWC workplaces. 25,000-50,000 new participants in the program could translate into -0.1-0.2 tpd NOx reduction. Co-benefits include fuel savings and greenhouse gas emissions.			Quantification tools and SIP guidance: www.epa.gov/otaq/stateresources/policy/pag_transport.htm#cp	(the program is a composite of incentive programs)	In 2005, Houston increased the number of participating employees 100% from 2004 levels, for a total of 246,000 employees. The Houston program provides ~300 tons per year in NOx reductions. For more case studies, see: www.bwc.gov/employ/csudies.htm		Varies

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General Idling					Examples of state & local idling laws, including EPA's Model State Idling Law - www.epa.gov/smartway/idle-state.htm				
Ports	See Diesel Retrofits. Other operational strategies to reduce NOx include gate efficiencies, expanded hours or incentives for off-peak operation during ozone season; cold ironing (onshore power), idle reduction technologies and policies, logistics/container management, and vessel speed limits.	For a full list of port strategies and technologies and their benefits see: www.epa.gov/cleandiesel/ports/technologies.htm	See Diesel Retrofits	See Diesel Retrofits	See Diesel Retrofits	All of the above.	See www.epa.gov/cleandiesel/ports/casestudies.htm	See Diesel Retrofits	Varies
Airports	There are several options to reduce mobile source emissions from airport operations, including electrification, retrofits, and upgrades of ground service equipment (GSE): clean fuels for passenger ground transport fleet; improved passenger transit including use of consolidated shuttles and rail; and reducing aircraft engine idling.	According to an internal EPA analysis, the largest sources of NOx emissions from GSE are baggage tractors, ground power units, aircraft tractors, cargo tractors, belt loaders, cargo loaders, and air conditioners.	Electric baggage tractors and belt loaders ~ \$25,000; Tier 3 diesel power units ~\$18,000; Tier 3 aircraft tractors ~\$90,000; 3-way catalyst retrofits ~\$2000.	The most cost-effective strategies include (1) replacing conventional fueled baggage tractors and belt loaders with electric GSE (2) replacing diesel ground power units (GPUs), air conditioners, and aircraft tractors with Tier 3 diesel units (3) retrofitting gasoline GPUs, air conditioners, and aircraft tractors to run with 3-way catalysts.	www.epa.gov/otaq/stateresources/policy/pag_transport.htm#a ; Also see Diesel Retrofits	All of the above, plus the FAA's Voluntary Airport Low Emissions (VALE) program www.faa.gov/airports_airtraffic/airports/environmental/vale/	DFW, Seattle-Tacoma		Varies

General:

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State/Local Resources Page	<p>A comprehensive website of mobile SIP/conformity guidance and other policies, quantification tools, and links to voluntary programs.</p> <p>www.epa.gov/otaq/stateresources/index.htm.</p> <p>Measures include: Accelerated Retirement of Vehicles, Airports , Commuter Programs, Fuels, Idling, Intelligent Transportation Systems Management, Land Use, Retrofits, Transportation Control Measures, Transportation Pricing</p>				<p>Matrix of all available guidance: www.epa.gov/otaq/stateresources/policy/guidancematrix3.pdf</p>				
Voluntary Mobile Measures & Bundling					<p>www.epa.gov/otaq/stateresources/policy/pag_guidance.htm</p>				