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Improving Air Quality In Texas Cities

Texas is leading the way in reducing emissions from diesel engines and equipment. The foresight of Gov. Rick Perry, Lt. Gov. David Dewhurst, Speaker Tom Craddick, and the Legislature made this possible.

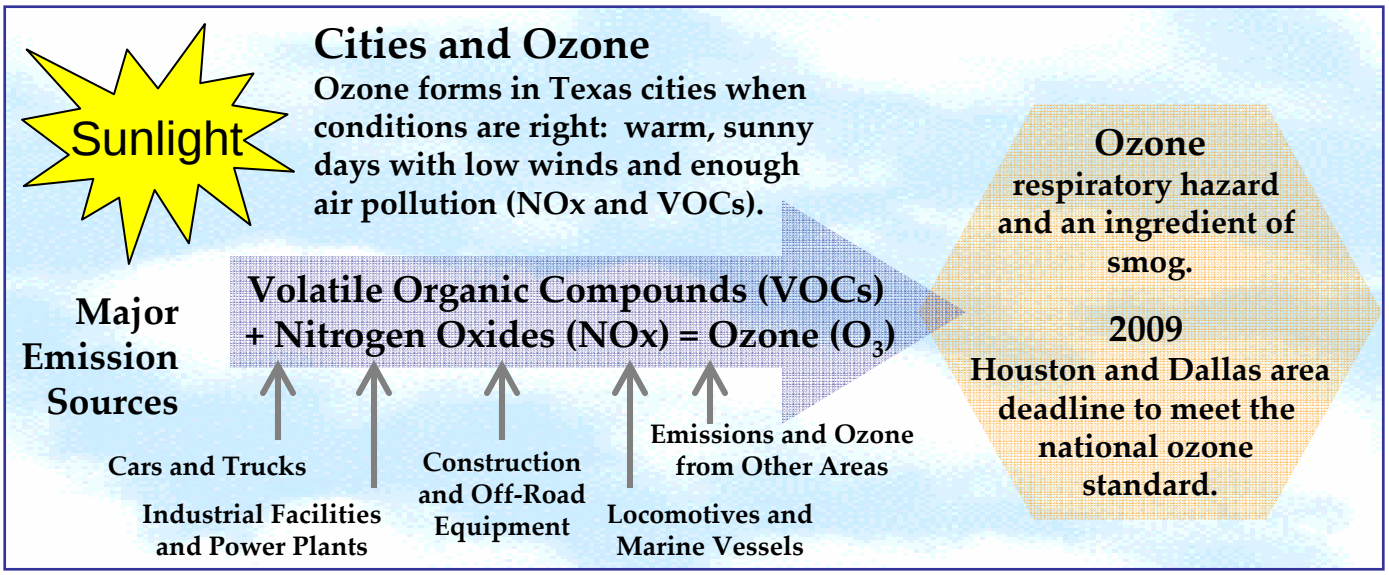
Texas Environmental Research Consortium

Founded in 2002 as a partnership of government and community leaders. Headquartered in Houston.

MISSION – To improve air quality research, modeling, and science.
CHALLENGES – Better information for policy decisions for meeting air quality standards.
RESULTS – Improved health and economic conditions in Texas from better air quality.

Now, making more cuts in diesel and other mobile pollution is a key challenge. Houston and Dallas/Fort Worth must meet the new 8-hour national health standard for ozone. The current deadline is 2009. New federal engine rules will reduce nitrogen oxides (NOx) somewhat. This ozone creator is Texas' key target. But federal cuts won't happen soon enough. Texas must make major NOx reductions. This will also help Texas cities avoid violating a new standard for airborne particles.

The Texas Environmental Research Consortium (TERC) commissions research to help meet air quality goals. This report outlines four key studies that assess past reductions and future opportunities. A major focus of these studies is on diesel and other mobile sources.



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Texas Emissions Reduction Program

The Legislature created TERP in 2001. Its main purpose is to reduce heavy-duty diesel emissions of NOx in the Dallas-Fort Worth and Houston areas. This study concluded it is one of "very few established, cost-effective programs" to reduce mobile emissions. But reductions will fall short of goals in the state ozone plan. TERP's average, per-ton cost for NOx cuts has steadily dropped. That average is expected to rise, however. Experts contracted by TERC provided the following analysis and recommended continuing the program to help meet the ozone standard.

Background

Diesel engines, on and off the road, emit a large part of all NOx pollution. But the state has no control over them. SB5 launched TERP in 2001 to address this problem.

TERP's funds come from fees and surcharges on vehicles and equipment. The Texas Commission on Environmental Quality awards the program's grants and incentives. They help buy cleaner new engines and cut old engines' emissions. TCEQ also provides grants to other agencies. With them, the North Central Texas Council of Governments and Texas Railroad Commission have funded projects.

TERP funds the state's New Technology Research and Development Program, its projects aim to hasten new NOx-cutting methods, and an air quality research program, which provides information needed to improve our state ozone plan.

In 2003, lawmakers expanded TERP to cover more counties and engine types. In 2005, HB 2481 extended TERP funding to Sept. 1, 2010. Yearly appropriated funding is about $128 million through FY 2007. TERP's 2007 revenue is expected to be about $160 million. After that, revenue is expected to fall with reduced allocation of a title application fee.

Reductions in Emissions

TERP funds projects to reduce NOx from locomotives, commercial marine vessels, stationary engines, and on-road and non-road vehicles operating at least 75% of the time in non attainment areas.

From 2002-06 all projects eliminated 37.2 tons per day (tpd). Houston's total was 23.1 tpd. DFW's was 14.1 tpd. Funding in Houston was $211.4 million. In DFW, it was $119.5 million.

The largest total reductions – 16.7 tpd – occurred in 2005. The 2006 total was 12.1 tpd. Houston's reductions fell from a 2005 high point of 11.8 tpd to 7.0 tpd in 2006. DFW's reductions reached a 2006 peak of 5.6 tpd.

Two categories accounted for nearly two-thirds of all reductions. They were rail (33 percent) and on-road diesel (30 percent). Other portions: non-road, 21 percent; marine (Houston only), 12 percent; and stationary, 4 percent. In Houston, on-road cuts were greatest (32 percent), with rail second (28 percent). In DFW, rail was the top category (42 percent), with on-road next (27 percent).

Cost-Effectiveness

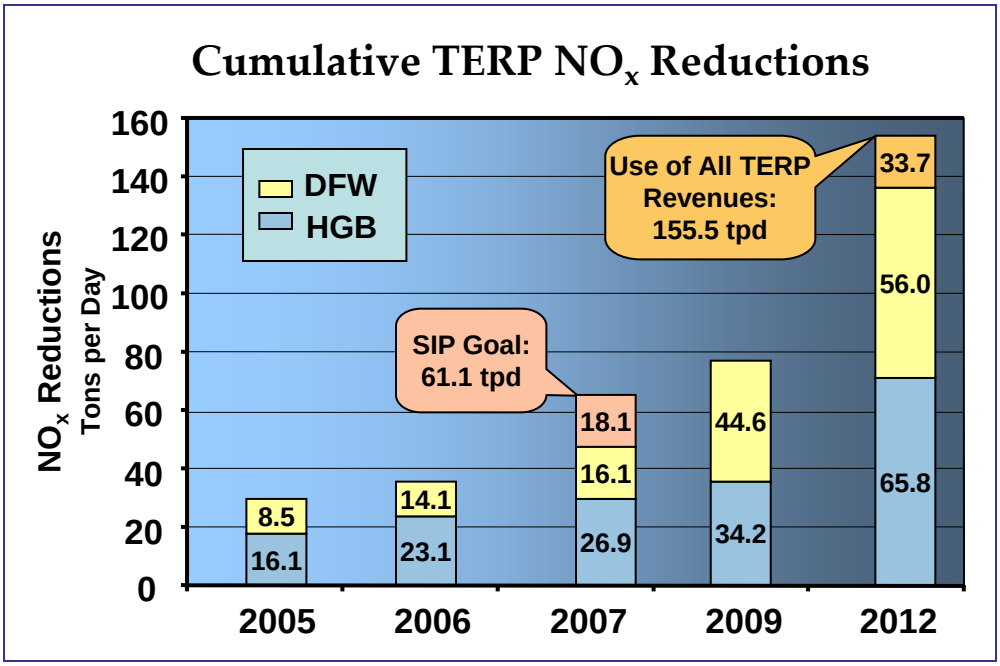
Researchers found TERP's cost-effectiveness has steadily improved. Cost effectiveness is calculated by dividing the cost to TERP of the project by the tons of NOx eliminated over the life of the project. The average per-ton payment for NOx cuts has declined. It went from $7,639 in 2002 to $3,127 in 2006. The average reduction cost to date was $3,946 per ton.

This trend occurred as TERP funded more cost-effective projects. Rail projects, for instance, received about 43 percent of all funding from 2002-06. The average reduction cost is expected to increase as TERP focuses on more challenging projects.

With a per-ton average of $1,868, stationary projects were the most cost-effective. Other average costs to date were: marine, $3,185; rail, $3,753; on-road, $4,138; and non-road, $5,180. TERP grants from other agencies had an average cost of $4,700.

In 2007, projected NOx reductions fall short of TERP goals for the state ozone plan. A total reduction of 61.1 tons/day was projected but only 43 tons/day is anticipated based on current analyses.

In 2012, projected TERP NOx reductions are 121.8 tons/day, however if TERP were fully funded at $160 instead of $128 million per year then an additional 33.7 ton/day reduction would be achieved for a total of 155.5 tons/day. See the chart on the left.



TERP Projections

TERP can reduce NOx emissions remaining after 2009, the analysts concluded. Using unappropriated funds would boost cuts, they said.

Estimated program revenue in 2007 is $160 million. Appropriated funding in 2007 is $128 million, leaving $32 million unused. The study projected future cuts based on 2002-07 funding. It also estimated extra cuts possible by spending the 2007 excess sum annual.

Researchers projected ranges of reductions. TCEQ assumptions, they said were "somewhat optimistic," produced the larger estimated cuts.

Low Income Repair Assistance Program

This study found major progress in cutting emissions. The reductions were cost effective. The report suggests ways to enhance LIRAP for further cuts. Other actions could reduce NOx with program tightening and targeting of diesel emissions.

Background

The *AirCheck Texas Repair and Replacement Assistance Program* (LIRAP) helps low-income citizens if their vehicle fails the state's emission test. The Legislature created the program in 2002. Most vehicles that fail are older, higher emitting models of cars and trucks.

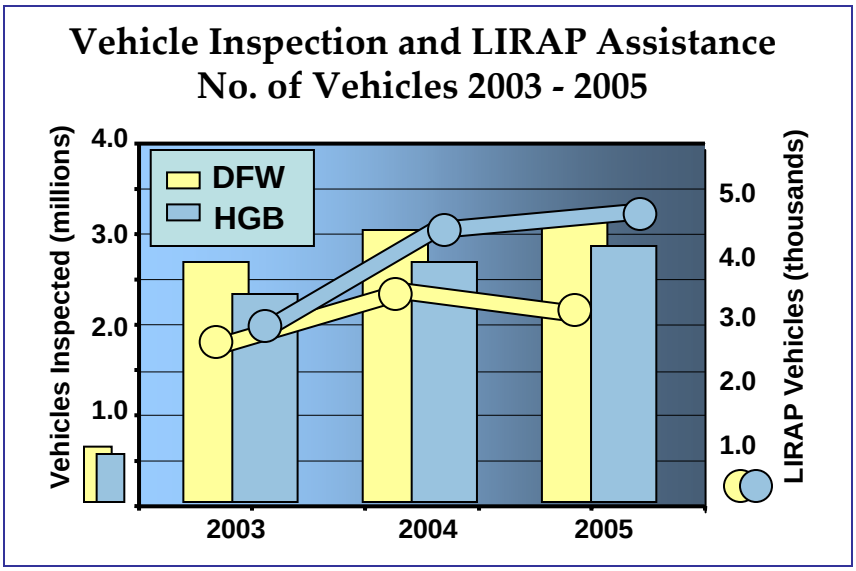
LIRAP is available in the Dallas-Fort Worth area (nine counties) and the Houston area (five counties). The region's councils of governments operate the program. LIRAP is funded with $6 of the $27 Inspection/ Maintenance test fee.

A LIRAP budget surplus is expected to keep growing. Projected program income exceeds $30 million in FY 2006. The FY 2007 projection tops $34 million. LIRAP's appropriation each year was $4 million. In 2005, HB 1611 approved using $20 million yearly to enhance LIRAP and start other air quality programs. However, no money was appropriated at that time.

Effectiveness

Roughly nine percent of all inspected vehicles fail the state Inspection/ Maintenance (I/M) test. Only 0.2% of all vehicles use LIRAP assistance. Vehicles that cannot be repaired may receive a time-limited waiver, if owners qualify. Researchers found that the low *waiver rate* for the I/M test provides a likely emission credit for the Dallas-Fort Worth and Houston areas.

Repairing vehicles through LIRAP provides "significant" emission cuts, according to researchers for this project. The cost per ton was about the same, or less, than other programs aimed at car and truck emissions ($7,000–$8,000 per ton). Replacing a vehicle that fails the I/M test cuts vehicle emissions more than repairs. Replacement vehicles were found to be substantially cleaner. However, less than five percent of LIRAP aid funds are used for replacement.



This graph shows that millions of cars are inspected in DFW and HGB each year, but under ten thousand get LIRAP funds.

Ways to Enhance LIRAP

Researchers identified several ways to increase LIRAP participation to reach additional older, high emitting vehicles. Additional appropriations from current program income would be needed for repairs, replacements, and program administrative costs.

1. Program Changes

- Advertise the program continuously.
- Make LIRAP more prominent on inspection reports.
- Place LIRAP brochures in letters to owners of problem vehicles.
- Raise the income ceiling from 200 to 250 percent of the poverty level.
- Boost the vehicle replacement incentive from $1,000 to $2,000.
- Require or urge through incentives that replacement vehicles be much cleaner.

2. Changes to I/M Test

Tightening emission tests will reduce emissions and increase the need for LIRAP. Improvements include:

- Reduce allowed emissions in the I/M test for older vehicles.
- Reduce allowed emissions in remote sensing tests on roads.
- Require I/M tests for all 1981 and newer models, rather than the current vehicle age limit of 24 years.

3. Use of LIRAP Revenues

Researchers identified additional ways that LIRAP funds could cut diesel emissions:

- Develop an I/M program for diesel vehicles. A pilot project could use remote sensing with emissions cut points.
- Provide incentives to *re-flash* diesel engines. Re-flashing recalibrates existing engines for lower NOx.
- Retrofit diesel school buses to cut emissions. Replace others with 2007 models. The Legislature approved this in 2005 but did not fund. Further information is included in the school bus project reported on the next page.
- Expand funding for the Texas Emission Reduction Plan. In 2005, HB 1611 dedicated to TERP 30 percent of the $20 million that lawmakers approved for LIRAP and other programs.
- Apply *SmartWay* technologies to heavy duty trucks. These have been shown to reduce fuel use and emissions.

4. Other Potential Actions

- Expand local law enforcement efforts to find fraudulent inspection stickers.
- Create a fund for quick-action programs to reduce emissions. These could be launched if voluntary programs do not achieve planned cuts.

Pollution Inside School Buses

TERC's study analyzes diesel pollution inside school buses. It compares levels before and after control devices are installed. The project aims to fill knowledge gaps left by other studies.

Background

"Self-pollution" of school bus cabins by buses' own exhaust is at issue in Texas and other states. Children are more susceptible to health problems from diesel exhaust. New buses are much cleaner than older models. But older buses often stay in service for many years.

With more than 35,000 school buses, Texas has the second-largest fleet in the U.S. In 2005, the Legislature passed HB 3469. It approved spending TERP funds for a Clean School Bus Program. The program was not funded, however.

The TERC Project

Other studies set the stage for TERC's project. One in Los Angeles found up to 0.3 percent of older bus cabins' air was self-pollution. Levels were higher with closed windows. A set of studies took place in Chicago, Atlanta, and Ann Arbor, Michigan. The studies compared pollution from bus crankcases and tailpipes. They also compared benefits of different emission controls.

TERC's study was designed to fill gaps left by other research. Researchers used buses in a Central Texas school district. The study analyzed two control devices used with ultra low-sulfur diesel (ULSD). One, a *Diesel Oxidation Catalyst (DOC)*, breaks down pollutants into less harmful substances.

The other, a crankcase filter called a *Spiracle*, traps crankcase emissions. The study measured pollutants inside and outside of school buses, including fine and ultrafine particles, NOx, carbon monoxide, and total volatile organic compounds.

Findings to Date

1. *Overall Test Results:* There was substantial variability in test results from bus to bus.
2. *Inside Bus Versus Outside Levels:* For most conditions, average concentrations of fine particles inside of buses were slightly lower than outside levels. However, measurement of outside concentration levels may have been affected by pollution from the bus itself.
3. *Crankcase Filter Addition:* The installation of the crankcase filter (Spiracle) reduced NOx levels inside two test buses, but not the third.
4. *Diesel Particulate Retrofit:* The addition of the particulate catalyst (DOC) reduced fine particles in two of three buses.
5. *Additional Testing and Research:* Testing of more buses is needed to ensure that consistent emission reductions are achieved with the retrofit devices.

Other Texas Research

Other recent research in Texas focuses on school bus emissions. These include:

A study by Environmental Defense and the Clean Air Task Force in the Conroe Independent School District: Researchers found that emission control devices "significantly" cut fine particles and black carbon emissions that inside the bus.

Two studies of tailpipe emissions by the Texas Transportation Institute: One study is comparing emissions of two biodiesel blends with low sulfur diesel, the current standard diesel. The other is analyzing tailpipe emissions on actual bus routes and on a test track.

NOx Credits for Renewable Energy

Texas can earn ozone plan credits for producing renewable energy. Credits are also granted for saving energy. TERC's study calculated these credits for reduced NOx emissions. They totaled 15.4 tons per day through 2009. Wind power topped the list. It accounted for 5.7 tons per day.

Background

The Legislature has boosted energy efficiency and renewable energy for Texas. In 1999, SB7 told electric providers to add renewable power with a goal of 2,000 megawatts (MW) by 2008. This was increased in 2005 to 5,000 MW by 2015 (SB20), with a goal of 10,000 MW by 2025.

Wind power is Texas' main renewable energy source. Texas now ranks second in wind energy. Other renewable sources include solar, geothermal, hydroelectric, tidal, and biomass. SB7 also launched energy efficiency programs. In 2001, SB5 added more. SB20 called for calculation of these various actions' NOx credits. This study produced the first annual report. Texas A&M's Energy Systems Laboratory (ESL) did the analysis.

Renewables and Energy Efficiency State NOx Reductions Tons/day Ozone Season

	2009	2013
Energy Code	4.47	5.75
PUCT	3.98	5.31
SECO	1.27	1.76
Wind/ERCOT	5.69	4.32
Total	15.43	17.14

Emission Credits

The Energy System Lab at Texas A&M projected the cumulative NOx credits in the following areas for the years 2009 and 2013.

- New residential construction must meet the *state-wide energy efficiency code*.
- The *Public Utility Commission of Texas (PUCT)* has incentives and rebates for residences, commercial, and industrial buildings.
- The *State Energy Conservation Office (SECO)* funds programs for schools, government, industries, and residences.
- The *Electric Reliability Council of Texas (ERCOT)* enables wind power production in West Texas.

THE DALLAS-FT. WORTH METROPOLITAN AREA

Texas Environmental Research Consortium

TERC is a non-profit organization based in Houston. TERC is governed by a Board of Directors who oversee a research management organization and is informed by the TERC Advisory Council.

The research management organization is the Houston Advanced Research Center (HARC) located in The Woodlands, Texas. HARC works with the Science Advisory Committee (SAC) and Research Teams to conduct state-of-the-science air quality research projects. In 2006, the New Technology Research and Development (NTRD) program was organized with an Environmental Technology Advisory Committee.

TERC has been managing air quality research projects since 2002. The projects address issues pertinent to the State Implementation Plan (SIP). NTRD projects support development and verification of new technology for reduction of diesel emissions.

More information can be found on TERC, NTRD and the air quality research program at http://www.tercairquality.org.

THE HOUSTON-GALVESTON METROPOLITAN AREA